Scottish Hospitals Inquiry

Closing Statement by Counsel to the Inquiry

following

The hearing from 19 August to 13 November 2024

"Glasgow III"

1. INTRODUCTION

1. This is the written Closing Statement by Counsel to the Inquiry following the conclusion of the Glasgow III hearing that began on Monday 19 August 2024 and concluded on Wednesday 13 November 2024 ("Glasgow III").

2. The focus of the Inquiry in relation to the QEUH/RHC is that, over the period since the opening of the hospital in July 2015, there has been a concern that the condition of the ventilation and water systems has been such that, notwithstanding mitigatory and remedial measures taken by NHS GGC, they have contributed to the incidence of hospital acquired infections among particularly vulnerable patient populations.

1.1 The objective of the Glasgow III hearing

3. The Glasgow III hearing followed earlier hearings from 20 September 2021 ("Glasgow I") and 12 June 2023 ("Glasgow II"), during which the Chair heard from patients and families about the physical, emotional, and other effects of what some clinicians have described as unusual infections in the Schiehallion Unit following its opening in 2015. A significant amount of evidence was also heard from clinicians.

4. On 15 May 2023 the Inquiry Team produced a Provisional Position Paper (PPP5 – History of Infection Concerns). The purpose of PPP5 was to set out in a chronological narrative the Inquiry's understanding at that time of the various issues and events said to indicate a concern that aspects of the built environment within the QEUH had caused, or created a risk of, infection to patients. The Core Participants had the opportunity to comment on PPP5.

5. The scope of the Glasgow III hearing was set out in Appendix A to Direction 5 issued by the Chair on 13 December 2023. In summary the aim was to lead sufficient evidence, taken with evidence led in Glasgow I, and Glasgow II, all

relevant Provisional Position Papers and also the evidence led in respect of ventilation principles and practice at hearings of the inquiry in respect of Royal Hospital for Children and Young People/ Department of Clinical Neurosciences, in Edinburgh, that would provide a basis to answer four Key Questions: The four Key Questions are:

(1) From the point at which there were patients within the QEUH/RHC was the water system (including drainage) in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?

(2) From the point at which there were patients within the QEUH/RHC was the ventilation in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?

(3) Are the water and ventilation systems no longer in an unsafe condition in the sense that they now present no additional avoidable risk of infection?

(4) Is there a link, and if so in what way and to what extent, between patient infections and identified unsafe features of the water and ventilation systems?

6. In the months between the issuing of Direction 5 and the end of the Glasgow III hearing, the Inquiry Team issued four further Preliminary Position Papers[1] and obtained seven principal and one supplementary report from the independent experts appointed by the Inquiry. Under the procedure set out in Appendix B of Direction 5, Core Participants had the opportunity to raise issues with those experts in respect of six of those principal reports, and the supplementary report, in advance of the Glasgow III hearing and also to respond to PPPs 11, 12 and 14.

7. Core Participants also had the opportunity to suggest to Counsel to the Inquiry that they ask specific questions of witnesses under an informal process. If they were dissatisfied with the response, they could formally seek the permission of the Chair to ask their own questions under the Rule 9 process. Only one formal application was made under the Rule 9 process, which was granted by the Chair. We derive reassurance that we have asked all necessary questions from the fact that no other formal Rule 9 application were made by **any** Core Participant.

[1] PPPs 11, 12, 13 and 14 can all be found in Hearing Bundle 21

8. At the end of the Glasgow II hearing, the Scottish Ministers and NHS GGC submitted that the Inquiry needed to hear more evidence before the Chair could make findings in fact in respect of communications with patients and families and thereafter reach conclusions on TOR 8. They renewed this submission in the early months of 2024. We acceded to this request, and specific evidence was heard in what became known as 'Communications Week' from 22 to 25 October 2024. In addition, some other Glasgow III witnesses offered evidence on Communications. Our submissions on this issue can be found in Chapter 8 of this Closing Statement.

9. On 6 August 2024 Counsel to the Inquiry issued an Opening Note[2] in which we set out the scope of the hearing, and questions, themes and topics which it was hoped would be covered by the evidence. In that Note we indicated that, in addition to the issues identified in Direction 5, we intended to lead sufficient evidence such that, by the end of Glasgow III, the Chair would be equipped to reach his conclusions on Terms of Reference 1, 7 and 8.

10. Terms of Reference 1, 7 and 8 are in the following terms:

> 1. To examine the issues in relation to adequacy of ventilation, water contamination and other matters adversely impacting on patient safety and care which arose in the construction and delivery of the QEUH and RHCYP/DCN; and to identify whether and to what extent these issues were contributed to by key building systems which were defective in the sense of:
>
> > A. Not achieving the outcomes or being capable of the function or purpose for which they were intended.
> >
> > B. Not conforming to relevant statutory regulation and other applicable recommendations, guidance, and good practice.
>
> 7. To examine what actions have been taken to remedy defects and the extent to which they have been adequate and effective
>
> 8. To examine the physical, emotional and other effects of the issues identified on patients and their families (in particular in respect of environmental organisms linked to infections at the QEUH) and to determine whether communication with patients and their

[2] This will be published on the Inquiry Website in due course

families supported and respected their rights to be informed and to participate in respect of matters bearing on treatment

1.2 Sources of Evidence

11. The evidence that may be used by the Chair to address the four Key Questions and TORs 1, 7 and 8 is all that has been heard in the Glasgow I, II and III hearings or contained in hearing bundles or bundled statements, the four Provisional Position Papers in respect of the QEUH/RHC to which Core Participants have had the opportunity to respond, and the evidence about the principles and practices of hospital ventilation heard at the Edinburgh I hearing from 9 to 20 May 2022.

12. During the Glasgow III hearing the Inquiry heard from 56 witnesses over 46 days, sitting in twelve weeks (the Inquiry did not sit in the week of 14-18 October). Further witnesses provided written statements but were not called to give oral evidence. Documentary evidence was collated into 51 volumes of Hearing Bundles, of which eight (Bundles 1 to 8) had previously been used in the Glasgow II hearing. Transcripts of the evidence from Glasgow I, II and III and the witness statements of the witnesses are available on the Inquiry website.

13. As the Counsel to the Inquiry now in place are different from those who conducted the Glasgow I and II hearings, we have placed considerable reliance on the closing submissions of Counsel to the Inquiry and closing submissions of Core Participants in respect of Glasgow I and Glasgow II. Insofar as those hearings were concerned with the perceptions of the witnesses concerned, no Core Participants then sought to challenge the Closing Submissions of Counsel to the Inquiry from Glasgow I and II as presenting materially accurate summaries of the evidence heard (even if a number of Core Participants reserved their position as to the factual accuracy of the evidence).

1.3 Connection with the Edinburgh Interim Report

14. The Chair is currently preparing the Edinburgh Interim Report. The Chair has already heard extensive evidence and submissions from Core Participants in respect of the principles and practice of hospital ventilation in the Edinburgh part of the Inquiry. This Closing Statement relies on and builds from the closing statement of Counsel to the Inquiry in respect of the RHCYP/DCN in Edinburgh in respect of

principles and practices of hospital ventilation and addresses how these impact on the ventilation systems specified, contracted for, designed, built and operated at the QEUH/RHC.

1.4 Standard of Proof

15. On 16 June 2021 the Chair issued Direction 1 which provided that:

> "In general, the standard of proof that he will adopt when considering evidence with a view to making a factual determination, will be the civil standard of balance of probabilities. However, this is without prejudice to the Chairman expressing a conclusion specifically by reference to a different standard of certainty."

16. It is for the Chair to decide what weight, if any, should be given to any piece of evidence and to decide what conclusions or inferences can properly be drawn.

17. Consistent with section 17 of the 2005 Act the Chair should consider the circumstantial evidence that is available. Proper consideration must also be given as to whether facts, circumstances and inferences drawn from evidence that the Chair accepts point in different directions and suggest different answers to the Key Questions and the questions and issues set out in the Terms of Reference.

18. Context is important when drawing inferences or reaching conclusions. Although a single event or action might not have a great significance when considered in isolation, when it is considered alongside other events or actions that are similar or related to it (particularly over a long period of time) that event might well support a more substantive or material inference or conclusion about the issues that face the Chair.

19. These submissions are structured to follow that approach, to identify what evidence should be accepted and what evidence put to one side and also what inferences should be drawn (and what inferences should not be drawn) from the facts and circumstances supported by the evidence.

1.5 Expert evidence

20. The Inquiry engaged the services of six experts: Dr Mumford, Ms Dempster, Dr Walker, Mr Mookerjee, Mr Bennett and Mr Poplett. Considering the four factors

identified in *Kennedy v Cordia* (Services) LLP 2016 SC (UKSC) 59 from [48] ,and as discussed in Chapter 7 of this Closing Statement, it is submitted that these six experts meet the standard of impartiality that would be required of an expert witness in a civil litigation in Scotland, albeit that this Inquiry is not civil litigation and is not bound to follow particular rules of evidence.

21. The substance of the submission on this issue can be found in Chapters 6 and 7, but it is submitted that in respect of all five experts:

- Their evidence clearly assists the Chair in his task,
- They have the necessary knowledge and experience,
- They are independent and impartial in their presentation and assessment of the evidence placed before them, and
- There is, in the case of each expert within their field, a reliable body of experience to underpin their evidence.

22. NHS GGC have expressed particular concern that Ms Dempster had done some work for the Independent Review and for the Case Note Review. Even if that amounts to a conflict of interest (which is not accepted) in civil litigation, a conflict of interest does not automatically disqualify an expert from giving evidence; *Toth v Jarman* [2006] EWCA Civ 1028 per Potter LJ para 100 (approved of by the Supreme Court in *Kennedy v Cordia* at [51]). It should not do so here. A similar and equally unfounded critique of Dr Walker was made in respect of what were said to be his links to Dr Inkster and his involvement in the Horne Taps meeting on 5 June 2014. This is addressed in Chapter 7 when Dr Walker's evidence is discussed.

23. NHS GGC did challenge the expertise of both Mr Poplett and Mr Bennett. Those criticisms are dealt with in the submissions on ventilation deficiencies. They are rejected.

24. A separate issue is how to approach the evidence of the wide range of skilled or expert persons who were involved in the events that are the subject of the Inquiry and gave evidence. Many are medical doctors with specialist knowledge of infection prevention and control and/or microbiology, but these witnesses also include nurses

with experience and training in infection prevention and control, medical doctors from other specialities, epidemiologists, engineers and persons trained and experienced in aspects of the management of water and ventilation systems. Some had produced or contributed to reports sponsored by NHS GGC. Much of their evidence has been factual in nature, but some had offered opinions in their reports, and we also took the opportunity to ask their opinion on questions within the scope of their expertise where that opinion could assist the Inquiry.

25. These witnesses cannot be said to be truly independent expert witnesses in the manner identified in *Kennedy v Cordia (Services) LLP* primarily because of their sometimes long involvement with events at the QEUH/RHC. However, in terms of section 17 of the Inquiries Act 2005 the procedure and approach of the Chair is limited only by the requirement to be fair and the need to avoid unnecessary cost. The Inquiry is not bound by the laws of evidence, but it must be fair. It is therefore submitted that the Chair should use opinion evidence from any suitably skilled or expert person on the subject of their expertise, on issues where they can help the Inquiry and where there is a reliable body of evidence or experience for them to rely on. Whether they are doing their best to help the Inquiry in an impartial manner or the extent to which they might be said to not be impartial should in this Inquiry, it is submitted, be a matter of degree which the Chair should consider when deciding what weight should be given to their opinion. It is submitted that the following are relevant factors that the Chair should consider when making such an assessment:

26. Whether the witness has considered a wide or full range of available evidence on the issue about which they express an opinion.

27. The extent to which the witness can be said to have applied rigour and structure to the opinion they have reached and can explain how they reached their conclusion.

28. How has the witness responded to investigations or the opinions of others that might be thought to challenge their own opinion? Have they considered any such alternatives on their merits and with mature reflection or do they ignore or unfairly minimise alternative views?

29. How have they have responded to other persons with relevant experience, expertise or skill who took a different view both in the past and at the hearing?

30. In essence a careful skilled witness who considers a wide range of sources of evidence, can explain the reasons to a lay person, is open to consider the approaches and conclusions of others and who responds to difficult issues where there might well not be a prospect of certainty with tact and care is, it is submitted, the sort of skill or experienced witness whose opinion, in this Inquiry, the Chair should give real weight to in reaching his own conclusions.

1.6 The weight to give to first impressions.

31. A question that arises in considering the evidence is where witnesses have given evidence of their first reaction to discovering a particular issue or problem in the QEUH/RHC. This is particularly the case for treating clinicians who gave evidence in Glasgow II about their concerns, at the time, about discovering what they said were unusual micro-organisms in blood and other samples taken from their patients and as well ICNs, ICDs and microbiologists who gave evidence in Glasgow III about the discovery of what the Inquiry Team has called Potentially Deficient Features of the water and ventilation systems.

32. A similar issue arises where there is no evidence that treating clinicians, ICNs, ICDs, microbiologists and other members of IMTs were considering alternative theories of infection – such as Meropenem resistance driven infections or gut translocation – at the time of the initial investigation into infections. In some cases – where the witnesses were available in Glasgow III - it was possible for us to ask whether such alternative causes were in discussion at the time, but it is submitted that the best evidence of what was in the mind of those involved at the time will be the PAGs and IMT minutes and related documents.

33. As Ms Dempster reminded us in her evidence, in respect of the various infection incidents being investigated by those PAGs and IMTs and considered in the many papers, reports and presentations:

> "… each one of these is a child with a bloodstream infection, as you said earlier on, and they would've been looked at very closely by their clinicians caring for them, the

consultant with responsibility for their care, at a time when they would've been very sick."[3]

34. If clinicians at the time were focused on particular hypotheses of causation, or did not consider alternative hypotheses of causation, that is a significant fact that requires to be respected.

35. How a skilled person reacts to discovering something out of the ordinary occurring, where they are equipped to assess how unusual and serious is the deviation from the norm, is evidence to which the Chair should give real weight. The retrospective opinion evidence of the Inquiry's appointed experts and persons of expertise and skill who were involved at the time is clearly of value. However, it would be an error to fail to appreciate that the views of skilled and experienced persons reached at the time will often be the best opinion evidence as to what was going on and what was the cause of unexpected events. To do otherwise would be to treat the four Key Questions as an abstract technical challenge rather than as a series of real events involving real people.

1.7 Relationship with Glasgow IV and the remaining TORs

36. The Chair has set out that he intends to hear all evidence necessary to determine the whole of his Remit and Terms of Reference in respect of the QEUH/RHC by the end of the Glasgow IV hearing, which will run for five weeks from 29 April to 30 May 2025.

37. The Inquiry Team sought to ensure that those witnesses in Glasgow III who had something to contribute to Glasgow IV issues were asked questions about the remaining terms of reference, and in particular, five fact specific questions that look forward to Glasgow IV. These were:

(1) Do any Glasgow III witnesses have any evidence to contribute to the question of whether the Shieldhall wastewater treatment works has given rise to an increased risk to patients that requires to be taken as oral evidence?

(2) What can the Glasgow III witnesses contribute to a complete understanding of the practices and processes of reporting HAIs within QEUH/RHC (including the

[3] Transcript, Dr Mumford and Ms Dempster, Day 1, Col 78-80

operation of the HAIRT system and the various committees and subcommittees of the board) and whether they were effective?

(3) What can the Glasgow III GGC Estates and IPC witnesses tell the Chair about their involvement in the procurement of the hospital and specifically any opportunities prior to contract close to spot any Potentially Deficient Features that have their roots in the Building Contract?

(4) What can the Glasgow III IPC witnesses tell the Chair about their involvement in the procurement of the hospital and specifically whether they had input into the design and/or any opportunity before handover of the hospital to spot any Potentially Deficient Features in the water and ventilation system?

(5) What can the Glasgow III witnesses contribute to the Inquiry's understanding of whether the recommendations in respect of the practices and processes of reporting HAIs made by the CNR and the Oversight Board have been fully implemented by NHS GGC.

38. In Chapter 9 of this Closing Statement, we will identify, in broad summary terms, some points which were made and some of the evidence which arose in Glasgow III, that is relevant to Glasgow IV, without seeking at this stage to reach conclusions.

39. A Provisional Position Paper on Contract and Procurement has already been issued and responses from a number of Core Participants have been received (the scheduled date for responses being by 1st December.) As set out in Direction 8, it is intended that the Inquiry Team will issue a Provisional Position Paper in respect of the Governance issues that relate to the QEUH/RHC by the end of January 2025. Since the conclusion of Glasgow III, the Inquiry Team has also decided to issue a Provisional Position Paper to provide a narrative of the design and construction period of the QEUH/RHC (insofar as relevant to the Inquiry's TORs) covering the period from the agreement of the Ventilation Derogation (as described in PPP 13) to handover of the hospital to NHS GGC. This will be produced at approximately the same time as the planned Governance PPP. It is intended to give Core Participants four weeks to respond to each paper.

1.8 Structure of this closing statement

40. This closing statement contains the following chapters.

2. APPROACH TO THE EVIDENCE AND EXECUTIVE SUMMARY

41. This chapter's main function is as an executive summary of the later chapters in these submissions, which then lead to proposed conclusions that the Chair should make in respect of the four Key Questions and Terms of Reference 1, 7 and 8. It is only, of course, a summary of the approach taken in this Closing Statement as a whole. Prior to setting out the chapter summaries, we touch on a number of evidential issues which it may assist to understand at this stage.

2.1 Approach to the evidence heard in Glasgow III

42. Given the passage of time since the events that have been subject of that evidence, it is important to recognise that it is often in the contemporary records rather than in the later recollection of individuals, that one should look in the first instance for the most accurate version of events. The most important documents and ones that form a structure from which the rest of the evidence can be drawn together are the IMT minutes in Bundle 1, the minutes of the Water Technical Group and Water Review Group in Bundle 13 and the NSS SBARs in Bundle 3 along with a large number of emails in Bundles 12, 14 (Volumes 1,2 and 3) and 27 (Volume 8).

43. The Inquiry instructed five expert witnesses covering microbiology, water systems, ventilation, engineering solutions for hospital water and ventilation systems, epidemiology and infection prevention and control. All should be considered to be expert witnesses to the standard required for civil litigation and their opinions accepted as evidence.

<u>Whistleblowers</u>

44. A large proportion of the witnesses who gave evidence in Glasgow III were closely involved from 2015 onwards in the response to (a) growing awareness of flaws in the water and ventilation systems of the QEUH/RHC and (b) the IPC response to potential HAIs or HCAIs in the hospital including PAGs and IMTs. In general, (with a few notable exceptions discussed in Chapters 3 and 4 of this Closing Statement), it is submitted that these witnesses should be considered to have attempted (consistent with a reasonable lack of memory in some cases about events many years ago) to have honestly sought to assist the Inquiry about these events and can

be generally relied as historians of what took place and why they acted as they did.

45. The inquiry heard evidence from three microbiologists who have become known as the 'whistle-blowers', Dr Redding, Dr Peters and Dr Inkster. It should be noted that Dr Inkster was never formally a 'whistle-blower,' in the sense that she did not make use of the NHS GGC formal Whistleblowing policies and was not involved with the formal Whistleblowing processes commenced by Dr Redding and Dr Peters in September 2017. However, all three have been the subject of criticism by NHS GGC, particularly Dr Peters and Dr Inkster.

46. It is striking that there is no substantive evidence to support the view that Dr Peters and Dr Inkster were ever wrong when they identified flaws in the ventilation systems of the hospital, which they then drew the attention of colleagues and NHS GGC. These attempts began in the summer of 2015 and continued well into 2019. At every turn NHS GGC senior managers, including the Medical Director, sought to minimise or belittle the points they were making, whilst at the same time reacting to the flaws identified in a way that suggests that they recognised (eventually) that the flaws existed. Those senior managers used informal meetings, Whistleblowing reports and eventually the power to remove Dr Inkster as IMT chair, in order to undermine points being made by Dr Redding, Dr Peters and Dr Inkster and to protect the reputation of NHS GGC.

47. There was some evidence that, from 2017, Dr Peters may have had a communication style in her emails that was aggravating to those in IPC and senior management who heard from her, but even if that is the case it must be acknowledged that this was after two or more years of having her concerns ignored or sidelined. Similarly, even if one was to decide that Dr Inkster's leadership of the Gram-Negative Bacteraemia IMT in August 2019 was sub-optimal (which we do not consider to be supported by the evidence) by that point Dr Inkster was overworked, under supported, and undermined in her role as lead ICD and chair of the IMT, and that would have to be taken into account.

48. Dr Armstrong's criticism of Dr Redding, Dr Peters and Dr Inkster that they put their interest ahead of patients is not supported by the other evidence. Had there been evidence of this, as NHS GGC's Responsible Officer Dr Armstrong would have had to deal with the issue at the time by formal disciplinary response or GMC referral.

The fact that no such steps have been taken since 2019 supports the view, derived from a contextual understanding of what these three doctors actually did, that there is no merit to this criticism.

49. In our submission Dr Redding, Dr Peters and Dr Inkster should be praised for their commitment to ensuring that the effect of the flaws in the water and ventilation systems of the QEUH/RHC on its patients were fully investigated.

Aspects of the NHS GGC Evidence

50. As set out in Chapter 4 it is submitted that there were aspects of the evidence of certain key employees of NHS GGC and Executive members of the NHS Board that pose some significant difficulties for the Inquiry. At a high level these difficulties can be separated into two categories. There are some witnesses to whom both categories apply.

51. The first is that a repeated feature amongst senior NHS GGC managers – particularly, but not exclusively in the Estates function, around the failure to act on or escalate the 2015 DMA Canyon L8 Risk Assessment - is to assume that other people were carrying out important tasks that impinged on their own responsibilities. In addition, the issue was failing to mention important information known to them in meetings and email exchanges, where others might reasonably expect them to mention the issue (on the assumption that that information was already known to those who needed to know it.)

52. The second arises, amongst those who were involved in the response to the 3 October 2017 SBAR[1] and its associated 'Whistleblowing' processes and also those who were involved in the removal of Dr Inkster as the chair of the Gram-Negative Bacteraemia IMT in August 2019. There was, to a greater or lesser extent, an inability to explain their behaviour in a way consistent with an acceptance that it was reasonable for Dr Redding, Dr Peters, Dr Inkster and others to raise concerns about risks to patient health from the water and ventilation systems of the QEUH/RHC. It seems more likely than not that the reason these concerns were dealt with in the way that they were was from a desire to undermine the people raising the concerns, and, to adopt a sporting idiom, to play the man not the ball.

Issues Relating to the CNR

53. On 28 November 2019 the Cabinet Secretary for Health and Sport announced the Case Notes Review in Parliament. The Overview Report of the Case Note Review[2] and the evidence of the three members of its Expert Panel clearly have the potential to be relevant to the Inquiry especially in respect Key Question 4 and Term of Reference 8. Now that the Inquiry has heard from Gaynor Evans, Professor Wilcox and Professor Stevens it is proposed to use their evidence in a particular, and partly restricted, manner.

54. There is no difficulty with treating the evidence of what the CNR Expert Panel found when they reviewed the case notes and other records at high level as expert evidence. In the Overview Report they were particularly critical of the quality of data retained in the hospital in respect of environmental sampling, cleaning, maintenance, sample retention and sampling methodology and management of IMTs. In Glasgow III they gave relevant opinion evidence about Whole Genome Sequencing, IPC Practice, epidemiology techniques, antibiotic resistance and the quality of the NHS GGC response to events. Their evidence on these issues comfortably meets the tests for expert evidence and, it is submitted, can be used to reach conclusions on the issues they address.

55. A more difficult question is what use to make of the CNR's primary conclusions about infection link. It seems incontrovertibly true that the CNR Expert Panel are experts in relevant fields, supported by a clear body of reliable evidence to support their expressed opinions, and they do appear to be clearly independent from NHS GGC or any other of the various parties with an interest in their conclusions. However, they were unable to produce to the Inquiry the 84 separate reports in which they set out their reasons for how closely they assessed that each of the 118 infections suffered by those 84 patients were linked to the hospital environment. These have also not been produced to NHS GGC and are now held on a secure server controlled by NHS NSS. This is a major limitation in their utility. The decision was made to give control of this personal data to the patients and families. Without that granular detail it is submitted that the Chair cannot directly use their conclusion, as expressed in evidence,[3] that 33 of the 118 infections or 27% were more likely than not to be linked to the environment, as a factor within his assessment of the

evidence taking account of the Bradford Hill Guidelines.

56. However, as an independent parallel investigation, approaching matters from a different direction from the Inquiry, and under a different remit and terms of reference, it is submitted that once the Chair has reached his conclusion on Key Question 4, he would be entitled to look over at the aggregated conclusions of the CNR and use them as a check or confirmation that he has not reached an unreasonable answer to that question.

2.2 CHAPTER SUMMARIES

Chapter 3

57. As outlined above, Chapter 3 contains a summary note on the Glasgow III witnesses (including those who did not give oral evidence). The lengths of the summaries vary, but no particular significance should be attributed to those differences. Most summaries also contain, in short form, our conclusion as to how the evidence of that witness should be regarded.

58. In addition, this Chapter contains a fuller discussion of the CNR and considers in detail the evidence given by its members in Glasgow III. We include assessments of the evidence of each of these witnesses and consider the overall value of that evidence, not only on the work of the CNR on infection link, but on other topics such as WGS.

59. As explained above, we conclude that this evidence was extremely helpful. With the exception of the need to use the CNR Panel final conclusions only as a check to the Chair's own conclusions, we broadly accept their evidence.

Chapter 4

60. Also as outlined, Chapter 4 deals with two topics – infections and risk. In the section on infections, we draw on submissions made by Counsel to the Inquiry after Glasgow II and expand that following evidence in Glasgow III.

61. We consider, among other things, the types and classification of infections, bacterial and fungal and consider a number of the particular organisms encountered. We discuss the definitions of HAI and HCAI and their utility. We go on to consider how

infections are investigated.

62. We thereafter go on to look at how risk – and thus infection risk – should be understood, drawing on a variety of sources to inform our views. We look at its definition. We consider, but reject, the approach proposed by NHS GGC, looking at a number of examples where risk arose (such as the Horne Optitherm taps). We consider the search for certainty and when there may be an issue over asking the wrong question.

Chapter 5

63. Chapter 5 contains a lengthy chronological narrative of significant evidence. Although the main focus is on the years 2015-2019, we touch briefly on dates outside that range. This Chapter build on material from Glasgow I and II and adds Glasgow III evidence to the mix. While we have considered all the evidence, even in a narrative of such length we have had to be selective. We have endeavoured to include key passages from many witnesses.

64. Within the generally chronological account we have include some more general pieces of evidence which provide context or shed light on the detailed events. We have also aimed to break the narrative into issues and important events within the chronological framework.

65. Going beyond what is set out briefly above would risk creating yet another lengthy narrative – which may be best avoided - so the reader is referred to Chapter 5 for the detail.

Chapter 6

66. Chapter 6 aims to pull together some of the issues explored during the chronological narrative in Chapter 5. It does so by the device of using seven fact-specific questions. These were

- What was the reaction of NHS GGC and its staff to discovering the potentially deficient features of the water and ventilation system in 2015?
- What was the scope and the extent of the response to potentially water related infections from early 2016 and what would have been the effect if the 2015 DMA

Canyon L8 Risk Assessment had been known to IPCT that year?

- What was the scope and extent of the response to further unusual potentially water related infections in 2017 and what would have been the effect had the 2015 DMA Canyon L8 Risk Assessment been known to IPCT that year?

- At the time of Stage 1 Whistleblow and the 27 Point Action Plan, what understanding was held within NHS GGC about the features of the hospital water and ventilation systems and whether there was any connection to the number of infections?

- How did the IPC team, Estates staff and GGC as an organisation respond to what appear to be unusual numbers of infections in the Schiehallion Unit in 2018?

- Were the various suspected and confirmed Cryptococcus and Aspergillus cases in the period from 2016 to 2020 properly investigated, and what can be learned that is relevant to the question of whether the ventilation gave rise to an infection link or increased risk to patients?

- What can the events of autumn 2019 tell the Inquiry about NHS GGC's understanding of the state of both the water system and the ventilation system during 2019 and about the way that NHS GGC were responding at that time?

67. In the course of our endeavour to answer these questions, we pick up a series of behavioural questions which may shed light on what occurred. We look, in particular, at the relationship between Dr Inkster and others such as Dr Armstrong and Professor Steele. We also look closely at the episode in 2019 around the removal of Dr Inkster as Chair of the IMT and conclude that this saga is not to the credit of many participants or to NHS GGC.

Chapter 7

68. Chapter 7 contains analysis of the Key Questions and the opinions of the experts. It is divided into sub-chapters by topic.

Water

69. In **7.1** we consider **water**. We look at the main features of relevance of the water system, and consider, in relation to each of them, the evidence of Dr Walker and Mr Poplett, together with such contributions as are helpful from witnesses such as Dr Makin, Dr Lee, Tim Wafer and Mr Watson. We do so to assist in answering those portions of Key Questions 1 and 3 which relate to water.

70. We look at precautions in the build phase (or the lack of them), early filling of the water system, issue surrounding how to control microbial growth in a water system (including the key roles of both temperature and movement). We consider chemical control, including whether it should be generally deployed.

71. The witnesses looked at the complex topic of biofilm and its formation. More important was its removal. We look at the puzzling topic of the bypass pipe. What processes, systems and appointments ought to have been in place caused considerable discussion. Inevitably we focussed on the 2015 DMA Canyon L8 Risk Assessment. The importance of record-keeping was considered.

72. A number of practical issues impinging on operation of the water system were looked at, including asset tagging, PPM, and indeed the sheer size of the water system. This section looked topics such as the use of POUFs, flexible hose and drains. It would not be a section on water if there was not also a discussion on Horne Optitherm taps.

73. The sub-chapter then draws together the evidence with a view to reaching an overall conclusion on water system safety. We conclude by attempting to reach conclusions on the Key Questions. Key Question 1 should be answered by saying that the system was unsafe in 2015. Subject to a degree of uncertainty caused by the experts being reluctant to set out a binary answer (eg Dr Walker preferred ‘safer’), the Answer to Key Question 3, we suggest, is that the system is no longer unsafe.

Ventilation

74. In **7.2** we look at **ventilation**. Here we start by summarising the deficiencies we conclude exist. We then turn to the expert and other evidence, as well as

considering a wider range of ventilation issues. The section includes a discussion on Cryptococcus, centred around the Hood Report.

75. We conclude that the deficiencies are reduced ACH in general, use of chilled beams, lack of validation and, (until 2019), annual verification, a series of deficiencies in Ward 2A, some remaining deficiencies in Ward 4B, incorrectly constructed PPVL rooms, and deficiencies in Ward 4C.

76. We look at the evidence from Mr Bennett and Mr Poplett, supplemented by, eg, Mr Lambert and Mr Leiper. That evidence then deals with principles, thermal wheels, HEPA filtration, and lack of resilience. The different wards are then examined, as well as the debate over the value of ACH for immune-compromised patients. Aspergillus is touched on. BREEAM is mentioned.

77. There then follows – given the controversy over the point – a discussion over risk, especially arising from ACH at less than advised in SHTM 03-01. We accept Mr Bennett's view that this does indeed create a risk, even if that risk cannot be quantified.

78. The section on Cryptococcus draws on Mr Bennett's Report and reviews the hypotheses in the Hood Report. Ultimately, we find the NSS criticisms of that Report persuasive. We reject the argument for NHS GGC that most hypotheses can be ruled out, reject also any view that the answer is reactivation, but conclude that the precise source may never be established.

Epidemiology

79. In **7.3** we turn to what became the vexed question of what the **epidemiology** can tell us. We consider Mr Mookerjee, his Reports and his oral evidence at length and conclude he was a credible and reliable witness.

80. We noted the general approach of an epidemiologist, and how tools can be applied to the experience of infection in the Schiehallion Unit. We looked at the debate over the use of comparison material. Causality is examined, as is correlation.

81. We discuss the Bradford Hill guidelines. We cover the scope of Mr Mookerjee's work. We note and discuss his response to data produced by NHS GGC following

his Report, and a series of issues arising from questions as to precisely what material and from where should be looked at. We also noted contributions to the discussion from Dr Mumford

82. Choice of comparator hospitals is considered, with comment and explanation from Mr Mookerjee as well as others such as Ms Imrie, Professor Wilcox and Professor Stevens. Other Glasgow hospitals would have a different patient cohort. There is a full discussion on the value, or otherwise of SPC (or SPCC) charts. We noted, and accepted, criticism from Mr Mookerjee of these tools.

83. We go on to consider anticipated criticisms of Mr Mookerjee's work and conclusions. We note his response to these. He was also asked to look at the Public Health Commentary produced by Dr Crichton. We then turn to the Schiehallion rate of infection and Mr Mookerjee's views, including a new chart produced for the hearing (which we reproduce). There is a long discussion around his use of the figures and various criticisms of that. Was there a correlation between infections and water positivity? There was.

84. Then we go on to note and consider other epidemiological material available to the Inquiry. They are not listed here. Their merits and demerits are discussed. We propose that the Inquiry should accept Mr Mookerjee's conclusion. We reject the notion that there is a need for more epidemiological data.

Infection Link

85. In **7.4** we turn to the issue of **Infection Link**. We consider in some detail the evidence of the expert witnesses Dr Mumford and Ms Dempster. We review and reject challenges to their role as witnesses. We also look at evidence from a wide range of other witnesses.

86. We go on to note observations on Key Question 4 in their Quantitative Report of May 2024. They conclude there was a link between infections and the water and ventilation systems. They considered the role of HEPA filtration in the context of airborne infections. Non-compliance with SHTM 03-01 caused a risk to patients.

87. Dr Mumford went on to discuss the various roles touching on IPC, and the manner in which major decisions such as ward decant should be taken. The witnesses went

on to discuss the role of Responsible Officer and the phrase ‘nurse-led service’ for IPC. They identified in detail the sources for their evidence. They also explained their understanding of what an unusual micro-organism was, and examined, and commented on, various groupings of bacteria. Dr Mumford’s discussion of background rates was similar to Dr Inkster’s. There is a discussion on water management.

88. A series of points were raised with the witnesses from their Direction 5 Response. Ms Dempster also answered a series of questions as to what she would have done in circumstances which arose at QEUH. In her view the whole of Wards 2A and 4B were ‘neutropenic wards’. Dr Mumford was asked similar questions. Both thought the position of Ward 4C was less clear. The decant of 2A was understandable.

89. On WGS, the amount of water testing was insufficient to exclude environmental connection. On number of ‘picks’ Dr Mumford thought 30 for a water sample. It was difficult to prove a negative connection to the environment because it's very easy to miss something, especially with the diversity of organisms in water. Meropenem was not the reason for rising infections. Dr Mumford then explained root cause analysis in detail. It is different from a case note review. Ms Dempster then looked at reporting definitions. Both witnesses then commented on the uses of epidemiology. We then took them to Cryptococcus where their focus was on the protective benefit of HEPA filtration. They would have reported further cases given how rare the infection is.

90. We took the witnesses to Sandra Devine’s Appendix to the NHS GGC Positioning Paper. They were dubious about the link with social deprivation. PPSs were of limited value here. The 3 organisms studied were not relevant. What about alternative explanations for the infections if not the environment? They said it was hard to think of another viable source. If it was not the hospital you would expect to see similar infections around the UK.

91. We took the witnesses through an extensive discussion on Mycobacterium chelonae. You would be duty bound to investigate even one case.

92. We asked the witnesses to offer their experienced views on the operation of IMTs during the periods in question. They were sympathetic to the difficulties faced by Dr

Inkster. After Dr Inkster was removed, Ms Dempster thought HPS attending in pairs was significant. They were critical of the declaration on 18th September 2019 that ward 6A was microbiologically safe.

93. Following a discussion on appraisal processes, Dr Mumford said she had not seen any documented evidence to support Dr Armstrong's view that Dr Inkster and Dr Peters were putting their interests above that of patients.

94. The witnesses defended their work against criticisms made by NHS GGC. They felt that it was probable that the environment caused the infections. They had not been confident in 2015 but by 2016 a link was beginning to emerge. The link continued through 2017 and 2018. It continued in 2019. In passing they offered the view that chilled beams should not be in hospitals.

95. In the same section we consider the NHS GGC response on infection link. We suggest it attacks an approach which has not been taken. We also suggest that the NHS GGC enthusiasm for WGS is undermined by the evidence of Professor Wilcox and others. It also showed a lack of respect for the judgment of treating clinicians. We conclude by suggesting that there has been no convincing alternative explanation.

Chapter 8

96. In this Chapter we consider some aspects of patient and family experience and a range of issues around Communications. In the course of the chapter, we look at duty of candour in both senses in which the phrase is used. We also look at the so-called ‘duty of candour incident’ involving Professor Cuddihy. Although we suggest that this can be ascribed to incompetence, it was a very unhappy incident.

97. In considering duty of candour, we draw attention to the need to ensure that clinically qualified staff who hold promoted posts are aware of their obligations. On statutory duty of candour, the preparation by NHS GGC of a policy which seems likely to have been unlawful stands out.

98. We record in some detail the experience and concerns of Mrs Slorance, Mrs Dynes and Beth and Sandie Armstrong, all of whom lost a relative at the QEUH.

99. On Communications as such we record the criticisms made by the Oversight Board. We posit that ‘communications are everyone’s business’. We look at whether the complaints process was ‘weaponised’ against patients.

100. More importantly we consider whether NHS GGC were defensive or transparent. Reputation was a factor being considered by NHS GGC. Looking at a number of examples we conclude there was ‘spin’. We also look at the timing of releases and what should be taken from the involvement of senior officials. We look too at means of communication.

101. We consider carefully the evidence on communication over prophylaxis. We conclude that deliberate concealment by clinicians is unlikely. We also note Professor White’s evidence on the need for communications to be patient centred. The communications issues raised in the patient experience evidence is reviewed, including the new issue of ‘social listening’.

102. Turning to TOR8 we suggest a finding that communications with families and patients did not in all respects adequately support and respect their rights to information and involvement. We propose deferring a conclusion on TOR4 until after Glasgow IV.

Chapter 9

103. In this Chapter we look forward to Glasgow IV. We start by outlining the topics we anticipate will be covered at Glasgow IV. We then turn to Glasgow IV evidence which emerged in Glasgow III and what questions we had anticipated would arise in that hearing.

104. We record the number of suggestions made about what could or might have been done better. We record these in summary form, under Governance headings, for consideration in Glasgow IV. We note in detail evidence on what happened before handover. We note the conflicts within that narrative and its potential relevance to the question of who was in a position to influence the specification or note problems with water and ventilation before handover.

105. We record in this Chapter some of the key points to emerge from Glasgow III which will require resolution in Glasgow IV.

106. As odour will be a topic in Glasgow IV, and as possible infection link due to siting is in the TORs, we took the opportunity to record fairly fully the evidence given on this topic in Glasgow I and II as well as in Glasgow III. We also look briefly at HAI reporting and committee functioning and note sources of detailed evidence on control of derogations.

107. Finally, we consider what material we have on implementation of CNR and Oversight Board recommendations and look to points arising from the CNR Overview Report.

Chapter 10

108. In Chapter 10, we seek to answer the four key Questions and look at proposed conclusions on TORs 1,7, and 8.

- Key Question 1 is – 'From the point at which there were patients within the QEUH/RHC was the water system (including drainage) in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?' We answer that Question 'Yes'.

- Key Question 2 is – 'From the point at which there were patients within the QEUH/RHC was the ventilation in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?' We also answer that Question 'Yes'.

- Key Question 3 is – 'Are the water and ventilation systems no longer in an unsafe condition in the sense that they now present no additional avoidable risk of infection?' We answer that Question 'No' for ventilation and a qualified 'Yes' for water.

- Key Question 4 is - 'Is there a link, and if so in what way and to what extent, between patient infections and identified unsafe features of the water and ventilation systems?' We answer that Question 'Yes, there is a link' and discuss matters more fully in Chapter 7.4.

109. Term of Reference 1 requires the Inquiry – 'To examine the issues in relation to adequacy of ventilation, water contamination and other matters adversely impacting

on patient safety and care, which arose in the construction and delivery of the QEUH and RHC, and to identify whether and to what extent these issues were contributed to by key building systems which were defective in the sense of:

- Not achieving the outcomes for being capable of the function or purpose for which they were intended:

- Not conforming to relevant statutory regulation and other applicable recommendations, guidance, and good practice.'

110. We consider that in the context of ventilation, which we conclude was not adequate and was inconsistent with the guidance. In the context of water, we conclude that in theory it was capable of performing its required function, but for a combination of reasons could not. It was accordingly not in accord with guidance.

111. Term of Reference 7 requires the Inquiry to examine what actions have been taken to remedy defects and the extent to which they have been adequate and effective. The answer to that question is more complex and follows from the answer to the third Key Question.

112. Term of Reference 8 requires the Inquiry to examine the physical emotional and other effects of the issues identified on patients and their families (in particular in respect of environmental organisms linked to infections at the QEUH), and to determine whether communication with patients and their families supported and respected their rights to be informed and to participate in respect of matters bearing on treatment.

113. We respond to this TOR by noting some of the real and significant impacts felt by patients and families. We then conclude that communications did not adequately respect patients' rights.

3. THE EVIDENCE HEARD IN GLASGOW III

1. This chapter comprises of a short summary of the evidence of each of the Glasgow III witnesses, both those who were heard in oral evidence and those who provided a statement but were not called to give evidence. The exception is the Inquiry's Expert Witnesses, where their evidence is discussed in the various parts of Chapter 7. It should be noted that summaries of the evidence of Glasgow I and Glasgow II witnesses can be found in the closing submissions from those hearings by Counsel to the Inquiry. The witnesses are organised into groups, largely reflecting their roles in NHS GGC and NHS NSS. The groups of witnesses are:

    - NHS GGC Estates and Facilities Staff
    - Members of the IPC Team and Public Health Consultants
    - NHS NSS Staff
    - External Contractors and Consultants
    - Members of NHS GGC Board
    - Other NHS GGC Staff
    - Patients and Families
    - The CNR Expert Panel

2. At the end of this chapter is a section which discusses the evidence of the CNR Expert Panel, proposing what inferences can be drawn from the CNR work and evidence.

3. For most witnesses their substantive evidence on events in the period from 2014 to 2023 is set out in the narrative in Chapter 5, so it can be considered along with the evidence of other witnesses talking about the same events.

4. It is anticipated that in their Closing Statements Core Participants will have comments on this narrative, proposed changes to the summaries in this narrative and may identify evidence that they consider should be referred to here or if it relates

to particular events in the period from 2014 to 2023 in Chapter 5. It would be of great assistance (and in conformity with the spirit of Direction 9) if when doing so Core Participants could identify the paragraphs in this Chapter (or Chapter 5) that are most closely related to the issue they raise and the date (at least to a month or months) when the event/evidence at issue occurs or is said to occur

3.1 NHS GGC Estates and Facilities Staff

Professor Tom Steele – 04 October 2024

5. Professor Thomas Steele gave evidence to the Inquiry on 4 October 2024. He adopted his witness statement which is incorporated into the bundle for the week commencing 30 September 2024. Professor Steele is the Director of Estates and Facilities with NHS GGC. Professor Steele began his role on 1 October 2018. He had previously been a Director at Health Facilities Scotland.

6. Professor Steele confirmed that, in 2019, the designated persons for water were Mary Anne Kane and Allan Gallacher. He was made the Designated Person when he took up his post. Professor Steele confirmed that in 2015, 2016 and 2017, there was not a proper structure of designated people and a written scheme for the new hospital. Whether the water system was contaminated or not, the system had the potential to be contaminated. The control of the system was not robust enough to eradicate the bacteria. Further, he explained that the systems would support a position that, on review of the data about how the system was commissioned, it compromised the sterility of the pipework as having water not moving in the system compromised the system.

7. Professor Steele also confirmed that he did not know that, in 2015, the ventilation systems in Ward 2A and 2B were not built to clinical specifications. The ventilation in Ward 2A was not upgraded until after 2018, except for some small rooms. Professor Steele confirmed that the ventilation system in the general wards had not been risk assessed. He also confirmed that there were no announcements or risk assessments about the ventilation system only delivering three air changes per hour.

8. Professor Steele confirmed that Dr Redding, Dr Peters and Dr Inkster were not amongst those that he considered had taken actions to systematically undermine

those charged with dealing with the complex issues with the hospital. It was not clear from his evidence whether he actually considered that these people were, in fact outside the organisation.

9. Professor Steele is clearly a dynamic administrator. He wanted to give the impression that his arrival at NHS GGC in the summer of 2018 with the news of the 2015 and 2017 DMA Canyon L8 Risk Assessments, and his appointment as Director of Estates and Facilities, was what set NHS GGC on the path to resolving the many issues it clearly had with the QEUH building. To some extent that is undoubtedly true, and Professor Steele was ready to act to address problems, but his involvement was marred by the difficulties in his working relationship with Dr Inkster which as discussed in some detail in Chapter 6 could best be understood as involving (on his part) a complete failure to understand the problematic culture of NHS GGC and how it could be made so much worse. His failure to admit to Dr Armstrong and Dr de Caestecker that he had made a "jocular" remark to Dr Inkster about not sending her SBAR by email at their 10 December 2018 meeting had (as is discussed in the narrative and Chapter 6) real and deleterious consequences for the management of IPC in the Schiehallion Unit and contributed to the breakdown in trust between Dr Armstrong and Dr Inkster.

10. The question of whether the inquiry should rely on Professor Steele's evidence in its entirety is difficult. There seems no reason not to do so when he is reporting on the actions of the Estates and Facilities service as a whole. The problem arises around his evidence about his own actions particularly in respect of his interactions with the Dr Inkster and Dr Peters in 2019. He now accepts what he said to Dr Inkster at their meeting on 10 December 2018 goes some way to remove doubts about his reliability but one is left with a slight sense that at times he was more interested in painting a picture of what happened in a manner that supports his actions rather than in a frank assistance to the inquiry.

Alan Gallacher – 23 August 2024

11. Mr Gallacher adopted his statement which is incorporated into the Witness Bundle for the week commencing 19 August 2024 (vol 1).

12. Mr Gallacher is currently employed as Head of Corporate Estates for NHS GGC (having been in that post for less than a year). At the time of the events with which the Inquiry is concerned he was General Manager (Estates), a board wide appointment which he took up in August 2015. As such his responsibilities included QEUH. Part of his responsibilities included support of the estate teams and compliance, ensuring NHS GGC met national and statutory requirements. He attended Responsible Persons (Water) training.[4] He was a member of the Board Water Safety Group.[5]

13. He accepted on a number of fronts that he had been reactive rather than proactive, and that with hindsight it would have been preferable had he been proactive. By way of example, compliance was within his remit, but before a compliance team was put in place in the course of late 2016, he did nothing to ensure that authorised engineers and authorised persons were put in place. He was aware that staff at the QEUH were working under considerable pressure but seemed to do nothing to assist.

14. He also illustrated the well-known risk of making assumptions (a risk he accepted).[6] Again, by way of example he did not raise the 2015 DMA Canyon report at the Board Water Safety Group because he assumed someone else would do so. He should have mentioned it at the IMT on 12th March 2018 but didn't.

15. Much of Mr Gallacher's witness statement seemed to be aimed at ensuring that no responsibility lay at his door. On several occasions it had to be pointed out to him that his answers to questions posed in his witness statement were unhelpful.

16. Ultimately the conclusion may be that he was, largely due to his inaction and reactive approach generally, unable to contribute much by way of substantive evidence. What evidence he did give requires to be treated with care, especially given the contrast between his witness statement and some of what he said orally. However, given the number of occasions on which he conceded that he could or should have done something, which might have made a difference to the troublesome issues at the

[4] Mr Gallacher, Witness Statement Page 436
[5] Mr Gallacher, Witness Statement, Page 509
[6] Alan Gallacher, Transcript, Page 47

QEUH, it is difficult not to treat these as potentially significant failures. Whether that indicates a broader failure in the NHS GGC system of management is for another day.

Ian Powrie – 22 August 2024

17. Mr Powrie gave evidence on 22nd August 2024. He adopted his statement, which can be found in the Witness Statement Bundle for week commencing 19th August 2024 (vol 1).

18. Mr Powrie's background was in electrical systems. He had spent most of his working life in the healthcare estates function. He had been involved with the QEUH Project Team from August 2012 until September 2015, when he became a sector estates manager. He continued in that post until January 2017, when he became deputy board general estates manager. He retired in July 2019. He was accordingly present at the QEUH during the majority of the time which concerns the Inquiry.

19. He was able to give evidence on the range of challenges which faced the estates team when the new building was handed over in January 2015. He was also able to give evidence about the discussions over selection and maintenance of the Horne taps, as well as interactions between the estates team and IPC as issues emerged including the Water Incident. In addition, when supporting Dr Peters, he became one of the first to hear from the project team about the ventilation derogation.

20. The part of Mr Powrie's evidence which has achieved greatest prominence in the inquiry process, has been his role as the individual who in April 2015 instructed the L8 Legionella pre-occupation water assessment from the external provider, DMA Canyon. He later received that report and issued instructions on what was to be done with it. Unfortunately, he did not read it, escalate it within his department or to Infection Control, or follow up on what steps had been taken to meet its requirements.

21. Mr Powrie was able to assist the Inquiry on a range of estates related issues, and in general terms there is no reason why his evidence should not be accepted. His performance and competence as an estates manager was commented on positively by a number of other witnesses. On some points differences may emerge either

because he had no recollection, or his memory differed from that of another participants. Caution should be exercised before accepting his evidence in these areas on an uncritical basis.

22. On the central issue, his open and honest acceptance ("I dropped the ball" [7]) of failings on his part does him some credit. However, it is inevitable that the Inquiry will find it necessary to pass adverse comment on the failing to handle the DMA Canyon report correctly given its significance.

Colin Purdon – 20 August 2024

23. Mr Purdon adopted his statement which is incorporated into the Witness Bundle for the week commencing 19 August 2024 (vol 1). Mr Purdon is currently head of estates at NHS Golden Jubilee which is separate from NHS GGC. In August 2015, he moved to the QEUH as senior estates manager and looked after the retained estate on the site (older buildings and the laboratory block, teaching & learning centre and office building built by Multiplex) and reported to Ian Powrie.

24. He gave evidence on the difficulties he encountered using the Estates' ZUTEC document management system. He also spoke to seeking an update of the 2015 DMA Canyon L8 Risk Assessment report. Notably, Mr Purdon conceded that he did not act on the 2015 DMA Canyon L8 Risk Assessment or mention it at an IMT on 12 March 2018 concerning the water incident. His evidence also discussed the pigeon infestation in QEUH/RHC, and the Horne Optitherm taps.

25. The evidence of Mr Purdon suggested that there was no system in place to ensure that risk assessments were acted on and in effect colleagues were relying on issues being communicated timeously. Indeed, his evidence indicated there was no system in place to ensure that there was an overview and ownership of the pigeon infestation issue.

26. Mr Purdon had a limited recollection of events, even those that one might reasonably expect him to remember given their apparent importance. Accordingly, the reliability of the evidence is limited, and it is difficult to place substantial weight on it.

[7] Ian Powrie, Transcript, Page 116.

Kerr Clarkson – 20 August 2024

27. Mr Kerr Clarkson adopted his statement which is incorporated into the Witness Bundle for the week commencing 19 August 2024 (vol 1) and also his supplementary statement which is incorporated into the Witness Bundle Volume 9. Mr Clarkson is currently the site manager for Operational Estates at the QEUH. From June 2018 to March 2020, he was an estates manager for the Retained Estate and the new laboratory building on the QEUH campus. In this role, he reported to Colin Purdon. He was trained and appointed an Authorised Person (Water) in August 2018.

28. In March 2020, Mr Clarkson was promoted to site manager for operational estates for the whole QEUH campus reporting to Euan Smith. His duties included looking after day to day planned and reactive maintenance and looking after compliance with regulations and statutory duties (SHTMs, HASWA 74 etc).[8]

29. In his time at the QEUH Mr Clarkson has gained considerable experience in the management of the hot and cold domestic water systems of the hospital. He clearly has skills and experience as an Authorised Person (Water), but he is not a microbiologist and should be treated as a person of skill working within a recognised field of experience.

30. In that context it is significant that Mr Clarkson was clear that there were differences in managing the water system in the QEUH compared to the Retained Estate because it was so big, there were significantly more water outlets which arose from having single rooms and en-suites.[9] In addition he explained that there was evidence of lack of planned maintenance between 2015 and 2018 for the QEUH.[10] His opinion was based on his understanding now that with the benefit of hindsight temperature and filtration controls were not sufficient for the QEUH.[11]

31. Mr Clarkson felt that he was good at writing HAI- SCRIBE documents and has written hundreds of HAI- SCRIBE documents in relation to changes within existing

[8] Kerr Clarkson, Transcript, Page 5.
[9] Kerr Clarkson, Transcript, Pages 11-13.
[10] Kerr Clarkson, Transcript, Page 15
[11] Kerr Clarkson, Transcript, Pages 14-17.

buildings (i.e. the retained estate) and maintenance of the QEUH/RHC. He explained that writing a HAI-SCRIBE involved working with Infection Control colleagues to produce the document, but it can take a significant amount of time to draft the HAI-SCRIBE. However there must be some concern that his understanding of whether a HAI-SCRIBE should be used for new build or refurbishment (particularly the commissioning of the new Wards 2A/2B in) does seem to be at variance with the clear requirements for a Stage 4 HAI-SCRIBE set out in SHFN 30 - Part B: HAI-SCRIBE – Implementation strategy and assessment process – Version 3.0, October 2014.[12]

32. Mr Clarkson appeared to make an honest effort to assist the Inquiry by providing as much relevant information as he could. He did not appear to be holding back information. Whilst he was keen to set out how, in his view the management of the domestic water system has significantly improved since he took over in March 2020 and now presents no additional avoidable risk of infection, he was willing to acknowledge failures and flaws in the system and its management, particularly prior to the 2023 DMA Canyon L8 risk assessment and Mr Kelly's most recent AE Audit. The Inquiry should rely on Mr Clarkson's evidence.

Karen Connelly – 30 August 2024

33. This witness gave evidence remotely from France on 30 August. Ms Connelly adopted her statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Unusually among the witnesses Ms Connelly was involved in the QEUH only sporadically. She was part of the project team between the summer of 2009 to the middle of 2015. Apart from providing a short period of absence cover she was not then involved until January 2018, when she took on the position as a general manager for estates and facilities, which she held until the middle of 2019.

34. Her focus throughout was more on what were described as 'soft' facilities, what used to be called hotel services. She was not involved in the design of ventilation. Although her name appeared on an e-mail with the ventilation derogation M&E log,

[12] Bundle 27, Volume 4, Document 35, Page 365 (A3362208) and particularly from Page 431.

she had no involvement in it and assumes it was sent to her address so that copies could be printed for a meeting in the Hillington office.

35. She was able to give some evidence about the consequences of the issues with the chilled beams, about discovery of mould in ward 2A and what she was told about the 2015 DMA Canyon L8 Risk Assessment.

36. Pest control was under her remit, so she gave evidence about the discovery of significant pigeon droppings and the system in place for dealing with pigeons.

37. Within the scope of the assistance she could provide there is no reason not to treat her evidence as reliable, subject to the acknowledgement she made that at times her memory was vague.

Darryl Conner – 28 August 2024

38. Mr Conner adopted his statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Mr Conner is currently employed by NHS Assure, where since July 2021 he has been a senior engineer and authorised engineer for healthcare ventilation systems. He joined the team at QEUH in 2014 initially as a duty manager providing out of hours responses to estates issues. He was focussed on electricity and trained as an AE in high and low voltage systems at the QEUH. In 2018 he became a day-shift manager and in September 2018 he received training to be the AP in ventilation.

39. He gave evidence as to what he found when he took over maintenance responsibility for ventilation (no record of validation, no verification of critical assets other than theatres, and no PPM other than theatres).

40. He had a good understanding of the issues which arose with chilled beams. He was involved in options appraisals after the Ward 2A decant to 6A and also at a later date in relation to 4C. He attended discussions on the proposals for new ventilation arrangements for ward 2A in his capacity as AP (ventilation).

41. He was able to explain the process for calling out pest control to deal with pigeons and carried out a survey of plant rooms on level 12.

42. Generally, it is submitted that Mr Conner's evidence can be treated as helpful and reliable.

David Brattey – 20 September 2024

43. Mr Brattey adopted his statement which is incorporated into the Witness Bundle for the week commencing 17 September 2024 (vol 5). Mr Brattey worked at the QEUH/RHC in his role as Senior Estates Manager from April 2015 until he retired in March 2018.

44. He explained the HAI-SCRIBE process, Planned Preventative Maintenance (PPM), his involvement in the action plan relating to the 2015 DMA Canyon L8 Risk Assessment report and the pigeon infestation.

45. A recurring theme in Mr Brattey's evidence was how busy he and the Estates team were during the period 2015 to 2018. It is inevitable that when a team is under-resourced and working long hours that matters will be overlooked and result in significant issues arising over the longer term.

46. Mr Brattey appeared to approach his evidence with a genuine willingness to assist the Inquiry, and his demeanour throughout was open, honest, and cooperative. However, his ability to recall events from several years ago was limited. This led him at times to rely on assumptions rather than clear memory.

47. Mr Brattey candidly acknowledged on multiple occasions that certain actions ought to have been taken, showing a commendable readiness to make concessions. Additionally, while he did not directly answer every question, often straying into broader or tangential responses, this appeared to stem from a desire to be thorough rather than evasive.

48. Of note, the witness was able to recall certain anecdotes of relevance, and his evidence broadly aligned with contemporaneous documentary evidence, suggesting consistency and credibility in those areas where his recollection was clear. However, the gaps in his memory and his tendency to make assumptions do raise some concerns about the overall reliability of his account.

49. In summary, while Mr Brattey's credibility in terms of honesty and intent was strong,

the reliability of his evidence is tempered by his incomplete recollection and reliance on inferences. This underscores the need to view his evidence with a degree of caution.

Melville MacMillan – 05 September 2024

50. Mr MacMillan adopted his statement which is incorporated into the Witness Bundle for the week commencing 03 September 2024 (vol 2/). Mr MacMillan is currently operational estates manager at the QEUH and has been in this role since November 2014. Between November 2014 and April 2018, he was an estates duty manager and thereafter a day shift operational estates manager. The duty manager role involved taking calls from the helpdesk, calls from the nursing staff, and firefighting - fixing and repairing things when they broke down. He would distribute jobs to technicians in his team to go and carry out the works.

51. Mr MacMillan spoke to his observations of the hospital in 2015, the function of an Authorised Person, the safety of the water system, bypass water, PPM, and pigeon ingress.

52. Mr MacMillan made an earnest effort to assist the Inquiry by recollecting events to the best of his ability. His responses were generally informative, and he appeared forthcoming in sharing details as far as his knowledge permitted. His genuine approach and demeanour added credibility to his account. He openly admitted areas where his involvement was limited or where his recollection was unclear.

53. However, on certain matters, there was a degree of reluctance to offer his personal viewpoint. This understandably constrained his ability to provide deeper insights on certain points and undermined the reliability of his evidence. Overall, his evidence was of some assistance in clarifying the factual background relating to the Estates team's involvement in issues of interest.

Thomas Romeo – 28 August 2024

54. Mr Romeo adopted his statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Mr Romeo is now a taxi driver in Glasgow but started his career as an electrician having done an apprenticeship,

working for the NHS and moving in 2011 to the Glasgow Royal Infirmary. He moved to the QEUH in 2014/15 to become an estates duty manager (reactive, fixing things when they break down). In May 2017, he became an estates manager which involved more PPM. His initial role reported directly to Ian Powrie, but by April 2015 this had changed to David Brattey. In 2017, this changed to Colin Purdon. He stopped working at the QEUH in November 2019.

55. His tasks included purging (putting air through medical gas hoses). These jobs would be allocated to him via the helpdesk or FM First (facilities management software). He explained the tasks were recorded and completed on an in-house software system, FM First, being allocated to and by him on this system.

56. Mr Romeo's evidence was marked by a degree of inconsistency and selective recall. While he was able to recount certain events from the relevant period with notable clarity, he demonstrated a surprising lack of recollection regarding other significant occurrences from the same timeframe. This apparent selective memory raises questions about the overall reliability of his evidence as it is unclear why certain details stand out while others seem wholly forgotten.

57. Mr Romeo appeared keen to address the questions posed, often engaging quickly and speaking at length, which conveyed a willingness to co-operate. However, he occasionally responded so rapidly that it seemed he may not have fully grasped the context or intent behind some questions. This eagerness coupled with his apparent difficulty in understanding certain lines of inquiry impacted the clarity and coherence of his evidence. His responses were, at times, vague, and his lack of clarity on issues detracted from his ability to assist the Inquiry effectively. Given the foregoing, his evidence should be treated with caution in assessing factual matters of significance to the Inquiry.

Phyllis Urquhart – 05 September 2024

58. Ms Urquhart adopted her statement which is incorporated into the Witness Bundle for the week commencing 03 September 2024 (vol 3). Ms Urquhart was a full-time compliance manager from November 2017 to January 2022 for Greater Glasgow and Clyde Health Board (but was in the role from May 2017 on a part-time basis). This

was a board-wide role across 186 sites which included the QEUH/RHC. This role involved providing technical managerial support and guidance support in meeting the Scottish Government's legislative & statutory compliance and improving compliance.

59. From July 2012 she had been at Gartnavel General Hospital ("Gartnavel") as a senior hospital estates manager. During this time, she held the position of Authorised Person for the water system for Gartnavel and the Western Hospital. She is now site manager in operational estates based at Dykebar Hospital, Paisley.

60. The compliance team reported to Alan Gallacher. Her role was water compliance; other team members worked on different areas of compliance. Day-to-day work included: organising audits, providing Board assurance, supporting colleagues in operational roles, compliance with statutory legislation, L8, and SHTM 04-01, reporting to the Board using Statutory Compliance Audit Reporting Tool ("SCART") providing information and technical advice in respect of water systems.

61. Ms Urquhart made a genuine effort to assist the Inquiry by providing as much detail as she could recall. Although she acknowledged some gaps and inconsistencies in her recollection, particularly regarding the precise timeline of events, she demonstrated openness and transparency. While some haziness to her recollections, and inconsistencies in timing, slightly reduce the weight of her evidence, her openness and co-operative approach lend credibility to her account.

Andrew Wilson – Statement only, not giving evidence

62. Andrew Wilson was an Estates Manager who worked at the QEUH/RHC in the period of time between January 2017 and December 2018. He provided evidence that explained the Estate team's software system called FM First which delegated work to the Estates team from service users. He elaborated that the tasks to resolve issues would be assessed by supervisors and then assigned to maintenance staff to complete but work delegated to him would be confirmed verbally or via email[13].

63. Mr Wilson noted that he did not see any commissioning and validation documentation for the Combined Heating and Power Unit (CHP) and recalled some

[13] Andrew Wilson, Witness Statement, Page 63

issues which the builder attempted to rectify[14].

64. He provided evidence that he was unable to recall seeing the 2015 DMA Canyon L8 Risk Assessment until after the 2017/2018 DMA Canyon L8 Risk Assessment had been issued to NHS GGC. He could not find any evidence that the recommended actions listed in the 2015 DMA Canyon L8 Risk Assessment had been carried out. However, following the 2017 DMA Canyon L8 Risk Assessment, he recalled putting the recommendations of the report into an action plan to monitor progress of closure of the issues[15].

65. His recollection was that no routine drain cleaning took place before 2018[16] and that may have been because the act of cleaning creates a risk of contaminating the surrounding area of the sink. However, he noted that a program of drain cleaning took place in June 2018 following patient infections[17].

3.2 Members of the IPC Team and Public Health Consultants

Tom Walsh – 13 September 2024

66. Mr Walsh adopted his statement which is incorporated into the Witness Bundle for the week commencing 10 September 2024 (vol 4). Mr Walsh trained to be a nurse and was on the nurse register until 2006 or 2007. He then became the Infection Control Manager ("ICM") for NHS Greater Glasgow in 2007 and held that role until April 2019. Subsequently he was a general manager for the Chief Operating Officer for acute services, Jonathan Best, until he retired in March 2021.

67. Mr Walsh explained to the Inquiry the function of infection prevention and control. He gave evidence on the powers of an IMT chair and suggested that an IMT chair could be over-ruled where there are balance of risk considerations. He also revealed that he had proposed that microbiologists and Lead ICD be under the head of Microbiology in late 2018 but explained that on her return from sick leave Dr Inkster

[14] Andew Wilson, Witness Statement, Page 71
[15] Andrew Wilson, Witness Statement, Page 78
[16] Andrew Wilson, Witness Statement, Page 81
[17] Andrew Wilson, Witness Statement, Page 82

found this proposal to be unacceptable and it was withdrawn.

68. He also gave evidence explaining how ICDs and microbiologists would pick up any unusual types of organisms and create an alert. He noted that a problem assessment group ("PAG") meeting or incident management team ("IMT") meeting would flow from that.

69. In Mr Walsh's view, he would expect an experienced microbiologist to be aware of very unusual organisms and to escalate where there is one infection rather than waiting for a sequence of the same unusual organism infection. He also thought that microbiologists in the lab should be made aware of any increased risks such as the Legionella report for the QEUH noting a high risk.

70. Mr Walsh described Dr Peters in his evidence as having an inappropriate and unnecessary interest in infection control. He recalled that she failed to use the appropriate structures for escalating issues.

71. His awareness of ventilation issues such as missing HEPA filters and related remedial work was discussed during the course of his oral evidence. His evidence was that IPCNs have limited involvement in ventilation systems. He appeared to acknowledge an inconsistency between his view that there was no involvement by IPC at the design stage and the contemporaneous documentation. His evidence also covered his involvement in the Board Water Safety Group where he defended his failure to appoint a Designated Person (Water) at the QEUH/RHC as required by the Board Water Safety System Policy.[18] In his evidence, Mr Walsh did not accept there was a link between the quality of the water and the infection risk.

72. It was observed that Mr Walsh was somewhat evasive in his answers (despite expressly stating that he was not being evasive on several occasions). On various occasions, he avoided directly answering questions put to him and sought to shift focus away from his own involvement.

73. The evidence of Mr Walsh also seemed to reflect an animus towards certain individuals involved in the Inquiry proceedings. The apparent bias was noted by

[18] Mr Walsh, Transcript, Pages 73-74 and Bundle 27, Volume 2 at Page 8

attempts to cast aspersions on the credibility of those individuals often without a substantive basis. This obviously undermines the witness' objectivity. Whilst he was clearly an ICM for many years his lack of regulated professional experience and training as an ICD or ICN substantially restricts the use that can be made of his evidence in areas of IPC practice other than the formal reporting systems in NHS GGC of which he was most proud. Although he did make certain concessions, given the evasive responses to certain questions, deflection of criticism and evident animus towards certain individuals, Mr Walsh's evidence must be treated with a degree of caution.

Professor Craig Williams – 17 September 2024

74. Professor Williams give evidence on 17th September. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 17 September 2024 (vol 5). He had started as a consultant microbiologist at Yorkhill in 2002 and left NHS GGC in March or April 2016.

75. He gave evidence about his understanding of the involvement of infection control in the specification and design of the new hospital. A nurse consultant was the conduit between the project team and infection control.

76. He explained that the Neonatal Intensive Care Unit ('NICU'), was part of the retained estate in the Southern General.[19]

77. He understood the original advice was to build to the guidance in the SHTMs. He never signed off the ventilation systems or any derogation from them. Most of the exchanges with the infection control team more on relatively minor matters.

78. He was being reassured by the project team that validation was complete. They were repeatedly told that. He was therefore surprised to find problems on handover. At one point he had been reassured by David Loudon.

79. He rejected criticism made by Dr Peters and others. He had 'no idea' why 3 ICDs had resigned. He knew it was a difficult time for everybody. It came 'out of the blue'.

[19] Professor Williams, Transcript, Pages 57 - 58

He knew so little he asked Brian Jones who said he couldn't talk about it.[20] Any suggestion that he had 'jumped before he was pushed' was incorrect. No allegations had been put to him at the time. His reason for resignation was that it was a 'hard job' and needed confidence in support from colleagues. He did not have that, so it became impossible to deliver the job to standards he wished'.[21]

80. Some areas in Professor Williams' evidence were challenging to accept (such as his claimed lack of knowledge about the reasons for ICD resignations in 2015). In relation to approval of the ventilation specification from an infection control perspective, it is not clear whether the full picture emerged from his evidence. With that in mind it may be necessary to be cautious about accepting what he says.

Dr Teresa Inkster – 01 & 02 October 2024

81. Dr Inkster adopted her statement which is incorporated into the Witness Bundle for the week commencing 01 October 2024 (vol 7) and also her supplementary statement which is incorporated into the Witness Bundle for the week commencing 04 November 2024 (vol 12).

82. Dr Inkster is currently a consultant microbiologist and infection control doctor with ARHAI Scotland which is part of NSS Scotland. She became a microbiologist and Infection Control Doctor ("ICD") with NHS GGC in 2009. She became Regional Sector ICD in 2015. She was appointed Lead Infection Control Doctor for NHS GGC in April 2016. Dr Inkster went on sick leave in June 2017 and returned in January 2018. She resigned as Lead ICD on 2 September 2019. She left NHS GGC in September 2023.

83. During her time at the QEUH Dr Inkster resigned or attempted to resign from ICD sessions on three occasions: in July 2015, on her return from sick leave in January 2018 and in September 2019. The circumstances of each resignation are relevant to the Remit and Terms of Reference of the Inquiry. The factual details of all three are set out in the Narrative in Chapter 5 along with observations about the significance of these events.

[20] Professor Williams, Transcript, Page 146
[21] Professor Williams, Transcript, Page 154

84. In Dr Inkster's view the three most complex IMTs were: the water incident in 2018, Cryptococcus in December 2018, and Ward 6A gram-negatives in summer of 2019.[22]

85. Dr Inkster's views on the various pieces of descriptive epidemiology have been incorporated into Chapter 7.3 on Epidemiology.

Structure, culture and operations of the NHS GGC IPC team.

86. Dr Inkster explained that in her view NHS GGC IPCT before the opening of the QEUH was very good at mandatory reporting, mandatory surveillance, adhering to the National Manual, workflow and presenting data, and SPC charts. She felt they were unfamiliar with how to approach new threats. If something was new and different and hadn't been described in guidance the approach was that things might often be downplayed, that they might look for other reasons as to why these infections were happening, that they weren't particularly open to new knowledge at the time from the literature or other sources.[23]

87. In the view of Dr Inkster, the AICC and BICC were not particularly effective in supervising the risk from unusual organisms that may have arisen in the water or ventilation system in the new hospital. The AICC was described by her as a tick box exercise. She was critical of the lack of reporting about serious issues on the site or outbreaks. It was highlighted that participants were discouraged to speak up and should leave it up to the lead ICD to talk to things. The AICC meetings were very controlled in her opinion. Before she became Lead ICD, she was told that it was for the lead ICD to speak and that Sector ICDs such as her should only speak if asked a question.[24]

88. Dr Inkster was asked how a microbiologist who does not have ICD sessions in their job plan raise Infection Control issues they come across in their practice as a microbiologist. She explained that if a microbiologist has an infection control concern following receipt of a sample, then they would normally communicate that with the lead ICD of the Infection Control team or the sector ICD. Also, ICNs would generally be copied in. She added that depending on the severity of the situation, the Infection

[22] Dr Teresa Inkster, Transcript, Day 2, Page 174.
[23] Dr Teresa Inkster, Transcript, Day 1, Page 9.
[24] Dr Teresa Inkster, Transcript, Day 1, Page 15 and Statement, Paras 83-35.

Control Manager and the Associate Nurse Director for Infection Control may be copied in. Dr Inkster told the Inquiry that if a microbiologist was faced with an outbreak or incident then the issue would be escalated to senior management, or a Situation Background Assessment ("SBAR") created and Recommendation document.[25]

89. Dr Inkster was asked about the attendance of executive board members at IMTs. By the time the GNB IMT of June 2019 had started she had noted a greater representation from senior management.[26] At the time of start of the GNB IMT in June 2019 she explained that as IMT chair she has some control of who attends the IMT, but that becomes very difficult when it is individuals who are part of the executive and it would be very difficult for her to ask them to leave the room.[27]

Positive Pressure Ventilated Lobby (PPVL) Rooms

90. Dr Inkster sets out her general opinions on PPVL rooms in her Statement at paragraphs 270, 287, 334 and 393. In oral evidence she explained that the problem with PPVL rooms was that the room itself is at a neutral pressure and it is the lobby that is at the positive pressure, and she was conscious that Peter Hoffman had concerns about the neutral pressure of such a room. His view was that it is never really neutral; it is either positive or negative. So, either way you will get leakage in one direction or the other, and that could potentially put immunosuppressed patients at risk.[28]

91. She was full of praise for CDC Protective Environment Rooms for Immunosuppressed Patients, where are two things you can do with the lobby: you can have it at a positive pressure and the room at a positive pressure - a positive pressure cascade, which means the lobby is at 10 pascals and the room is at 20 pascals, and that is giving the patient an extra layer of protection, or you can have the patient room at a positive pressure and the lobby at a negative pressure and the benefit of that is that you can have an immunosuppressed individual protected in the room, but if they have an airborne infection, for example, chickenpox or tuberculosis,

[25] Dr Teresa Inkster, Transcript, Day 1, Pages 3-6.
[26] Dr Teresa Inkster, Transcript, Day 2, Page 173.
[27] Dr Teresa Inkster, Transcript, Day 2, Page 95.
[28] Dr Teresa Inkster, Transcript, Day 1, Page 18.

you are protecting other patients. So, that CDC guidance was much more descriptive as how you could utilise a lobby in a different way than the PPVL concept.[29]

The meaning of 'Neutropenic Ward' in SHTM 03-01 (2009)

92. Dr Inkster was taken to Table 1 of SHTM 03-01 (2009)[30] and asked about her interpretation of the guidance in SHTM 03-01 the reference in that table to 'Neutropenic Ward'.

93. In her view the SHTM 03-01 was vague and can be misinterpreted, for example people may not realise they had to undertake a risk assessment if they derogated from the guidance. However, she thought the guidance relating to air change rate for general wards was clear. She understood most people were taking the reference in that table to 'Neutropenic Ward' to mean neutropenic rooms within a ward rather than a neutropenic ward. Her view was that a whole ward would not have required to be at a standard for neutropenic patients, but that rooms should have a lobby. This arose in her view because the SHTM 03-01 is not descriptive enough; for example, doesn't mention lobbies, double-door entry, pressure rates of other areas in ward like "dirty facilities" or "domestic services room". Dr Inkster commented that the single room in a neutropenic ward should have a sealed ceiling. To have a whole ward at 10 ACH and 10 Pa, the ward would need to be sealed from the rest of the hospital.[31]

94. Later in her evidence she noted that in Ward 2A children would be let out of their isolation room to play or going to the family dining room and that patients with acute lymphoblastic leukaemia who can become very immunosuppressed were certainly being managed at times in the main ward because there were not sufficient isolation rooms. She accepted that this would be a reason to think that "Neutropenic Patient Ward" in the context of paediatric haemato-oncology has to be the whole ward.[32]

95. She did agree that, given the patient cohort in 4B, guidance suggests that the whole of 4B would have been treated HEPA-filtered, positive pressure, 10 air changes an

[29] Dr Teresa Inkster, Transcript, Day 2, Page 18-20.
[30] Bundle 16, Document 5, Page 483.
[31] Dr Teresa Inkster, Transcript, Day 1, Pages 32-37.
[32] Dr Teresa Inkster, Transcript, Day 1, Pages 53-55.

hour.[33]

96. Dr Inkster explained that Ward 2A would be impacted by 2-3 ACH because there would not be rapid dilution of airborne contaminants. For example, if a staff member coughed in a room. Depending on the pressure of the rooms, a staff member coughing in the ward corridor could also be a risk. There would be a greater risk of infection for general adult patients in Ward 6A with 2-3 ACH.[34]

97. It was argued by Dr Inkster that the whole paediatric oncology ward should be treated as neutropenic now so if something goes wrong there is scope for contingencies rather than just a certain number of rooms being for neutropenic patients. Furthermore, the reality is that it is difficult to keep immunosuppressed patients confined to their rooms as they may wish to play or to go to the family dining room.[35]

Disagreement with Mr Hoffman

98. A recollection of Dr Inkster was disagreement with Mr Hoffman's view that ACH is only for comfort, temperature and odour control. Her view was ACH was about dilution, whereas he felt the important factors were HEPA filtration and positive pressure with the focus on control of Aspergillus spores. In her view, as an ICD, she is concerned with what is happening in the room; an ingress of potentially contaminated air into the room or a staff member with a respiratory virus coughing in the room. In these scenarios, ACH is important for rapid dilution of pathogens.[36]

Opinion on Infection Link

99. Dr Inkster was of the opinion that in the summer of 2017 there was a link then between patient infections and the water system in Ward 2A. Just before she went off sick in June 2017, she said they were starting to see an increase in environmental organisms. She saw the three possible routes of infection in ward 2A from the water system in 2017 were: direct contamination through skin breach (Hickman line) showering, indirect contamination via a healthcare worker, and secondary

[33] Dr Teresa Inkster, Transcript, Day 1, Page 38.
[34] Dr Teresa Inkster, Transcript, Day 1, Page 116.
[35] Dr Teresa Inkster, Transcript, Day 1, Pages 55-56.
[36] Dr Teresa Inkster, Transcript, Day 2, Pages 1 to 5

contamination through contact with an item. At that point she did not consider that the drains were a route of infection.[37]

100. Dr Inkster was of the opinion that looking back at Ward 2A in 2018, before the decant there was a link between patient infections and the water system. The same infections in the patients were found in the water. It was more complex than typical outbreaks, but it was polymicrobial, in that several different types of genus of bacteria, and it was polyclonal, and by that, she meant several different strains. The definition of outbreak in the National Manual had been met; two linked cases in time, place, and person. Control measures were put in place in the form of POUFs, but the issue of the drains arose. The Ward didn't see a decline in infections with the measures in place because the situation was not under control.[38]

101. She did not consider that there was merit in the argument that the line infections were the main issue, because the CLABSI line infection work been in place as far back as August 2016 and throughout the issues in 2018 and 2019. Haemato-oncology staff are very aware of the risks of infection in children, and they are usually very stringent and very compliant with infection control measures. So, whilst those measures are important, they had already been put in place and continued into 2018 and 2019. CLABSI line infection work breaks that route of transmission, but that alone was not the reason, in her view, that things are now under control.[39]

102. It was Dr Inkster's opinion that she had known about the Mycobacterium Chelonae cases in 2016, 2018 and 2019, then that would have strengthened the hypothesis that the water system was the source of patient infections. Her justification was that there is an increase in numbers over a defined period of time; here they had three cases of an incredibly rare organism in essentially three years. She further told the Inquiry there was no background rate for Mycobacterium Chelonae in a haemato-oncology population.[40]

103. In her first day of evidence Dr Inkster explained that it was her opinion that the ventilation arrangements in Ward 2A – before it is rebuilt - were possibly relevant to

[37] Dr Teresa Inkster, Transcript, Day 2, Page 135-136
[38] Dr Teresa Inkster, Transcript, Day 2, Pages 17-20
[39] Dr Teresa Inkster, Transcript, Day 2, Pages 20-21.
[40] Dr Teresa Inkster, Transcript, Day 2, Pages 119-124.

the existence of Aspergillus infections in that ward. Her view was that these infections arose from three possible sources: construction and demolition works nearby, water damage within the hospital and the dust from chilled beams. She also considered that the lack of contingency, in the sense of lack of neutropenic rooms, meant that very immunosuppressed patients were being managed in the ward making them vulnerable to infection. In addition, Dr Inkster commented that she observed children being let out of their isolation room to play, or going to the family dining room, and that patients with acute lymphoblastic leukaemia who can become very immunosuppressed were certainly being managed at times in the main ward because there were not sufficient isolation rooms.[41] On her second day of evidence she adjusted that evidence to explain that she considered an Aspergillus infection in 2016 to have a potential link to the ventilation system. However, the 2017 Aspergillus infection had a very clear link to the ventilation system, but the more plausible hypothesis was water damage.[42]

104. In Dr Inkster's view there was a link between patient infections in the first half/two thirds of 2019 and the water/ventilation systems of the hospital. Her rationale was that the organisms were similar to what had been seen in 2018 and that ward 6A was not the safest of environments. It was supposed to be a temporary decant only rather than long-term facility for those patients. Patients encountered several environmental risks, which included the water leaking from the chilled beams, and exposure of children to unfiltered water elsewhere in the building. They also had a series of water leaks on the ward, a leak from a corridor, a leak into one of the prep rooms and the problems with the showers in that ward. There was also the problem with the ventilation and the low air changes and the pressures, so Ward 6A was never a long-term solution. It was with environmental risk at the time of decant and that was a contributing factor.[43]

105. Dr Inkster considered that the Ward 2A refurbishment was essential to bringing the outbreak under control rather than a precautionary step.[44]

[41] Dr Teresa Inkster, Transcript, Day 1, Pages 53-55.
[42] Dr Teresa Inkster, Transcript, Day 2, Pages 29-30.
[43] Dr Teresa Inkster, Transcript, Day 2, Page 180-181.
[44] Dr Teresa Inkster, Transcript, Day 2, Pages 180 and 201.

106. It was explained by Dr Inkster that it was highly likely that the Elizabethkinga Miricola incident in 2017 was linked to the environment. She considered that the source of the infection may have been from the taps or the water from the chilled beams which did not have dew control. She recalled swabbing and testing the outlets of the chilled beams, but they did not have the technology at that time to identify gram-negative bacteria in the water. In Dr Inkster's view outbreak management and hypothesis generation is about plausibility from the available information. A waterborne organism had been identified and there were leaks from the chilled beams. She told the Inquiry that it was highly probable that the chilled beams were the cause but that due to pitfalls of environmental testing were not able to prove it. However, she also acknowledged that outbreak management is uncertain and very difficult as swabbing often has low yields of bacteria.[45]

107. It was explained by Dr Inkster that there is no background rate for organisms such as Cupriavidus, Comamonas, and Delftia. A background rate is what would normally be expected for that patient population, taking into account the high-risk nature of the group, vulnerability to infection, and the likely sources of infection. For organisms such as E. Coli there will be a background rate backed up by epidemiological studies. She further explained that E. coli is an endemic organism, there are low levels of this organism all the time, but she would not expect that for unusual waterborne organisms there to be an endemic or background rate.

Whole Genome Sequencing ("WGS")

108. Dr Inkster gave detailed evidence on the complexity of biofilm, how the biofilm in the QEUH was likely to be very extensive and very complex with multiple different types of bacteria and multiple different strains of bacteria as well, and how it would be very difficult for disinfectants to penetrate the biofilm so it becomes resistant to disinfection. She was taken to an editorial article she wrote in the Journal of Hospital Infection in 2021[46] and agreed that it summed up her understanding of the issue of the complexity and diversity of biofilms. Dr Inkster explained that confirmation of the complexity of the biofilm in the hospital came from the diversity of different organisms

[45] Dr Teresa Inkster, Transcript, Day 2, Pages 123 to 126.
[46] Bundle 19, Document 41, Page 1232.

they were growing from the water.[47]

109. Dr Inkster told the Inquiry her response to Dr Leanord's hypothesis that, where there is no close genetic connection between individual samples, that excludes a connection between the patient and the environment. She argued that it depends on the input of the WGS. In Ward 2A, they did not sample exclusively over a prolonged period of time because they had to test other areas of the hospital when they realised there was systemic contamination. The sampling strategy was flawed; it was not representative sampling of where children placed, the water system and the drainage system. It was limited in numbers and time. It was also focused on one organism, Enterobacter. Moreover, she explained that drain sampling was extremely limited as the act of swabbing a drain can put patients at risk. In her view, she required to only identify the organisms in the drain to strengthen the hypothesis because it was not safe to go beyond that. Dr Inkster said that to run WGS in such a way as to exclude an environmental link, the number of colony picks should be increased (more than 1 colony pick). Ideally 20 or 30 colony picks, which is evidenced in the literature and accords with Dr Susanne Lee's view. Alternatively, a section of pipework could be analysed which is called metagenomics. This is more sophisticated than WGS, but the chlorine dioxide dosing may have altered the biofilm so you would not be able to guarantee that the same strains as the infected patient would be identified.[48]

Oversight Board, the Independent Review and the Case Note Review

110. Dr Inkster set out in great detail her interactions with the Oversight Board, the Independent Review and the Case Note Review in her Statement at Chapter 15.[49] The document produced by Jenny Copland of NHS Scotland at the start of March 2020[50] was a useful list of Dr Inkster's desired outcomes at the time.[51] It is notable that not only does the document list issues that have been at the heart of Glasgow III[52] but in that list Dr Inkster also raises issues that are potentially relevant to

[47] Dr Teresa Inkster, Transcript, Day 1, Pages 125.
[48] Dr Teresa Inkster, Transcript, Day 1, Pages 130-134.
[49] Dr Teresa Inkster, Statement, Para 949 onwards, Hearing Bundle Page 298.
[50] Bundle 14, Volume 3, Document 187, Page 63.
[51] Dr Teresa Inkster, Transcript, Day 2, Page 204.
[52] Including the 27 Point Action Plan, Ward 6A, Ward 4C, Water Systems issues around taps, IPC Team Working, Duty of Candour, inaccuracy in Press Releases.

Glasgow IV around TOR 9 – the processes and practices of reporting healthcare associated infections with QEUH.

111. In respect of the Oversight Board, her concern was that it was not truly independent as members from NHS GGC were attending Oversight Board meetings. She was concerned about the accuracy of timelines in the final report and that they had not taken account of information that she had given them. Dr Inkster was particularly concerned that both the Independent Review and the Oversight Board seemed to think that she was on sick leave and not available when she was not on sick leave. She considers that NHS GGC either misled these two bodies or used the various attempts described to get her on to sick leave to create a sense that she was on sick leave and unavailable.[53]

Dr Walker

112. Dr Inkster was asked about her working relationship with Dr Walker. She explained that whilst she had never actually met Dr Walker in person, she has collaborated with him on papers with Michael Weinbren. They would have Teams meetings. She has sat on the non-tuberculous mycobacteria group with Dr Walker and was involved in a conference by the European Society of Infections, Diseases and Microbiology in Northern Ireland. They were both speakers, and as she was aware of Dr Walker's involvement with this Public Inquiry he had travelled to Ireland and delivered two sessions in person and she stayed in Glasgow and delivered her sessions remotely, so there was no interaction. She was clear that she has never discussed the Public Inquiry or the June 2014 Horne Taps meeting with Dr Walker.[54]

Assessment of the Witness

113. Dr Inkster was a straightforward witness who gave her evidence in a broadly controlled manner, although she did have a tendency to provide a lot of information quite quickly which made it difficult sometimes to understand the point being made. However, she did not stray beyond the limits of her actual knowledge and her undoubted expertise in IPC, including ventilation and water systems in hospitals.

[53] Dr Teresa Inkster, Transcript, Day 2, Pages 204-206.
[54] Dr Teresa Inkster, Transcript, Day 2, Pages 207-209.

114. On occasion she did not answer directly the question asked of her, but she made concessions and answered all her questions openly. She dealt well with the NHS GGC critiques around her conduct in respect of the 'Duty of Candour Incident' in August 2019 and her disclosure to Mr and Mrs Gough that their son had contracted Serratia from the drains. She was a credible witness, and her evidence was largely supported by the documentation placed before the Inquiry.

115. Most importantly there seems to be no evidence that she was wrong when she identified potentially deficient features of the water and ventilation systems from 2015 to 2019 when she resigned as Lead ICD. Until a point in the first half of 2019 NHS GGC were clearly happy to rely on her expertise and did so. It cannot be said that she did anything other than act in the best interests of patients. There is no reason for the Inquiry not to give significant weight to Dr Inkster's opinion about clinical events prior to her resignation.

Sandra Devine – 03 October 2024

116. Ms Devine gave evidence on the 3rd October 2024. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 01 October 2024 (vol 7). By training a nurse, she had worked her way up through a series of appointments and was now Director of Infection Prevention and Control for NHS GGC.

117. She gave evidence on the structures operating within the Board. She also stressed the realities which applied to the allocation of resource in the NHS. Ms Devine tried to explain how the external perception of what happened in the NHS was impacted by the way systems operated[55]. Using the example of a burns unit which had had an infection outbreak and identified a need for improved ventilation, she explained that it was not simply a question of the unit saying,' so give us it'. A decision would be made on where that risk stood in relation to other risks, the higher risks being prioritised. She accepted that that would be frustrating if you had been the person identifying the need - because you would see it disappearing into a process driven void. Asked why, the risk having been identified, you do not just fix it, she said' it's just not like that in

[55] Sandra Devine, Transcript, Page 21

the NHS'.

118. Sandra Devine also explained that a point prevalence survey was only done every four years and was not very good at dealing with unusual things in the meantime[56]. In addition, it mainly looked for patient to patient infections.

119. She also accepted that a new single room hospital should produce better results for patient-to-patient infections. For other infections, it was not as straightforward, but the teams should have the best possible chance of reducing infections.[57]

120. She had participated in many of the events on which the Inquiry has heard evidence. She was, at least on paper, a critic of Dr Peters and Dr Inkster, but the Inquiry may conclude that by the end of her oral evidence, some of these criticisms were more muted. She was keen to stress the limits of her expertise. She was not a microbiologist or an expert in ventilation. Any perception that she was challenging those who were was incorrect. To the suggestion that there was an inconsistency about supporting clinicians and being perceived to be against IPC when they had clinician support, she asserted that would have been to do with resource issues. She was not the author of the criticism that Dr Peters did not accept that IPC was a nurse led system, and in reality, other than that amounting to a recognition that in IPC most of the day-to-day work is done by ICNs, no witness was prepared to agree with that description.

121. She was defensive of the AICC and BICC, saying that it might not appear they were doing anything, but they were about oversight.

122. She accepted that she was wrong to try to correct the NSS note of the meeting at which Dr Inkster was removed as IMT chair.

123. She was the author of the appendix on infection rates attached to the NHS GGC Positioning Paper and was able to explain its limitations.[58]

124. Overall, a degree of caution must be exercised in accepting all of her evidence, given the polarised position which seemed to be the basis of her witness statement.

[56] Sandra Devine, Transcript, Page 34
[57] Sandra Devine, Transcript, Page 39
[58] Bundle 25, Document 10, Page 363

Subject to that caveat the Inquiry may find some of her evidence of assistance.

Dr Penelope Redding – 04 September 2024

125. Dr Redding adopted her statement which is incorporated into the Witness Bundle for the week commencing 03 September 2024 (vol 3). Dr Redding was a consultant microbiologist from 1984 until her retirement in 2018. She was one of the first lead ICDs for Glasgow. Professor Williams took on her role as Lead ICD in 2008. The Inquiry heard evidence that Dr Redding was a clinical director for all the laboratories of Greater Glasgow and Clyde from 2008 to March 2011. By the time she retired in March 2018 she was one of the longest serving consultant microbiologists in NHS GGC.

126. Although the leading 'Whistleblower' in the sense that she was the only microbiologist who formally raised her concerns to Stages 2 or 3 of the NHS GGC Whistleblowing policy, Dr Redding did not have a great operational connection to the growing concerns about potential links between infections in the Schiehallion Unit and the hospital environment between 2015 and her retirement. She had a small amount of connection to the design process.[59] From the perspective of the Inquiry and bearing in mind its remit and terms of reference her evidence was particularly relevant to:

- Assisting the Inquiry with a general understanding of microbiology and infection prevention and control practice.
- The culture within the NHS GGC IPC team to the extent that it impacted on any lack of IPC input into decisions that arguably contributed to potentially deficient features of the water and ventilation systems.
- The culture within the NHS GGC IPC team to the extent that it impacted on delays in understanding and responding to potential links between infections in the Schiehallion Unit and the hospital environment.
- Her own involvement in the Whistleblowing process to the extent that it helps the

[59] Details of Dr Redding's evidence in this area are noted in Chapter 10 which looks forward to Glasgow IV.

Inquiry understand the NHS GGC response to the concerns she and others raised in that process that were related to the potentially deficient features of the water and ventilation systems.

127. Dr Redding provided the Inquiry with considerable useful detail about the practice of microbiology and how samples are processed and analysed to identity microorganisms of concern, and particularly how a sample is processed is driven by what bacteria microorganism is being investigated to grow through and the focus is on advising the clinician about the organism and providing treatment advice.

128. Given the issues that appear to have emerged about unusual microorganisms not being reacted to, she explained how the response to an organism which is not on the alert organism list, but something that maybe a microbiologist has seen once or twice in the whole of a career, relies on somebody highlighting that an organism found in a sample is really unusual.[60]

129. Dr Redding was able to assist with background on the history of the management structure of IPC and microbiology in Glasgow. She described how the managerial function for Infection Control was removed from in the laboratory directorate following the Vale of Leven Inquiry and given to the Infection Control Manager ("ICM") and the lead Infection Control Nurse ("ICN"). The lead ICN would be a senior nurse consultant. Dr Redding could see that this structure might have been thought to be a good idea at the time, but felt that it worked well when it was all under the laboratory directorate. When the structure changed it became messy. This was because the microbiologists and the ICDs report through two lines.[61]

130. It was useful for Dr Redding to explain there is no out of hours ICD or ICN service and quite often microbiologists will have an infection control responsibility (even if they have had no infection control sessions) by responding to concerns out of hours and then passing issues to the ICNs in the morning.[62] Dr Redding gave a particular example where she got a call on a Friday that orthopaedic services had been suspended due to resistant Pseudomonas (ward shut, operations cancelled and

[60] Dr Penelope Redding, Transcript, Pages 5-27.
[61] Dr Penelope Redding, Transcript, Pages 28-34.
[62] Dr Penelope Redding, Transcript, Pages 34-41.

doctors afraid to go on the ward). When Dr Redding saw the patient results, she noticed that they were different species and not at all resistant; there was no outbreak, and the ward was reopened. From the context in her statement this must have been in early 2018.[63] This example was given to illustrate what happens when there is no input from a microbiologist on test results and shows that interpreting complex microbiology results should not be done by ICNs but by microbiologists. She was clear that Infection Control should not be a nurse-led service but work as a team, because it is necessary to have the experience and expertise of the ICD.[64]

131. In Dr Redding's view, even if a consultant microbiologist is not dedicated to infection control session, they still have to be able to alert the IPC team that there is a problem so that every single bit of information that is needed by the team is channelled in their direction.[65]

132. The essence of the concern that Dr Redding expressed about the culture of the IPC team in NHS GGC is that there was an atmosphere of intimidation and bullying, a practice of not putting things in writing or emails and not recording things in minutes. The culture of bullying was from the top of the organisation all the way down. Lots of people could speak to the bullying but were too afraid to speak up. She explained how many colleagues were afraid to speak up and approached her for support due to her management experience. Her core advice was always to put in writing that a concern has been raised.[66]

133. The issue for the Inquiry is the extent to which this evidence is relevant to our remit and terms of reference. It is submitted that at least until the QEUH/RHC was handed over and IPC practice commenced in it, specific details of culture within the IPC team at, say, the Victoria Infirmary, are not relevant, but if it can be said that bullying, a lack of record keeping and an unwillingness to accept challenge have caused delays in understanding and responsing to potential links between infections in the Schiehallion Unit and the hospital environment then they do become of interest to the Inquiry.

[63] Dr Penelope Redding's Statement, Para 149.
[64] Dr Penelope Redding, Transcript, Pages 41-50 and Dr Redding's Statement, Para 149.
[65] Dr Penelope Redding, Transcript, Page 147.
[66] Dr Penelope Redding, Transcript, Pages 75-84.

134. Dr Redding was very clear that in 2015 to 2017 her involvement was in reporting concerns brought to her by others with Dr Stewart (then Deputy Medical Director) and Grant Archibald (Chief Operating Officer). That she is raising such issues must be taken to corroborate that such issues were live within the IPC team at the time. A good example is an email of 16 September 2015 to Mr Archibald and David Stewart[67] following a meeting a few days before which she discussed in evidence.[68] Dr Redding was full of praise for Dr Peters, and explained how lucky NHS GGC was to have Dr Peters in a meeting with Dr Stewart and Mr Archibald.[69]

135. In essence Dr Redding provides confirmation (if confirmation was needed) that Dr Inkster and Dr Peters were not acting unreasonably or in isolation in raising issues about the way IPC in the QEUH/RHC was being managed in 2015 (particularly when they resigned their IPC sessions). Whilst Dr Stewarts' report[70] and Dr Cruickshank's appointment as Interim Clinical Director for Infection Control Doctors, November 2015 to May 2016, confirm that something had to change as a result of their concerns it assists to know, from Dr Redding, that all was not as it should be within the IPC team in the new QEUH/RCH in 2015.

136. Dr Redding described in some detail how in 2017 she came to raise her concerns about the QEUH/RHC with a series of senior officials of NHS GGC before she (with others) raised a Stage 1 Whistleblow with Dr Armstrong in September 2017. Dr Redding explained that she followed the 2013 Whistleblowing policy and although the email she sent on 5 September 2017 was not described as stage 1, she raised issues of concern with Jennifer Armstrong, Tom Walsh and Sandra Devine in a series of emails.[71]

137. The detail of the SBAR of 3 October 2017[72] and the meeting that followed[73] have been incorporated into the Narrative in Chapter 5 of these submissions.[74]

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[67] Bundle 14, Volume 1, Page 463.
[68] Dr Penelope Redding, Transcript, Page 83-89.
[69] Dr Penelope Redding, Transcript, Page 82.
[70] Bundle 14, Volume 1, Document 40, Page 464.
[71] Bundle 14, Volume 1, Document 73, pages 722-727.
[72] Bundle 4, Document 19, page.104.
[73] Bundle 14, Volume 1, page 753.
[74] Dr Penelope Redding, Witness Statement, paras 107 to 144.

138. In her evidence Dr Redding explained that in October/November 2017 as the Action Plan arising from the meeting of 4 October 2017 had yet to be sent to her she started warning Jane Grant, Dr Armstrong and Dr Stewart that they were considering a move to Stage 2 of the Whistleblowing policy[75]. Once she had been sent the 27 Point Action Plan she took the issue to Dr de Caestecker by email on 8 February 2018 as Stage 2 Whistleblow. [76] She explained this did not raise any new issues but focused on the failure to address the existing concerns around patient safety.[77] The detail of what happened has been incorporated into the Narrative in Chapter 5 of these submissions.

139. In 2019 Dr Redding prepared a paper for the Independent Review, she wrote to the Scottish Parliament Health and Sports Committee, approached Anas Sawar MSP and met Jean Freeman MSP, the Cabinet Secretary for Health Secretary at the time. Both meetings were with Dr Peters. On 21 November 2019, she raised the Stage 3 Whistleblow. She was in part prompted by a November 2019 press release from NHS GGC that stated that because no tests were done at the time, it was not possible to conclude that infections were connected to the water supply and criticising the "extremely disappointing" actions of a whistle-blower who had suggested that that there was a link with the water. As part of the Stage 3 Whistleblow she met NHS GGC Board members William Edwards and Ian Ritchie on 4 December 2019 and an issue arose about whether the Board would recognise the emails of September 2017 and the SBAR of 3 October 2017 as a Stage 1 Whistleblow. On 29 January 2020 she had a scheduled meeting about the Stage 3 Whistleblow with Jennifer Haynes, Ian Ritchie, William Edwards, Dr Scott Davidson (Deputy Medical Director, Acute Services) and Tom Steele, Director of Estates and Facilities. When she received the final report Dr Redding was concerned that there were a lot of inaccuracies in what had been written and ultimately wrote to the Chair of the Board, Professor John Brown, to alert him to her concerns. Despite repeated requests by Dr Redding no changes were made.[78]

140. Once the Independent Review had started work, Dr Redding formed the view that

[75] Dr Penelope Redding, Witness Statement, para 145.
[76] Bundle 14, Volume 2, Document 87, page 72.
[77] Dr Penelope Redding, Transcript, page 137.
[78] Dr Penelope Redding, Witness Statement, paras 187-204.

there had been an attempt by NHS GGC to cover up the Stage 1. This led her to raise another stage 3 Whistleblow highlighting this concern.[79]

141. Dr Redding clearly has many concerns about how her Stage 3 Whistleblow was investigated and how NHS GGC have reported her Whistleblow to the Independent Review. In our submission the primary importance of the evidence of Dr Redding arises from her Stage 1 and Stage 2 Whistleblows. Had she not acted in September 2017, the 27 point Action Plan would likely never have been created, and whilst the Stage 2 report entirely failed to engage with the reasons why the QEUH/RHC was built with ventilation that did not comply with SHTM 03-01 (2009 Draft) - as it should have done - the way that Dr de Caestecker and senior NHS GGC staff responded to the good faith of Dr Redding and her colleagues is clearly something that this Inquiry should pay close attention to in addressing a number of Terms of Reference, including 1, 4 and 7.

142. Dr Redding is clearly a deeply experienced Consultant Microbiologist and was doing her best to assist the Inquiry, but she did have difficulty recalling some events relevant to the Inquiry from before the hospital opened. This undermined the flow of her oral evidence to a degree in terms of its reliability, but as so much was already set out in her statement and contemporaneous correspondence retained largely by Dr Peters, the impact of her lack of detailed recollection was limited to the period prior to 2017 for which she no longer had access to her work emails. Whilst it lacked detail her evidence about early involvement in 2008 of IPC in the procurement of what became the QEUH/RHC will be of assistance in Glasgow IV and her evidence about the culture, whilst lacking in specifics, has the potential to corroborate more detailed evidence from Dr Peters, Dr Inkster and others covering the period after the opening of the QEUH/RHC.

Professor Brian Jones – Statement only, not giving evidence.

143. Professor Jones is a Consultant in Medical Microbiology. He was Head of Service for Microbiology in NHS GGC between 2013 and 2020. He produced a soul and conscience certificate and was not called to give evidence. He produced a written

[79] Dr Penelope Redding, Witness Statement, paras 206-208.

statement.

144. The evidence provided to the Inquiry from Professor Jones touched on the IPC service and, in particular, the risk of giving one individual, namely Professor Williams, too many roles. He was also critical of Professor's Williams inability to be a good team player, failure to attend meetings and that he was an extreme risk-taker.

145. He also provided evidence relating to Dr Peters' behaviour which he considered was hugely disruptive to the IPC service. In his view, Dr Peters saw herself as a guardian of patient safety with a remit to police the IPC service. He also provided his view on air quality, which he considered was less important than other strategies, just one mitigating factor and not essential for safe effective care of transplant patients. He placed more emphasis on the JACIE standard than SHTM.

146. Professor Jones' view was that as long as the rooms were sealed and patients given prophylaxis, then deviations from HPS recommendations did not represent a risk to patients. He also noted that the infection rate in the adult SCT unit in the QEUH is extremely low and compares very favourably with any other units in the UK. He also did not consider HEPA filters to perform a crucial role.

147. On the issue of an infection link, the evidence provided by Professor Jones tended to mirror that of Professor Leanord. For example, he also questioned whether Klebsiella and Enterobacter should have been included in the "enteric/environmental" category as they form part of the normal mammalian gut flora.

148. He was critical of Dr Inkster's view that negative results did not disprove an infection link and thought that made a mockery of the scientific method. He also considered the hypothesis of airborne spread of Cryptococcus organisms derived from pigeon guano via the ventilation system to be improbable.

Professor Alistair Leanord – 09 October 2024

149. Professor Leanord gave evidence on 9 October 2024. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 08 October 2024 and also his supplementary statement which is also in the same witness bundle. He is Chief of Medicine, Diagnostics, Glasgow.

150. Professor Leanord's main role was probably as the joint author of a Report on Whole Genome Sequencing.[80] His evidence on this subject and on the potential role that Meropenem resistance might have to play in the infections is set out in the section of the narrative in Chapter 5. That explains what took place at the IMT of 8 October 2019 when he appears to have reported his conclusions to the IMT for the first time.

151. He was also acting lead ICD from November 2019, but ceased to do IPC work in 2023, having been clinical lead in Microbiology at the opening of the QEUH.

152. While Professor Leanord was able to speak to a number of matters, including exchanges with Dr Peters, inevitably the main focus of his evidence was on the conclusions to be reached from his WGS work. The most controversial element was the argument that not finding a positive WGS match with environmental isolates, went further than simply indicating a failure to find that match. Did it exclude an environmental link?

153. That debate was closely connected with whether the phrase, 'there was nothing going on' was correct.

154. Professor Leanord acknowledged the restrictions on the work done. Indeed, he introduced the Inquiry to Noble's Rule of Tenths, where in taking a swab about one tenth of the microbiological material will be collected. The same is then true when transferring from swab to plate.

155. Professor Leanord gave his evidence in a confident manner, though some of his assertions were less absolute then might have been anticipated. Ultimately, his view of the use to be made of his WGS approach, differed from other witnesses (including the Inquiry's experts) and should be viewed in that light.

Dr Christine Peters – 11 & 12 September 2024

156. Dr Peters joined NHS GGC as a consultant microbiologist in 2014. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 10 September 2024 (vol 4). During her training, and while at Crosshouse Hospital, she had developed a particular interest in the link between infection control and the

[80] Bundle 6, Document 40, page 1195.

built environment. She had been invited to contribute to a revision of HAI Scribe. She explained the relationship between an ICD and the ICN team. She had no clear job description. Professor Williams was the lead ICD.

157. Dr Peters joint the IPC team in NHS GGC in August 2015. She was appointed Sector ICD for the South Sector which would include the new QEUH/RHC. Along with two other microbiologists she attempted to demit her ICD sessions in July 2015. In April 2017 Dr Peters took on the role of Clinical Lead for Microbiology from Professor Leanord.[81]

158. She was able to give evidence on a wide range of topics. She spoke to some of the cultural issues she encountered as an ICD. She explained why she had attempted to resign as an ICD in 2015 and how issues had re-emerged in the IPC team when Dr Inkster was on sick leave in 2017. The detail of this and her interactions with the rising number of infections and her discovery of and response to potentially deficient features of the water and ventilation systems of the QEUH/RHC from before handover are set out in detail in the narrative in Chapter 5.

159. From the perspective of the Inquiry and bearing in mind its remit and terms of reference her evidence was particularly relevant to:

- Factual material about what actually happened in the QEUH/RHC in the period from 2014, as the number of infections rise and potentially deficient features of the water and ventilation systems were discovered and reacted to.
- Assisting the Inquiry with a general understanding of microbiology and infection prevention and control practice.
- The culture within the NHS GGC IPC team to the extent that it impacted on any lack of IPC input into decisions that arguably contributed to potentially deficient features of the water and ventilation systems.
- The culture within the NHS GGC IPC team to the extent that it impacted on delays in understanding and responding to potential links between infections in

[81] Dr Christine Peters, Day 2, Transcript, page 5.

the Schiehallion Unit and the hospital environment.

- Her own involvement in the Whistleblowing process to the extent that it helps the Inquiry understand both the NHS GGC response to the concerns she and others raised in that process that were related to the potentially deficient features of the water and ventilation systems.

160. Her attempt to resign from her ICD sessions in July 2015 and the detail of her involvement with the events in the QEUH/RHC from 2014 to 2020 are incorporated into the narrative in Chapter 5 of this closing statement.

161. With Kathleen Harvey-Wood she is an author of two early epidemiological reports:

- Presentation on Bacteraemia rates and Resistance Paediatric Haemato-oncology 2014-2018, 30 August 2018.[82]

- Draft report: Bacteraemia rates and resistance patterns in paediatric haematology/oncology patients 2014-2018, 10 October 2018.[83]

162. Dr Peters had concern about the use of Positive Pressure Ventilated Lobby (PPVL) rooms for certain patients. She explained that they were designed to have positive pressured lobbies with air circulated in the patient space and then extracted via the ensuite. These were not suitable in Dr Peter's view for seriously immuno-compromised patients or infectious patients due to the risk of small leaks. They were a possible solution for a patient both immune compromised and infectious (though HEPA filtration would be needed and, in any event, - as the Inquiry has heard – the QEUH PPVL rooms were designed with the extract in the patient bedroom, compromising their effectiveness.)[84]

163. As a Consultant Microbiologist, she gave her opinion on the approach to genetic typing. As she explained, context was critical. If you are looking at one outlet only and one group of patients that is very different to the QEUH where contamination arose early. That was seeding into a tank, there is the potential for biofilm, no-one

[82] Bundle 27 Volume 6, Document 9, page 107
[83] Bundle 19, Document 19, Page 143
[84] Dr Christine Peters, Witness Statement, para 156.

knew exactly how long or where. On top of that were the incorrect temperatures and lack of flushing. 'We don't actually know the full extent of the diversity, particularly for, say, one organism, Stenotrophomonas, and then how that's evolved over four, five, six, seven years.'[85]She explained 'you never take even whole genome sequencing, which is the most detailed level of typing you can get. Even that has to be informed by the epidemiology. So, the time, place, person and the clinical history of that particular patient. So, as a microbiologist, every single blood culture you get, you do, in effect, a root cause analysis. You're trying to say, "Where has this come from?"[86]

164. In respect of Cryptococcus neoformans cases in the QEUH, she remains concerned about the safety of immunocompromised and organ transplant patients. She gave specific evidence about a paediatric case treated by Dr Sastry in the summer of 2020, where there was a dispute between him and Professor Leanord over whether there was a false positive for Cryptococcus. Dr Peters' strong view was that the treating clinician's view should prevail.[87]

165. In respect of the case of Andrew Slorance, Dr Peters explained that the material she saw, though it was not conclusive, suggested this patient had acquired COVID in the hospital. In addition, she saw information in the records with a consistent view from a number of microbiologists that they were treating a probable aspergillosis infection. She became aware of another team reviewing the case, but they had not discussed the review with the team at the QEUH. She was not able to assist on the precise nature of the rooms in which he was accommodated. She had been keen to meet Mrs Slorance but that had not proved possible. Ultimately, she was told there had been a complaint and therefore discussion was inappropriate.[88]

166. Dr Peters was a Whistleblower in October 2017. The detail is set out in the narrative in Chapter 5. On October 2017 with Dr Redding and another colleague she raised a Stage 1 Whistleblow which resulted in the NHS GGC 27 Point Action Plan. The detail of the SBAR of 3 October 2017[89] and the meeting that followed[90] have been

[85] Dr Christine Peters, Day 2 transcript page 11
[86] Dr Christine Peters, Day 2 transcript page 11-16
[87] Dr Peters, Day 2 transcript, page 145-152.
[88] Dr Peters, Day 2 transcript, pages 150-155.
[89] Bundle 4, Document 19, page 104.
[90] Bundle 14, Volume 1, page 753.

incorporated into the Narrative in Chapter 5 of these submissions.[91] In February 2018 she helped Dr Redding raise a Stage 2 Whistleblow arising from the same issues. In June 2018 Linda de Caestecker issued an internal report into that Stage 2 Whistleblow [92]. It was contained some material which Dr Peters found surprising.

167. Dr Peters had a significant concern about the culture within NHS GGC. She said, 'you need to have a culture that allows the ground level staff to openly raise their concerns, without it becoming a Whistleblow. We shouldn't ever need Whistleblows, because we should be able to deal with sincere, hardworking, expert people who run our hospitals day in, day out. They are the eyes and ears on the ground, and if they have something they want to raise, management and others should listen, and that should be the first response'.[93]

168. The NHS GGC criticisms of Whistleblowers were put individually to Dr Peters. She did not accept them[94]. In particular, she had not made excessive demands of Estates and Facilities, she had merely acted as any competent microbiologist would have done; unless disagreeing amounted to undermining she had not undermined or intimidated colleagues; she had not failed to accept recognised scientific principles when testing hypotheses – that was more something for the NHS GGC process. What about providing inaccurate information to patients and families about infection and links to the environment? This was a serious accusation never put to her. She was duty bound to tell the truth. Had she made false allegations against colleagues in relation to their professional conduct? No. That was another serious accusation never put to her. Had she made false accusations about the accuracy of Board public statements? No, she had had evidence to challenge accuracy and had done so in the correct way. If the public are being told something that is inaccurate, she felt she had a duty to point that out.

169. In conclusion Dr Peters felt that there was no acknowledgment by the Board and to get learning you needed acknowledgement. She said, "if you have an Infection Control team that have to maintain a position that there never has been an increased

[91] Dr Redding, Statement, paras 107 to 144.
[92] Bundle 27, Volume 3, page 472.
[93] Dr Christine Peters, Day 2, Transcript, pages 165-167
[94] Dr Christine Peters, Day 2, Transcript page 169

risk beyond that which is expected, then that is not going to carry us forward into places of better practice."[95]

170. After she gave evidence, Dr Peters answered a supplementary questionnaire from the Inquiry Team.[96] That related to the issue of Meropenem resistance and a graph in her report with Ms Harvey-Wood mentioned in evidence by Professor Leanord, but of which she was the author. Apart from identifying literature sources on the number of 'picks' needed for adequate WGS analysis, the main content related to whether the graph supported prescription of meropenem as a cause of the unusual infections. She maintained that it did not.

171. Dr Peters gave her evidence in a moderate manner and was prepared to make appropriate concessions. She was, however, one of the individuals singled out for trenchant criticism by NHS GGC. The Inquiry heard little evidence to support these attacks. It cannot be said that she did anything other than act in the best interests of patients. On all the substantive concerns about ventilation and water at QEUH it appears (subject to the Inquiry's conclusions), that she was correct. It is submitted that the notion that her behaviour was motivated by anything other than concern for patients can be rejected, and her evidence can be accepted as credible and reliable (subject only to a theme common to many witnesses i.e. that many events happened up to 10 years ago).

Dr Alison Balfour - Statement only, not giving evidence.

172. Dr Alison Balfour was a part-time consultant microbiologist and infection control doctor (ICD) at the QEUH/RHC from 2015 until she retired in 2022. She was not called to give oral evidence but produced a statement.

173. The evidence she provided to the Inquiry was her involvement in air sampling in the QEUH/RHC following the Cryptococcus IMT on 17 January 2019. In addition, she described her understanding of the HIIAT process, her recollection of the rationale for her resignation as an ICD, and her view from a microbiological perspective on evidence of pigeon infestation.

[95] Dr Christine Peters, Day 2, Transcript, pages 173-174
[96] Dr Christine Peters, Post Oral Evidence Statement - A50815524.

174. Dr Balfour explained that Healthcare Infection Incident Assessment Tool ("HIIAT") is a tool used to assess an incident, which has a scoring system with parameters like severity of illness and impact on services that results in a collective score. She added that the generated score is either red, amber or green, with actions/communications. Dr Balfour's view was that HIIAT was useful for primary care issues like a norovirus outbreak, but it was perhaps too basic for more complicated matters[97].

Dr Kalliope Valyraki - Statement only, not giving evidence.

175. Dr Kalliopi Valyraki is a Consultant Microbiologist and was an Infection Control Doctor (ICD) at QEUH/RHC from March 2017 until July 2021. She was not called to give oral evidence but produced a statement.

176. Dr Valyraki provided evidence to the Inquiry that there was tension in the Infection Control team when Dr Inkster was on sick leave. She also noted a lack of clarity around roles and decision making within the Infection Control team. Her statement did appear to lack recollection of events that other people thought significant. She also described how infections were monitored and reported within the QEUH/RHC. She also explained her limited involvement at certain IMTs relating to various matters such as Serratia marcescens in PICU. In addition, she explained HAI-SCRIBE.

Dr Anne Cruickshank – 04 October 2024

177. Dr Anne Cruickshank gave evidence on 4 October 2024. She adopted her statement, which is incorporated into the Witness Bundle for the week commencing 4 October 2024. She is a retired consultant clinical biochemist. From November 2015 to May 2016, Dr Cruickshank was the Interim Clinical Director for Infection Control Doctors at NHS GGC.

178. Dr Cruickshank gave evidence about the structure of the IPCT. She explained that the direct reporting line between the IPCT SMT and the Medical Director marginalised the input from ICDs. Her evidence of these issues is set out in the narrative in Chapter 5. In the late summer of 2015, she was appointed Interim

[97] Dr Alison Balfour, Witness Statement, page 492 (Witness Bundle)

Clinical Director for Infection Control Doctors. That role was not continued beyond May 2016. It was felt that the appointment of Dr Inkster as Lead Infection Control Doctor would improve relations between infection control and microbiology. She noted that Dr Peters was also made the lead clinician for microbiology, which must have meant that she was professionally thought of well.

179. Dr Cruickshank was also clear that the duty of candour was very important. She explained that if a mistake is made, one needs to speak up.

180. Dr Cruickshank was a credible and reliable witness who gave her evidence in a clear and comprehensible manner. She sought at all times to assist the Inquiry in relation to the matters on which she could speak.

Ms Kathleen Harvey-Wood – 18 September 2024

181. Ms Harvey-Wood gave evidence on 18th September 2024. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 17 September 2024 (vol 5). She was a principal clinical scientist in the microbiology department at the QEUH, specialising, as she had done at Yorkhill, in paediatrics. She worked with Dr Peters for a time. When she retired at the end of May 2023 she had 40 years' experience.

182. Ms Harvey-Wood explained the role of a clinical scientist and the operation of the lab. She made clear that she did not think the criticisms of Dr Peters were correct.

183. She was very clear that there was an outbreak of unusual organisms, an increase in positive blood cultures, more mixed blood cultures than usual and that these were environmental. For some of the organisms even she had to look them up. She rejected any suggestion what she was finding was normal. She co-presented a PowerPoint presentation in 2018 to the haemato-oncology Clinicians[98] and later produced a report version on 10 October 2018.[99] She explained what the graphs presented at that point showed and her evidence is discussed in Chapter 7.3 on Epidemiology.

[98] Bundle 27 Volume 6, Document 9, page 107
[99] Bundle 19, Document 19, Page 143

184. Ms Harvey-Wood gave her evidence clearly. She had enormous experience. It is suggested that her views on what was found at the time can be given significant weight.

Pamela Joannidis – 30 August 2024

185. Ms Joannidis adopted her statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Ms Joannidis was an infection control nurse in NHS Greater Glasgow and Clyde. Before that, she was in the Yorkhill NHS Trust. Between 2007 and 2013 she was a lead Infection Prevention Control nurse in the South Sector of NHS GGC. From January 2013 to March 2019, she was a nurse consultant and during this time in a part-time capacity set up the new paediatric Infection Prevention Control team in the RHC. Susan Dodd took over from Ms Joannidis' RHC role in March 2017 and she returned to being a full-time nurse consultant. Subsequently, Ms Joannidis became acting Associate Director of Nursing from March 2019. In March 2022, she retired from NHS GGC.

186. Given her experience in practice as an ICN, the Inquiry took the opportunity to ask Ms Joannidis about the different roles of ICDs, ICNs and microbiologists. She explained that an ICN usually works full time in that post and does not have any other duties, whereas an ICD would usually be a consultant microbiologist but have some sessions of the week doing ICD work. As a microbiologist an ICD would usually sit within the laboratory and would normally be the first person to see the microbiology results. As she understood it an ICD would also be involved in the more technical aspects of any new build project around water and ventilation systems, particularly for at-risk patients (intensive care, neonatal intensive care, and haemato-oncology units). Any water testing decisions such as where to test, when to test and what organisms to test for would be within the responsibility of an ICD. In contrast, an ICN would be giving advice on standard IPC precautions as set out in the NIPCM (chapters 1 and 2), which would be hand hygiene, decontamination of equipment, decontamination of the environment and education for staff. An ICN would also be involved in an audit of all of those precautions and would liaise generally with staff in clinical environments. In addition, an ICN nurse may give advice on the layout of a

ward, bed spacing, hand hygiene sinks etc.[100] Ms Joannidis disagreed that it was a nurse-led service and highlighted that an Infection Control Manager does not necessarily need to be a nurse.[101]

187. Ms Joannidis was involved in the IPC input into the procurement of the new hospital. The opportunity was taken to take her to various minutes and emails from the period from then until handover, that she had not had access to when drafting her statement. Emails and the meeting of 18 May 2009[102] about the requirements for isolation rooms were put to her and her recollection was that the project team were looking for advice on how many mechanically ventilated rooms might be required.[103] Her recollection was patchy, but she did explain that her memory from conversations were that the appropriate SHTMs were being followed in terms of all systems for the hospital - she thought she got that from Jackie Barmanroy who was the nurse consultant.[104] Her recollection was that Ward 2A was to be a sealed ward with HEPA filtration, positive to the rest of the hospital, with a lobby on the entrance to the ward, as the understanding was that was the description of the existing Schiehallion Unit at Yorkhill.[105] She had some involvement in the 1:200 drawing process, possibly when there were three bidders in competitive dialogue, but was unclear of the details due to passage of time.[106]

188. She explained in respect of the design of new facilities that she would expect that infection control doctors would be involved in the more technical aspects of a new build around water systems and ventilation, particularly for at-risk patients, so intensive care, neonatal intensive care, haemato-oncology units.[107]

189. Ms Joannidis had a particularly interesting perspective on the decision to install Positive Pressure Ventilated Lobby Rooms in the new Schiehallion Unit. She understood that the PPVL room was to solve the problem where an immunocompromised child gets an infectious disease such as chicken pox and has

[100] Pamela Joannidis, Transcript, pages 55-60.
[101] Pamela Joannidis, Transcript, page 171.
[102] Bundle 14, Volume 1, Page 75 and the minutes of the meeting Bundle 23, Document 5, page 46.
[103] Pamela Joannidis, Transcript, page 64.
[104] Pamela Joannidis, Transcript, page 66.
[105] Pamela Joannidis, Transcript, page 67.
[106] Pamela Joannidis, Transcript, pages 69-70.
[107] Pamela Joannidis, Transcript, page 58.

to move to an infectious diseases ward. PPVL would allow the immunocompromised child with an infectious disease to stay in the same room.[108]

190. Ms Joannidis ability to recall relevant events was significantly limited. Throughout her evidence, she demonstrated a cautious approach, often providing short, minimal responses that offered little detail or elaboration. This guarded style created an impression of reluctance to engage fully with the questions posed, which hindered the Inquiry's efforts to gain a comprehensive understanding.

191. Ms Joannidis' evidence about the IMT of 23 August 2019 was unusual. She had a different take on events and, as described in the appropriate part of the narrative in Chapter 5, described the meeting as a business-like and formal meeting. Somewhat surprisingly she maintained, contrary to the terms of the minutes, that it was not explained to her why the chair changed.[109] It is difficult to square this response with a conclusion that she was being entirely straightforward about what took place on 23 August 2019.

192. While it is not uncommon for witnesses to be unable to recall events from some time ago, Ms Joannidis' restricted answers and apparent lack of openness limited the Inquiry's ability to explore or clarify key points in her evidence. The brevity of her responses combined with the absence of detail, diminishes the value of her evidence and is of limited assistance to the Inquiry.

Lynn Pritchard – 21 September 2024

193. Ms Pritchard adopted her statement which is incorporated into the Witness Bundle for the week commencing 17 September 2024 (vol 5). From October 2015 until September 2022 Ms Pritchard was the lead ICN for the South Sector of NHS GGC and that effectively made her the lead ICN in the QEUH adult hospital. In September 2022 she became a Nurse Consultant in the IPCT, in a role held by Kate Hamilton and, prior to that, Pamela Joannidis. Ms Pritchard explained that she had no expertise or experience in water or ventilation systems.[110]

[108] Pamlea Joannidis, Transcript, page 83-84.
[109] Pamela Joannidis, Transcript, pages 154-158.
[110] Lynn Pritchard, Transcript, page 119.

194. Although she is recorded in emails and IMT minutes as taking part in events involving the RHC between October 2015 and September 2022, Ms Pritchard had no formal IPC responsibility for the children there. Whilst Ward 2A had been decanted to Ward 6A from September 2019 they remained the responsibility of the RHC ICN team leader who was at the start of that period Susan Dodd.

195. She gave some detailed evidence in her statement about the systems and structures of the IPC Team at the QEUH and more widely across NHS GGC.[111] She accepted that the HIIAT system is only as good as the internal surveillance system inside each health board, as that unless unusual micro-organisms are spotted in the laboratory and the Infection Control Team are told the team will not ever realise there is a problem with an unusual microorganism.[112]

196. The Inquiry asked what the role of an ICN in contrast with an ICD is, and Ms Pritchard responded that an ICN does the practical work. Once an ICD has identified the organism the ICNs would liaise with them, discuss it. They would maybe liaise with clinicians, because if it was an unusual organism, they would notify the medical team in charge of the patient and advise what precautions to take. For some organisms ICNs know what precautions are needed, but there are other unusual ones that they maybe hadn't dealt with before or don't deal with frequently. She sees that role of an ICN as a practical one. It was striking that it had to be put to Ms Pritchard that in some cases it will be microbiologists who identify micro-organisms, when the reality must be that many infections will be identified by microbiologists who do not have ICD sessions.[113] Her evidence about the incident with the facemask, Dr Peters and the RSV virus in December 2015 is set out in the appropriate place in the narrative in Chapter 5.

197. Ms Pritchard was asked what it meant to say that IPC is a nurse-led service, and explained that she understood it to mean that the nurses are managed by another nurse, and that's their line management, but that she does not think there would ever be a time that they do not need Infection Control doctors or microbiologists working

[111] Lynn Pritchard, Witness Statement, Responses to questions 4 to 6 from page 258.
[112] Lynn Pritchard, Transcript, page 125.
[113] Lynn Pritchard, Transcript, pages 125-126.

with them.[114]

198. Mr Pritchard was involved along with Dr Inkster in the early stages of the draft Serious Critical Incident Report (SCI) following the death of the adult patient in the Cryptococcus incident.[115] She accepted she was involved but could not remember whether Dr Inkster was unhappy with changes being made to the draft SCI report or those changes being made.[116]

199. Throughout her evidence, Mr Pritchard demonstrated a cautious approach, often providing short, minimal responses that offered little detail (particularly around dates) or elaboration. When providing more detailed analysis of issues around practice the answers seemed to stay at a high level and avoided to some extent getting involved in specific events. The brevity of her responses combined with the absence of detail, diminishes the value of her evidence and is of limited assistance to the Inquiry.

Clare Mitchell - Statement only, not giving evidence.

200. Clare Mitchell was a lead Infection Prevention and Control Nurse (IPCN) for GGC between 2010 and October 2015. She was then a senior IPCN until 2020 and an IPCN for North Lanarkshire's Care Home Support Team until her retirement in March 2024.

201. She provided evidence to the Inquiry on how HAIs were investigated and reported within QEUH/RHC. Furthermore, she recounted an incident relating to contaminated beds shortly after the hospital opened in 2015. In addition, she described the purpose of HAI-SCRIBE

Dr Iain Kennedy – 25 September 2024

202. Dr Kennedy adopted his statement which is incorporated into the Witness Bundle for the week commencing 24 September 2024 (vol 6). The reports he produced are discussed in detail in the part of Chapter 7 that deals with epidemiology.

203. He considered an unusual organism to be rare, not something frequently seen. He

[114] Lynn Pritchard, Transcript, page 128.
[115] Bundle 14, Volume 2, Document 128, pages 505 to 508.
[116] Lynn Pritchard, Transcript, pages 178-180.

agreed that unusual could be something rarely seen in a clinician's career. Dr Kennedy explained that the professional judgment of senior clinical staff, microbiologists, and clinical team looking after the patient, is key to spotting an unusual organism. He clarified this was the only way to spot an unusual organism.

204. He explained that where there are multiple organisms then this limits the extent of epidemiological investigation. If there is a single organism, for example, MRSA, then an epidemiologist can ask which bedrooms are patients in, what times in hospital, has anyone else been in bedroom etc. Dr Kennedy explained that when working out causality by comparison of two groups, better evidence is when you control all other variables. For example, for the Cupriavidus organism, the same organism is found in patient and the tap. The epidemiology, microbiology and environmental information is considered as a whole. He considered Bradford Hill postulates as something to keep in mind, rather than a tick box exercise, when carrying out an epidemiological investigation. Dr Kennedy used the example of smoking and cancer to explain the various postulates such as strength or degree of association,

205. Dr Kennedy was generally a credible and reliable witness on the whole. However, he was somewhat hesitant to discuss topics which appeared to criticise NHS GGC's handling of matters but did make several concessions in relation to the significance of his epidemiology report.

3.3 NHS NSS Staff

Annette Rankin – 03 September 2024

206. Ms Rankin adopted her statement which is incorporated into the Witness Bundle for the week commencing 03 September 2024 (vol 3). Ms Rankin is a Nurse Consultant in Infection Control at ARHAI Scotland. She worked in NHS GGC until 2009. Her first staff nurse post was from 1989 to 1991 in the then Southern General Hospital. She was trained as an infection control nurse. She had various roles but started out as a lead infection control nurse and then moved to head of nursing for Glasgow and Clyde. She was a nurse consultant for a short period before she moved to Health Protection Scotland ("HPS") which is now ARHAI. She gave evidence about events in 2008/2009 related to the procurement of the new hospital which will be of use in

Glasgow IV.

207. The Inquiry heard evidence that Ms Rankin has completed a number of City and Guilds courses on Water and Healthcare Premises, Specialised Ventilation and Healthcare Premises and Engineering Aspects of Infection Control. Recently she completed a Waste and Water Safety in Healthcare course run by the Healthcare Infection Society.

208. The responsibilities of Ms Rankin at ARHAI were discussed. She explained that she is responsible for the ICBED program which is Infection Control in the Built Environment and Decontamination. She elaborated that issues like cleaning of Optitherm taps would be under the remit of Health Facilities Scotland ("HFS") not ARHAI.

209. Ms Rankin explained that the biggest difference between an infection control nurse ("ICN") and an infection control doctor ("ICD") is that an ICN is full-time whereas an ICD tends to be a consultant microbiologist with time assigned in their job plan to infection control; it's not a full-time role for an ICD. She noted that an ICD has a more detailed understanding of microbiology.

210. It was accepted by Ms Rankin that an ICN is more focused on the practical consequences of issues whereas the ICDs are more focused on microbiology. However, she clarified that ICNs are also focused on microbiology, but just not to the same extent as the ICDs.

211. In Ms Rankin's view, Infection Control does not need to be a nurse led service. In her view, it is about leadership and who has the best skills to lead and manage the team.

212. It was acknowledged by Ms Rankin that the National Infection Prevention Control Manual ("NIPCM") does not require every infection to be reported and there is an assessment exercise carried out by the IPC team of NHS GGC[117]. Before 2016 it was not mandatory to report green labelled infections, only amber and red labelled infections. She accepted that this created a risk of an imperfect understanding of infections in a hospital[118]. She observed that NHS GGC often gave very limited

[117] Annette Rankin, Transcript, page 66
[118] Annette Rankin, Transcript, pages 66 and 67

information and did not like being questioned for more information. In her view, NHS GGC does not understand the role of ARHAI, to such an extent that communication is now done on the whole via the ARHAI lead consultant who meets with NHS GGC on a weekly basis to address any issues[119]. It was accepted by Ms Rankin in evidence that the National Infection Prevention and Control Manual had many caveats so if people did not want to report then, generally, they can find a reason not to[120].

213. Ms Rankin had a varied ability to recall events depending on the timeframe and the nature of matters discussed. While she was able to provide clear and detailed accounts of more recent events in 2018 and 2019, her recollection of older events, particularly those taking place in 2009 and 2015 was limited. She frequently stated she could not recall her involvement in certain activities or could not recall being present at meetings. Her evidence on more recent events was notably much more helpful and suggested her difficulty with earlier events was genuinely due to the passage of time.

214. It was clarified by Ms Rankin that she does not have technical expertise and would seek support on technical aspects from colleagues in HFS. She explained that her expertise and experience is understanding routes of transmission. She accepted that her role is more to do with the implications of a system rather than how it operates.

215. On balance, while Ms Rankin's evidence was less useful in relation to older matters, her contribution to understanding more recent issues was constructive and credible.

Laura Imrie – 06 September 2024

216. Ms Imrie adopted her statement which is incorporated into the Witness Bundle for the week commencing 03 September 2024 (vol 3), and also her supplementary statement which is incorporated into the Witness Bundle for the week commencing 10 September 2024 (vol 4). Ms Imrie is Clinical Lead for NHS Scotland Assure. She was a nurse consultant in HPS until April 2020 when the HAI group joined with Health Facility Scotland to become NHS Scotland Assure. In 2019 she was

[119] Annette Rankin, Transcript, page 158
[120] Annette Rankin, Transcript, page 165

appointed interim lead consultant in the HAI group in HPS before being appointed lead consultant in 2019.

217. Her evidence about the production of the Appendix 4 to the HPS Situational Assessment RHC Wards 2a 2b Draft – 5 June 2019[121], the Draft HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019[122] and the HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019 - 29 November 2019[123] is addressed in the part of Chapter 7 that deals with epidemiology.

218. Given her experience, the opportunity was taken to ask general questions about the functioning of an Infection Prevention and Control Team. She explained that an Infection Control Team can only function with infection control doctors, infection control nurses, epidemiology scientists and healthcare scientists. It requires teamwork. The evidence from Ms Imrie suggested that Infection Control was a nurse-led service, because infection control nurses are full-time whereas infection control doctors are not. In addition, she highlighted that the pay scale would not be attractive to consultant medics. Ms Imrie commented that she could see how the microbiology and infection control teams can be managed separately or together. In her view, leadership, communication and team building are key.

219. As a leading figure in ARHAI during the events that are the subject of the Inquiry, it was important to understand the role and functions of ARHAI. Ms Imrie explained that ARHAI has two roles, the first is to communicate to the Scottish Government and give assurance on how IMTs are being managed. The second role is to report any incidents so there is a national picture to pick up any changes in healthcare. ARHAI may also be contacted by local health boards for support to carry out rapid literature reviews. On occasion, ARHAI may provide senior cover for health boards for employees absent due to long-term sickness or unfilled vacancies.

220. ARHAI co-ordinates national surveillance of organisms. Ms Imrie explained that there were two ways in which ARHAI might not become aware of an unusual organism.

[121] Bundle 7, Document 5, Page 205
[122] Bundle 7, Document 6, Page 214
[123] Bundle 7, Document 7, Page 250

Firstly, the health board might know about an unusual infection but not report it up to ARHAI. Secondly, the health board's local surveillance may not pick it up, so the health board is unaware of the unusual infection. The Inquiry heard evidence that a HIIAT may be carried out by a health board on an unusual infection but that may not lead to the health board reporting it to ARHAI. As she put it "when boards don't report things in, it's not just that we're not aware of it; it's that we're losing that national intelligence to plan for any emerging issues."[124] However, the ICNET electronic system allows information to be pulled out of the local laboratory systems and patient management systems. It can be set up to look for one case of a particular microorganism and a trigger set if one occurs to alert HPS. In theory, a health board could set up triggers for a list of unusual micro-organisms.[125] It was acknowledged by Ms Imrie that there was a gap in the system if experienced microbiologists and scientists do not notice an unusual organism and escalate it.[126]

221. She gave evidence of particular issues around the NHS GGC IPC operation. She explained that she meets with Sandra Devine of GGC every week to discuss ongoing Glasgow incidents, following the poor working relationship between ARHAI and GGC arising from HIIAT information requests. As she described it "the pushback we got from Glasgow became such that the government asked myself and Sandra Devine to sort it out between the two organisations."[127]

222. Ms Imrie showed a clear willingness to assist the Inquiry particularly in relation to the function of governmental bodies such as HPS, ARHAI, NSS etc. She also commented on the function of an infection control team. She was particularly helpful in explaining her views on epidemiological reports and the working relationship between HPS/NSS and GGC.

223. In light of her co-operative attitude taken together with her general expertise and experience in the areas touched upon, her evidence was highly informative. She was a credible and reliable witness.

[124] Laura Imrie, Transcript, page 62.
[125] Laura Imrie, Transcript, pages 55-56.
[126] Laura Imrie, Transcript, page 53.
[127] Laura Imrie, Transcript, page 88.

Susan Dodd – 29 August 2024

224. Ms Dodd adopted her statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Ms Dodd is currently a nurse consultant at ARHAI Scotland. Her current role is working on the National Policy Guidance and Evidence programme which amounts to being editor of the National Infection Prevention and Control Manual ('NICPM'). She signs off the content that goes into the NICPM. In addition to the that work, she also has reactive work where she will be on-call and support health boards by providing advice.

225. Between March 2017 and August 2019, she worked as lead Infection Prevention Control nurse in the RHC. In August 2019, she moved to ARHAI, initially on secondment, but this became a permanent role in January 2020.

226. It was striking that Ms Dodd formed the view that there was an environmental link to some of the infections in August 2017 following Elizabethkingia, Aspergillus and Stenotrophomonas maltophilia infections. In essence her analysis at the time appeared to be built primarily on the practical logic that if all other potential causes had been addressed then, given the nature of these organisms, there was some significance with the Ward 2A environment causing the infections.[128] The potential connect to the ventilation systems (including chilled beams) in Ward 2A seems significant.

227. As a ICN now in a senior role at ARHAI, the Inquiry Team took the opportunity to ask Ms Dodd about the different roles of ICDs, ICNs and microbiologists. She explained that her understanding was that ICDs are typically microbiologists whilst ICNs take the lead on a more practical level by supporting the staff on the floor with advice about good IPC practices, auditing the practice and giving general advice about patient management.[129] She was also asked about the role of microbiologists in identifying and reporting unusual micro-organisms. She considered an unusual infection to be an organism that is not seen commonly in certain patient groups, and that the system relies upon the microbiology laboratory staff deciding than an

[128] Susan Dodd, Transcript, pages 6 to 19.
[129] Susan Dodd, Transcript, page 5.

organism is unusual.[130]

228. The Inquiry heard evidence from Ms Dodd that the best practice approach is to act on the unusual infections regardless of how they have been reported. The first step is to consider if the infection has been acquired in health care. This requires contacting the ward and informing them of the result and making sure they know how to manage the patient then putting controls in place and finally investigation.[131] The investigation would firstly consider the epidemiology of the cases; how many cases, when were samples taken, when did patient come into hospital, which dates treated and where the patient had been placed. In other words, the "time-place-person" link.[132]

229. In terms of patient placement Ms Dodd explained that haemato-oncology patients from Ward 2A could have been accommodated overnight in another ward outside Ward 2A before the decant to Ward 6A happened. She understood there were two scenarios where this may have occurred. The first scenario was a lack of available beds on admission and the second scenario was the complexity of the patient's condition. For example, if a patient had renal complications, then that patient may spend time on the Renal unit so they may have a bed there. Post-decant, largely all patients would have been in Ward 6A, but may be placed outside the ward for the same reasons above. However, a 2A pathway was developed so that every ward a 2A patient may end up for whatever reason, would have the same standards and controls as Ward 6A (such as POUFs, portable HEPA filters etc).[133]

230. Ms Dodd's closing comments in her first statement are significant:

> "139. From an infection prevention and control perspective, the challenges associated with the built environment were not in keeping with the expectations of a new build facility and it is my opinion that the built environment contributed to infections. When compared with my time spent working on older hospital sites, the frequency and severity of issues reported in relation to the built environment was significantly higher.

[130] Susan Dodd, Transcript, pages 9-10 & 98.
[131] Susan Dodd, Transcript, page 28.
[132] Susan Dodd, Transcript, pages 74-76.
[133] Susan Dodd, Transcript, page 109-111.

> 140. The complexity of the faults associated with the water and ventilation system are for the Public Inquiry to explore, however it is my opinion that the approach to exploring the hypotheses associated with incidents and with findings from investigations was not cohesive, transparent or supportive."

231. Ms Dodd was a clear and consistent witness who patently was doing her best to assist the Inquiry and refrained from making assertions beyond what she could confidently recall. She has clearly acquired a significant additional expertise in IPC in her role at ARHAI since 2020 which is recognised by the important role, she has in respect of the NIPCM which she was able to use to assist the Inquiry.

232. She did not shy away from questions and gave a full and candid response sometimes stepping into areas outwith her expertise. She diligently provided as much relevant information as possible and was a credible witness.

Eddie McLaughlan – 10 September 2024

233. Mr McLaughlan gave evidence on 10th September 2024. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 10 September 2024 (vol 4).

234. He had been employed by NSS Assure, and in the unfortunate absence of some other NSS participants (particularly Ian Stewart and Ian Storrar) did his best to explain the NSS involvement.

235. He had thoughts on the possible role of NSS as a policeman. He also spoke about the state of documentation found when they started to investigate the water system. He was able to assist on the features of Horne taps and about the challenges of dosing with chlorine dioxide.

236. In his evidence he took the Inquiry through the final HFS Water Management Issues Technical Review.[134] That Report, contributed to by a wide range of individuals including external experts and NHS GGC employees, had concluded that water contamination was widespread and looked at the causes from design, through the

[134] Bundle 7, Document 4, page 70.

construction phase to handling of the system post-handover.

237. He had brief comments to make on Cryptococcus.

238. While Mr McLaughlan was clearly a knowledgeable witness on the topics he covered, his direct recollection of events was limited and to some extent he was relating events covered by Ian Storrar and Ian Stewart, neither of whom were available to the inquiry. Subject to that caveat, there is no reason why his evidence should not be relied upon

Lisa Ritchie - Statement only, not giving evidence.

239. Lisa Ritchie is the National Deputy Director of Infection Prevention and Control for NHS England. Between April 2009 and March 2020, she was a Nurse Consultant in Infection Prevention and Control with ARHAI Group at HPS in Glasgow.

240. She provided evidence to the Inquiry in relation to the QEUH/RHC's ventilation system being SHTM 03-01 compliant. She also explained the function of Horne Taps and her involvement in the June 2014 meeting which considered their selection for the new hospital. She recollected emphasising six critical points during the meeting, which included risk management being key and Pseudomonas elimination being the holy grail.

241. Ms Ritchie provided evidence explaining her understanding of the micro-organisms, Serratia Marcescens, Mycobacterium Abscesses and Stenotrophomonas. In addition, she observed IMTs and summarised deficiencies in the IMT meetings. She also gave her view on GGC's Infection Surveillance Programme and summarised the deficiencies set out within the SBAR[135].

3.4 External Contractors and Consultants

David Watson – 19 August 2024

242. Mr Watson adopted his statement which is incorporated into the Witness Bundle for the week commencing 19 August 2024 (vol 1). Mr Watson is a legionella consultant

[135] Bundle 27, Volume 11, Document 17, page 89

and has almost 30 years' experience in the water industry. He is one of the directors of the company, DMA Canyon Ltd ("DMA"), which specialises in water hygiene and plumbing. DMA produced a number of reports and documents for NHS GGC that are relevant to the Inquiry. The key ones are:

- The 2015 DMA Canyon L8 Risk Assessment[136]
- The 2017 DMA Canyon L8 Risk Assessment[137]
- The 2019 DMA Canyon L8 risk assessment[138]
- The 2023 DMA Canyon L8 risk assessment[139]

243. Mr Watson has many years' experience in the management of hot and cold-water systems within domestic water systems from office blocks all the way to big hospitals. His CV was produced for the Inquiry.[140] He clearly has skills and experience in relation to Legionella and Pseudomonas but was clear that he was not a microbiologist, and should be treated as a person of skill working within a recognised field of experience.

244. He explained that the objective of a water hygiene consultant like himself is to assess the water systems with a view to limiting the scope for bacteria such as legionella to grow within the water systems, by making sure the hot water is hot (over 50-55c), and the cold water is cold (under 20c). When asked what relevance an L8 Risk Assessment has to the general management of a domestic system beyond Legionella and Pseudomonas he was clear that:

> "You maintain the water system in a way that prevents – prevents -is probably the right word, prevents the conditions for the growth of Legionella or pseudomonas then kind of by default, almost every other organism likes the same conditions and therefore you reduce the chance of other organisms being able to grow in the system."[141]

[136] Bundle 6, Document 29, page 122 (A33870103).
[137] Bundle 6, Document 30, page 416 (A33870243).
[138] Bundle 25, Documents 11-31, page 378.
[139] Bundle 27, Volume 1, Document 17, page 51 (A49511470).
[140] Bundle 6, Document 41, page 703.
[141] David Watson, Transcript, pages 148-149.

245. Mr Watson explained that the carrying out of an L8 risk assessment involves looking at how a water system is laid out and then considering if it complies with the L8 guidance and support document HSG 274 (Health and Safety Guidance 274), both issued by the Health and Safety Executive along with SHTM 04-01 Part B. Where there are areas of a particular water system that are non-compliant, then DMA will make recommendations to amend the water system to bring it up to standard. An L8 Risk Assessment will also consider Planned Preventative Maintenance ("PPM"), which is the tasks that need to be carried out on a daily, weekly or monthly basis to maintain the water condition at the correct standard.

246. Given the importance of sampling to the debate over the value of WGS it is of significance that when asked whether his company could sample water from a tap without dismantling the whole system to recover any biofilm there might be on the pipework inside, behind the panel his response was:

> "No.... All you can do is recover the water. We can recover the water and if parts of the biofilm slip off and come into that then it may be picked up by the lab, but there's nothing that we can do to say, "This will guarantee that we're sampling the biofilm." If we wanted to do that, we would need to open it up and either swab it or take sections of the paperwork out and ship that away."[142]

247. Mr Watson appeared to make an honest effort to assist the Inquiry by providing as much relevant information as he could recall. However, it was evident that, with the passage of time, he struggled to remember specific details of events that took place in 2015. This is understandable.

248. There was a degree of reluctance on the part of Mr Watson to offer evidence that might be construed as critical of NHS GGC. The hesitance was apparent in the careful choice of language and measured tone adopted when discussing potentially contentious matters.

249. Mr Watson was generally reliable and made efforts to recall events to the best of his ability, but his apparent reluctance to be openly critical of NHS GGC has to some extent limited the value of his evidence. The reluctance does not detract from the

[142] David Watson, Transcript, pages 119-120.

overall sincerity of his evidence.

Dr Thomas Makin – 27 August 2024

250. Dr Makin adopted his statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Dr Tom Makin gave evidence as an individual with considerable relevant experience in safety in hospital water systems, having been throughout his career concerned in that field from involvement in an early outbreak of Legionella at the Royal Liverpool Hospital in 1979.[143] He was a co-author of the HTM 04-01 guidance, being the equivalent in England & Wales to the SHTM 04-01 guidance, and has published widely and held public appointments and provided services to public bodies, before moving into consultancy in retirement.[144]

251. That background both informed his evidence as to the general nature of hospital water systems and the problems encountered by them, as well as informing the choice made by NHS GGC when approaching him for advice about their water system.

252. He provided his evidence in a knowledgeable and straightforward fashion, attributing his knowledge of events at QEUH appropriately and consistently with those sources. He did not overstate his expertise or involvement and was keen to emphasise the limitations of his involvement in meetings. Where he expressed concern over more remote aspects, such as when he remarked on the proximity of the sewage treatment works, he did so with appropriate caveats.

253. His evidence is commended to the Inquiry.

Matthew Lambert – 21 August 2024

254. The witness gave evidence on 21st August 2024. Mr Lambert adopted his statement which can be found in the Bundle for week commencing 19th August 2024 (vol 1).

255. Mr Lambert was an M&E services engineer. He operated a company called Innovated Design Solutions (IDS). They had extensive healthcare experience.

[143] Tom Makin, Transcript, page 20.
[144] Tom Makin, Witness Statement, pages 1-4.

256. The initial IDS instruction for the QEUH, given informally at some point before October 2018, had been no more than to determine the viability of increasing existing air change rates to six in Wards 2A and B, and the impact that would have on the ductwork.

257. As the first Glasgow III witness on ventilation, he provided the Inquiry with useful general information about various ventilation issues, including the significance of increasing the air change rate on duct sizing, having regard to the need to avoid pressure drops and increased noise. His main role was to speak to the Reports he provided to the Board in October 2018 on the deficiencies in the ventilation systems of Wards 2A and 2B.[145] The views he set out in these Reports in summary were that, far from being designed for the safety of the patient cohorts, the ventilation systems almost seemed to have been designed to cause problems. There were inadequacies of ACH, pressure, sealing, inappropriate use of thermal wheels etc.

258. He gave a limited amount of evidence about a further Report[146] on the CHP system, where he discussed the implications of inadequate water temperatures on microbiological growth.

259. Mr Lambert was clearly an expert, who was helpful and knowledgeable on issues relating to M&E services. Reliance can properly be placed by the Inquiry on his evidence both as to fact and opinion.

Dr Susanne Lee – 10 September 2024

260. Dr Susanne Lee adopted her statement which is incorporated into the Witness Bundle for the week commencing 10 September 2024 (vol 4). Dr Lee is a consultant clinical scientist, public health microbiologist, and she is a director of Legionella Limited which is a small independent public health microbiology service. The company provides prevention and detection of waterborne infections, supporting hospitals to and develop water safety plans, supporting water safety groups.

261. She gave evidence about water safety, POUFs, flow straighteners, biocide, and the

[145] IDS Ventilation Reports (Bundle 6, docs 33 and 34).
[146] IDS CHP Report (Bundle 15, page 1072).

DMA Canyon report.

262. Dr Lee displayed a strong level of confidence in her demeanour coupled with her clear enthusiasm for engaging with various topics like biocide and waterborne organisms. She demonstrated considerable knowledge across different aspects of the water system. However, her recollection of events in 2018 was rather vague and certain views she expressed appeared more to be more akin to assertions rather than conclusions grounded in evidence.

263. She evidently was doing her best to assist the Inquiry, and her evidence was helpful on several topics. She was a credible witness, and her evidence was broadly reliable on relevant matters to the Inquiry.

Professor Stephanie Dancer – 24 September 2024

264. Prof Dancer adopted her statement which is incorporated into the Witness Bundle for the week commencing 24 September 2024 (vol 6). The Inquiry heard evidence that Professor Dancer is currently a Consultant Microbiologist in NHS Lanarkshire, Professor of Microbiology at Edinburgh Napier University and visiting professor at Strathclyde University.

265. She is partially retired but has research interests in hospital cleaning, decontamination, antimicrobial stewardship, and MRSA control. She is also a PI (Primary Investigator) for the NHS Assurance Scheme to look into environmental deficits in hospitals such as water and ventilation.

266. In 1993, Professor Dancer came to Scotland and began working in Glasgow. In her early career as a junior doctor, she trained Dr Inkster at the Western General when Dr Inkster was a registrar. She was at the Scottish Centre for Infection and Environmental Health (which later became Health Protection Scotland) from 2002 to 2005. She also worked as a consultant microbiologist at the Southern General between 2005 and 2007.

267. Professor Dancer gave evidence detailing her potential locum opportunity at the QEUH/RHC in February 2019 and her observations during her hospital visit. She also touched briefly on her own view why her assistance was suddenly no longer

sought.

268. During the course of her evidence, the merits of natural ventilation over mechanical ventilation were discussed. The general take away was that mechanical ventilation is likely to result in a greater prevalence of gram-negative bacteria.

269. She also explained what measures she would have introduced to both the ventilation and water systems to reduce the risk to patients. The Inquiry heard evidence from Professor Dancer on the use of strong broad-spectrum antibiotics and the adverse impact that can result from these antibiotics encouraging particular types of organisms such as Stenotrophomonas.

270. Professor Dancer gave her own view on what she considered an unusual organism to be and also her view in relation to genotyping. Her view was that just because there is no match found between the environmental samples and the patient does not mean there is no risk. She concluded that an environmental link should not be excluded, and the investigation should continue.

271. Professor Dancer was an enthusiastic and eager witness who provided a lot of information, some of which was helpful to the Inquiry's understanding of certain matters. She did appear to recall her experiences from 2019 very well and her evidence was consistent with documentary evidence provided to the Inquiry.

272. She trained Dr Inkster, and clearly has a good ongoing relationship with her, and the evidence she gave must be evaluated with that in mind. However, she did come across as a credible witness who did her best to assist the Inquiry and had many interesting past experiences and anecdotes.

Tim Wafer – 08 October 2024

273. Mr Tim Wafer adopted his statement which is incorporated into the Witness Bundle for the week commencing 08 October 2024 (vol 8). Mr Wafer is the Director of Water Solutions Europe Limited and H2O Solutions Europe LLP. He worked at Glasgow through H2O Solutions from June 2018 on the establishment of a chlorine dioxide

programme.[147] H2O are still involved with the hospital and NHS GGC.

274. Mr Wafer has twenty-five years of experience in water systems and with the use of chlorine dioxide dosing in systems which have experienced issues regarding microorganisms in the water. His experience is not limited to healthcare.[148] Mr Wafer has carried out the role of authorising engineer for water for a number of NHS establishments and management companies. He carries out these roles at NHS locations in England, as well as one in Scotland.[149]

275. He has been involved with the QEUH/RHC since June 2018. He was able to recall the precise details of his initial engagement with the QEUH/RHC, the details of his visits to site, and the issues which he encountered when he was there.

276. Mr Wafer then went on to describe the nature of a ClO_2 system, and how he and his company went about designing and implementing the system. He was also able to provide the Inquiry with details as to how the system is maintained and monitored. Further, he was able to provide the Inquiry with detailed conclusions as to the positive effects that the system has had on the water system at the QEUH/RHC.

277. In general, Mr Wafer was a very helpful witness. He gave his evidence in a measured and fair manner. He was only interested in providing the Inquiry with the facts as he saw them, with admirably little spin or colour. At all times, Mr Wafer sought to assist the Inquiry in understanding the issues and how the ClO_2 system came to be and the impact that it had on the water system.

278. His experience and the ability with which he was able to recall details make him a helpful witness, who came across as both credible and reliable.

Peter Hoffman – 26 September 2024

279. Mr Hoffman gave his evidence on 26 September 2024. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 24 September 2024 (vol 6). He worked in a public health laboratory in Colindale for his entire career, going through various name changes in his employing organisation. He

[147] Tim Wafer, Transcript, page 104.
[148] Tim Wafer, Transcript, page 106.
[149] Tim Wafer, Transcript, page 107.

had been retired for five years by the time of giving evidence.

280. His special interest was in how microbes transmit to patients in healthcare settings. He was often described as the' go to' person on ventilation.

281. Mr Hoffman was asked to give evidence about the Cryptococcus Subgroup. Much of his view on the various hypotheses was recorded in the minutes. Essentially there were a number of possibilities. Nothing was conclusively ruled out. He was not able to comment on the issue of reactivation.

282. He was also asked about a number of emails in which he featured. He had had no involvement in the design of the hospital. His view was, however, that immune-compromised patients were protected by HEPA filters and positive pressure. ACH was irrelevant (though it was important for infectious patients). He acknowledged that UK guidance contained requirements for ACH.

283. He maintained his view that PPVL rooms were not suitable for highly immuno-compromised patients, but in any event their functioning depended on being built precisely in accordance with guidance.

284. Mr Hoffman had no direct recollection of the e-mail exchanges or other materials. He clearly had firm views, particularly on the value of ACH. That view differs from views advanced by others to the Inquiry and is not reflected in the consistent terms of HTM and SHTM. Accordingly, while his views are entitled to respect, they clearly do not represent the consensus. The points made in this paragraph should be borne in mind in considering his evidence.

Jim Leiper – 23 October 2024

285. Mr Leiper gave evidence on 23 October 2024. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10). He had spent almost his entire career in healthcare estates management, including as Head of Estates at NHS Tayside, Director of Estates, Facilities and Capital Services at NHS Fife, and also Strategic Director of Facilities at Health Facilities Scotland. He had then been engaged by NHS GGC on a series of temporary contracts to assist on particular matters.

286. His evidence was unusual. Firstly, due to availability issues, it was given during Comms Week, rather than alongside other estates related witnesses. That meant that some of the substantive issues he covered - whether the state of the ventilation in Ward 2A, or what had been done with the DMA Canyon Report - had already been covered in various ways by other witnesses.

287. Secondly, although he had been asked to produce reports on these two issues,[150] he had in each case accompanied his substantive findings with a good deal of commentary on related matters. His commentary was more extensive than his findings. Much of that will be of particular interest in Glasgow IV.

288. He was clearly a witness of considerable experience and expertise. If there was a criticism, it was of his almost non-judgmental approach to the failures to deal properly with the DMA Canyon Report. That was difficult to understand. Otherwise, it is suggested that his evidence will prove to be of considerable assistance to the Inquiry on a number of topics.

Dennis Kelly – 27 August 2024

289. Mr Kelly adopted his statement which is incorporated into the Witness Bundle for the week commencing 27 August 2024 (vol 2). Mr Kelly set up his own consultancy, Pro LP Consultancy Limited. He has been doing Authorised Engineer work since 2010-2011 when he was appointed as an AE for NHS GGC. This involves supporting Estates people with decontamination, water etc. Mr Kelly had no involvement with QEUH until after his annual report (2015-2016).

290. Mr Kelly reached the view that the lack of filling of designated roles meant that it was never clear who was responsible for what.[151] He described the Estates team record-keeping as 'haphazard', such that where a task such as sampling required to be performed in a specific manner, it might be impossible to know whether it had been done properly. The entire process would be undermined. This had been an issue with legionella sampling at QEUH to 2017.[152]

[150] Ventilation – Bundle 23 p872
[151] Dennis Kelly, Transcript, Page 145
[152] Dennis Kelly, Transcript page 165

291. He spoke to the Estates' team's poor record-keeping[153], no evidence of samples[154] and questionable competency of staff[155]. In Mr Kelly's view, it was likely that the Estates staff had not been trained and if samples were being taken, then they were not being taken correctly[156]. He also noted significant gaps of evidence of task completion during his audit in 2017[157] which is in sharp contrast to the position now where there are virtually no gaps in the records[158]. Notably, Mr Kelly was not requested to carry out an audit in 2019 and he acknowledged that an audit should have been done[159].

292. He explained that a 'dead leg' is typically a term used to describe a run of pipework that is no longer in use or a pipe that has become isolated from the regular flow of water. The risk with dead legs is that they contain stagnant water which provides an increased opportunity for biofilm to develop which in turn may increase bacterial growth opportunities[160].

293. Mr Kelly observed that he was very concerned by the strong recommendations in the 2017 audit, but due to the installation of chlorine dioxide dosing he had confidence in the water system from 2019 onwards. He spoke to the improvement in his subsequent audits in 2018[161], 2020[162], 2021[163], 2022[164], 2023[165] and 2024[166].

294. Mr Kelly delivered his evidence in an authoritative and matter of fact manner. He answered directly and concisely the questions put to him. He readily acknowledged

[153] Dennis Kelly, Transcript, page 167
[154] Dennis Kelly, Transcript, page 166
[155] Dennis Kelly, Transcript, pages 148 and 149
[156] Dennis Kelly, Transcript, pages 165 and 166
[157] Dennis Kelly, Transcript, pages 129 and 130
[158] Dennis Kelly, Transcript, page 143
[159] Dennis Kelly, Transcript, page 213
[160] Dennis Kelly, Witness Statement, page 13 (Witness Bundle page 56)
[161] D Kelly, 'Legionella Control AE Audit – Queen Elizabeth University Hospital' - 23 July 2018; Bundle 18 vol 2, doc.112 at page 909.
[162] D Kelly, 'Legionella Control AE Audit – Queen Elizabeth University Hospital: 30 and 31 January 2020'; bundle 18 vol 2, doc.125 at page 1355.
[163] D Kelly, 'Legionella Control AE Audit – Queen Elizabeth University Hospital: 4 and 5 February 2021'; Bundle 18 vol 2, doc.126 at page 1402.
[164] D Kelly, 'Legionella Control AE Audit – Queen Elizabeth University Hospital: 28 February and 1 March 2022'; Bundle 18 vol2, doc.134 at page 1335.
[165] Pro Lp Consulting Ltd, Authorising Engineer Water Systems Management and Compliance Audit of NHS Water Systems, 11 January 2023; bundle 15, doc.45 at page 1226.
[166] Authorising Engineer Water Systems Management and Compliance QEUH/RHC - 11 January 2024; Bundle 27 vol 1, doc.18 at page 252.

areas where he could not provide an informed opinion.

295. The clarity of his explanations enhanced the accessibility of his evidence. He gave a good account of how water systems are managed and supervised. His evidence was credible, reliable and very valuable in elucidating technical points about water system management.

3.5 Members of NHS GGC Board

Dr Jennifer Armstrong – 10 October 2024

296. Dr Jennifer Armstrong is the Medical Director of NHS GGC. She gave evidence to the Inquiry on 10 October 2024. She adopted her witness statement which is incorporated into the witness bundle for the week commencing 8 October 2024. Dr Armstrong became the Medical Director of NHS GGC in 2012. Prior to that, she was a consultant. Appendix D of her witness statement contains an expanded CV.

297. Dr Armstrong was able to give evidence on a wide range of topics. Most of her evidence is set out in the narrative in Chapter 5 at the point of the events about which she was speaking.

298. She spoke with some force about her role in patient safety and the importance of balancing risk.[167] She is a non-executive director on the board of NHS GGC. She is also a member of the Corporate Management Team. She used to be the HAI Executive for NHS GGC across the whole health board from 2012 to 2020.[168] She was very clear in her statement that she did not have expertise in IPC.

299. As Responsible Officer for NHS GGC, Dr Armstrong puts forward doctors for re-validation every five years.[169]

300. Dr Armstrong explained that she was the Healthcare Acquired Infection lead ("HAI Lead") until early 2020. As such she chaired the Board Infection Control Committee ("BICC"). The ICM reports to her.[170]. There are two professionals in IPC. The Lead

[167] For example, Dr Armstrong, Transcript, Pages 45-46, 99-100
[168] Transcript, Dr Armstrong, page 2 and 3
[169] Transcript, Dr Armstrong, page 4
[170] Transcript, Dr Armstrong, page 5 and 6

ICN and the Lead ICD. The Lead ICN and Lead ICD report into the ICM.[171]

301. The Lead ICD from 2015 to 2019 had half their sessions in IPC and half in microbiology. There were a number of sector ICDs around the board with a couple of more sessions. There were five teams with a sector ICD and a lead nurse.[172]

302. Dr Armstrong expected a fantastic new hospital.[173] She was involved in the initial decision to move the adult BMT to the QEUH and add it to the project in 2013. Clinicians wanted to be co-located on the new site with intensive care and renal care. She put forward the clinical case for it.[174] Dr Armstrong did not know at the time that the ventilation systems did not have enough duct capacity for more than 6 air changes per hour.[175] For the Ward 4B isolation rooms and Ward 2A, there were questions regarding whether the physical fit out was to the standard people were expecting. She thought they were getting a fantastic hospital but did not get what they expected.[176] She agreed that there were questions about whether the hospital was built in conformity with the guidance and as people expected. She did not have the expertise to say if the hospital was built in conformity with SHTM-03-01.[177]

303. Dr Armstrong expected that the hospital would be fit for patients. When it became apparent that the adult BMT had to move back to the Beatson, that was extremely surprising.[178]

304. It was put to Dr Armstrong that she had an obligation to ask if things were wrong, what else was wrong. Dr Armstrong stated that she would have reported all of that to the board CEO and Project Director. They were responsible for looking at that.[179] Dr Armstrong was worried about the BMTs. A big part of the hospital was working well, even though they did have problems. She knew there were problems with the paediatric unit, and adult BMT, which were significant. A range of other services were

[171] Transcript, Dr Armstrong, page 7 and 8
[172] Transcript, Dr Armstrong, page 8 and 9
[173] Transcript, Dr Armstrong, page 9 to 11
[174] Transcript, Dr Armstrong, page 11 to 13
[175] Transcript, Dr Armstrong, page 13
[176] Transcript, Dr Armstrong, page 20 and 21
[177] Transcript, Dr Armstrong, page 27
[178] Transcript, Dr Armstrong, page 27 to 29
[179] Transcript, Dr Armstrong, page 29 and 30

working well. [180]

305. It was put to Dr Armstrong that the Inquiry heard from Professor Steele, that on his appointment, he had a meeting with the Chairman and CEO in 2018 and did a review of the procurement. He got a report from a consultant, which led to litigation. He acted to find out what had gone wrong. Dr Armstrong stated that it was not in the remit of the medical director to go into estates and ask questions about the water system.[181]

306. Dr Armstrong was asked, as the board member responsible for ensuring patient safety, if she could have done more to learn lessons from the procurement. Dr Armstrong explained that she was a 'fish out of water' regarding procurement. They were trying to keep things like bone marrow transplants going whilst they fixed the hospital. She thought they did that reasonably well.[182]

307. Dr Armstrong did not know that there was an HAI SCRIBE document that set out the processes to certify a new or refurbished facility. There was a senior management team in infection control, and she did not have a detailed knowledge of HAI Scribes.[183] It was not something that someone at her level would be aware of. She was not aware that the same processes applied to new construction.[184]

308. Dr Armstrong was asked if that pressure of funding was not a reason for when spending £800m on a hospital to build it to guidance and with your eyes open. Dr Armstrong said it would have avoided all the issues that they have had. They need to look at the evidence, consider what that translates into, and how hospitals are built in the future. They need to balance up all the risks within the resources that they have.[185]

309. Regarding Wards 2A and 4B, Dr Armstrong was asked if Dr Inkster and Dr Peters were wrong about the state of the isolation rooms. Dr Armstrong stated that there

[180] Transcript, Dr Armstrong, page 30 to 32
[181] Transcript, Dr Armstrong, page 32 and 33
[182] Transcript, Dr Armstrong, page 222 and 223
[183] Transcript, Dr Armstrong, page 33 and 34
[184] Transcript, Dr Armstrong, page 34 and 35
[185] Transcript, Dr Armstrong, page 126 and 127

was a lot of debate.[186] They were bringing up good points. It ended up with an SBAR and a multi-disciplinary group led by regional director, Gary Jenkins.[187] She accepted that in the Stage 1 Whistle Blow in October 2017, the Whistleblowers were acting on the duties they hold under good medical practice, to advise people of problems that they think they can see, and she did not mind them writing to her.[188]

310. In respect of her working relationship with Dr Inkster as LICD, Dr Armstrong thought she worked well with Dr Inkster, Tom Walsh and Sandra Devine.[189] She considered that at the time of the decant of Ward 2A, her relationship with Dr Inkster was reasonable. There were not any pressure points on her burden of work.[190]

311. The news on 31 January 2019 from Anne Gow that Dr Inkster had accused Professor Steele of telling her not to put anything in writing clearly came as a profound shock to Dr Armstrong. She was most animated in evidence even though she had heard Professor Steele's qualified admission. It seems reasonable to assume the acceptance by Professor Steele that he had said something of that sort, albeit in a 'jocular' manner, was a surprise to her and rather undermines her concerns.

312. Whilst we do not need to decide exactly what was said at the meeting between Dr Inkster, Dr Armstrong and Ms Devine on 24 June 2019, the fact that somehow no-one remembered to invite or inform Dr Inkster about the major national IPC meeting at the Golden Jubilee in July 2019, suggests this is when relations between Dr Armstrong and Dr Inkster really broke down. When the evidence was focused on the IMTs in August 2019, and the decision to remove Dr Inkster as chair of the IMT, Dr Armstrong explained that her position was that the focus of the IMT degenerated. It was not looking at the broad issues. It became skewed to the environment.[191] Dr Armstrong was asked if the focus of Dr Inkster was the best interests of her patients. Dr Armstrong stated that she thought Dr Inkster believed that. She did not think Dr Inkster's actions led to that. She would not go as far as to say Dr Inkster was not

[186] Transcript, Dr Armstrong, page 48 to 50
[187] Transcript, Dr Armstrong, page 51 and 52
[188] Transcript, Dr Armstrong, page 87 and 88
[189] Transcript, Dr Armstrong, page 53
[190] Transcript, Dr Armstrong, page 114 and 115
[191] Transcript, Dr Armstrong, page 227 and 228

focused on the patients.[192]

313. Dr Armstrong was referred to her witness statement where she said that there was a view set out that it became more about proving themselves right than the children[193]. Dr Armstrong explained that she thought Dr Inkster became identified with the hypothesis of the environment. It drove the IMT away from other areas it should explore. It led to a loss of perspective. The focus became about the environment.[194]

314. Dr Armstrong was referred to the Positioning Paper for NHS GGC[195]. Paragraph 69 refers to the conduct of Whistleblowers undermining infection control. Dr Armstrong agreed with this analysis.[196]

315. It was put to Dr Armstrong that this was understood to describe behaviour from 2015 to 2019. She was asked what steps she took to address these serious issues with those doctors. Dr Armstrong explained that the 2015 review mentioned some of this. She regretted that they did not have a meeting. It should have been shared at that point, in a delicate way.[197] It was put to Dr Armstrong that the following IMT minutes contradict entirely what is in the Positioning Paper. She was not aware of that. She thought there were behavioural patterns over several years that were difficult to address.[198]

316. Dr Armstrong thought there was some evidence of undermining the infection control team. That was addressed at the time by Dr Green. People try to use the process and not just go straight to the GMC. When you see behaviours re-occurring it becomes difficult. She did not have personal experience of all the instances.[199]

317. Dr Armstrong thought Dr Inkster and Dr Peters should be listened to. She thought that there were significant issues with the QEUH. She thought Dr Inkster and Dr Peters picked those up. There was a balance. The Inquiry should listen to Dr Inkster

[192] Transcript, Dr Armstrong, page 228
[193] Witness Statement, Dr Armstrong, page 293
[194] Transcript, Dr Armstrong, page 225 to 227
[195] See Bundle 25, page 1282
[196] Transcript, Dr Armstrong, page 213 and 214
[197] Transcript, Dr Armstrong, page 214 and 215
[198] Transcript, Dr Armstrong, page 216
[199] Transcript, Dr Armstrong, page 218

and Dr Peters.[200] Regarding Dr Peters, Dr Armstrong explained that one IMT, the 14 August 2019 IMT, focused on their hypothesis and on the environmental issue and not on the wider focus on children. The focus was on the argument. Dr Armstrong said you would need to ask Dr Peters if her primary focus was the interest of patients. The focus was on what she had been brought there to do.[201]

318. As discussed in the section that deals with Dr Inkster in this chapter, and in Chapter 6, the submission of Counsel to the Inquiry is that Dr Armstrong's criticisms of Dr Inkster are not objectively justified, partly because there was considerable evidence that Dr Inkster was right to be concerned about infection rates in the summer of 2019 and the potential that chilled beams and residual risk from the water supply posed a risk to patients, but also because Dr Armstrong did not attend any of these IMTs herself, no IPC trained clinician or treating clinician was willing to back up her criticism in evidence, and most profoundly of all Dr Armstrong and Dr de Caestecker were clear that no thought was given to getting the insight of Professor Gibson who might be well placed to assess the critique made by those people who did complain to Dr Armstrong.

319. The critique of Dr Peters has even less merit. Dr Peters attended one IMT that summer (on 14 August 2019) and appears to have annoyed Professor Steele by her insistence that she knew what she was talking about in the area of microbiology. It is the case that Dr Peters has repeatedly brought issues about the water and ventilation systems of the hospital and the running of the IPCT to the attention of Dr Armstrong. No doubt that had been annoying for Dr Armstrong who clearly does not like to be contradicted. The problem for Dr Armstrong is that these critiques of the water and ventilation systems of the hospital are objectively justified and whilst her concerns about the management of the IPCT might be harder to resolve at an evidential level, there is evidence that when Dr Inkster was not being listened to as Lead ICD the ICPT at the QEUH/RHC was less than effective.

Dr Linda de Caestecker – 08 October 2024

320. Dr Linda de Caestecker adopted her statement which is incorporated into the

[200] Transcript, Dr Armstrong, page 219 and 220
[201] Transcript, Dr Armstrong, page 228 to 233

Witness Bundle for the week commencing 08 October 2024 (vol 8). Dr de Caestecker retired as the Director of Public Health and an executive board member with NHS GGC in March 2022. She was called as a witness because of her particular responsibilities in respect of Whistleblowing. She explained that in 2018 there were two, but had been up to four previously, non-clinical board directors who heard whistle blows and that she started in that role in 2014.[202]

321. Dr de Caestecker was not involved in the Stage 1 Whistleblow in October 2017.[203] The substance of her involvement in the Stage 2 Whistleblow of Dr Redding is contained within the narrative in Chapter 5.

322. In her statement[204] Dr de Caestecker stated that ""In my investigations into the Whistleblowing complaints, it was reported by members of the IPCT that they felt that this step of multiple resignations was taken to destabilise/undermine the IPC service." This was a reference to the September 2017 ICD resignation. Dr de Caestecker immediately wanted to make this a reference to Dr Peters and how she worked. She was asked what her source was and explained that members of the IPC team had this reported to her during the Stage 2 Whistleblowing interviews and that she had since found it in her notes. The statement does not occur in her Whistleblowing report. She did explain that this "needed to do a much more thorough investigation in order to know whether or not that was a true remark" and that she did not know whether anyone had given those microbiologists feedback about their conduct at the time.[205] She did not consider that by putting the criticisms in the report she created something that could be used later against Dr Peters' arguments.[206]

323. Dr de Caestecker's explanation as to why she felt it appropriate to include a critique of Dr Peters in her report into Dr Redding's Stage 2 Whistleblow was unconvincing. In effect it amounted to a statement that she felt obliged to record the complaints of those to whom she spoke about Dr Peters without making any attempt to check whether they were accurate. Given her explanation that she felt that her duty was to find out if the issues raised had been accepted by the people that needed to work on

[202] Dr Linda De Caestecker, Transcript, page 3.
[203] Dr Linda de Caestecker Transcript, page 4.
[204] Dr Linda de Caestecker, Witness Statement, question 26.
[205] Dr Linda de Caestecker, Transcript, pages 16-19.
[206] Dr Linda de Caestecker, Transcript, page 50 and 51.

them to change things, to improve things, where they'd be taken seriously and was action being taken[207] there seems no reason to record in a formal document these criticisms of Dr Peters.

324. Dr de Caestecker was taken to Dr Peter's appraisal which stated that she was not involved in complaints or critical incidents. Dr de Caestecker did not take a view on whether this was of similar, more, or less weight than the Whistleblowing report as it is a very different process. Dr de Caestecker said nobody was questioning Dr Peters' clinical practice. She stated that she was reporting complaints about behaviours.[208]

325. The evidence given by Dr de Caestecker the meeting of 20 August 2018 about the removal of Dr Inkster as IMT Chair was problematic. She accepted that no thought was given to inviting Professor Gibson[209] but she would not accept that the meeting only obtained a partial perspective that looked at one side of the argument. Her response, that what she wanted to do was to ensure that a crucial IMT was working well, and the feedback that she had received was that it was not,[210] was not in any sense a justification for proceeding as she did.

326. Remarkably Dr de Caestecker was of the view that if you have an ICD saying this is a possible problem, that should be investigated. If Estates say there is no problem, there would be a tension. She considered that this reinforces why there should be a chair that is not the expert.[211] Dr de Caestecker's evidence that she was hoping Dr Crighton would be there chairing the IMT, Dr Inkster would still be on the IMT, and she would be able to make her case and have the debate in a way that was more manageable, because she did not need to also chair the meeting and deal with the behaviours, seems at best naive and at worst fanciful.[212] If that is what she wanted to achieve, she would have needed to actually treat Dr Inkster with a small measure of professional courtesy and respect, which is not consistent with how she ran the meeting of 20 August 2019 and this whole process.

327. It was put to Dr de Caestecker that what she had been doing in these two events

[207] Dr Linda de Caestecker, Transcript, page 27.
[208] Dr Linda de Caestecker, Transcript, page 81 to 83.
[209] Dr Linda de Caestecker, Transcript, page 60.
[210] Dr Linda de Caestecker, Transcript, page 67 and 68.
[211] Dr Linda de Caestecker, Transcript, page 75 and 76.
[212] Dr Linda de Caestecker, Transcript, page 76 and 77.

was accepting the view of a minority or particularly chosen subset of people and giving them status and authority which was then used by others to criticise the doctor involved. Dr de Caestecker did not accept that. She stated that she interviewed people and presumed they were being honest. She felt it was relevant to report these matters because Dr Peters and Dr Redding brought up their relationship with the IPC team.[213]

328. In respect of her December 2019 report [214]into the anonymous Whistleblow to HPS about conduct of members of the IMT of 14 August 2019[215] it was put to her that she was investigating a Whistleblow about a meeting where it had already been decided that the chair needed to change. She stated that the IMT changed the chair to support the working of the IMT. She stated that she hoped Dr Inkster would continue with the IMT. She did not feel that there was a conflict of interest because she wanted to support Dr Inkster and make the IMT work better. If people felt there was a conflict, they could have said that to HPS.[216] It is difficult to see how there could not be a conflict of interest. The Whistleblow was that on 14 August 2019 the Chair – Dr Inkster – was being undermined by some members of the IMT. Dr de Caestecker chaired a meeting on 20 August 2019 which decided to remove Dr Inkster for reasons related to the conduct of the members of the IMT, having listened to the very members of the IMT that the Whistleblower had in mind. She had already made her mind up on the facts of what took place on 14 August 2019 and what took place. It is clear that in the case of Dr de Caestecker there is a clear reason for seeing an appearance of bias, if not actual bias, on the facts involved in the Whistleblow she was investigating. Dr de Caestecker should not have taken part in the investigation into Dr Peters' 16 August 2019 Whistleblow to HPS and the Inquiry should not give any weight to the conclusions of that report.

329. Dr de Caestecker was heavily involved in several of the incidents which the Inquiry is interested in, and for which the Inquiry has heard evidence. Whilst she did appear to give her evidence in a straightforward manner about most issues, her evidence about the criticisms of microbiologists which were input into the reports that she

[213] Dr Linda de Caestecker Transcript, page 84 and 85.
[214] Bundle 27, Volume 7, Document 49, page 536.
[215] Bundle 14, Volume 2, Document 148, page 573 and Bundle 14, Volume 2, Document 155, page 601.
[216] Dr Linda de Caestecker Transcript, page 91 to 93.

prepared left a lot to be desired.

330. She was very keen to suggest that all that she was doing was simply reporting things that people had said to her, but she was not prepared to take any responsibility for the consequences of doing so for the individuals concerned. One was left with the impression that Dr de Caestecker had some form of motivation for including the criticisms of, particularly Dr Peters, in her reports when the relevancy of those criticisms to the issues at hand was questionable. Her explanation as to why those criticisms remained in despite the questionable relevancy was not particularly persuasive.

331. She appeared at times to be evasive and as though she was articulating a position on behalf of NHS GGC, which fits in with the notion that the criticisms of Dr Peters were input into the report to allow for them to be used later as a sort of cudgel. As such, the Chair should treat Dr de Caestecker's evidence with a degree of caution.

Professor Angela Wallace – 25 October 2024

332. Professor Wallace gave evidence on 25th October 2024. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10). Her background was as a nurse, and she held the title of Executive Director of Nursing and Midwifery for NHS GGC. She had no involvement with the QEUH before the creation of the Oversight Board and taking up her role as interim director for Infection Prevention and Control.

333. She was appointed by the Scottish Government as someone independent but reported to the NHS GGC chief executive. She explained some of the challenges that brought. She was able to confirm that all the recommendations of the Oversight Board had been dealt with (albeit a spreadsheet detailing this was not available to the Inquiry when she gave evidence).

334. She accepted that performance against national infection targets was not particularly valuable when looking at the environmental infections.

335. Perhaps the most remarkable feature of Professor Wallace's evidence was that she had produced a witness statement which appeared to direct not insignificant criticism

against one particular group (largely Dr Peters and Dr Inkster). In oral evidence, however, she departed from most or indeed all of these criticisms, suggested she was equally challenging to others, and confirmed those who did raise concerns were perfectly correct to do so. While the' disconnect' as the Chair put it was striking, there seems no reason why her oral evidence should not be accepted.

Dr Emilia Crighton – 24 September 2024

336. Dr Crighton adopted her statement which is incorporated into the Witness Bundle for the week commencing 24 September 2024 (vol 6). Dr Crighton is the current Director of Public Health for NHS GGC having succeeded Dr de Caestecker on the latter's retirement. She has been a Consultant in Public Health Medicine since May 2004 initially in NHS Argyll and Clyde and then NHS GGC

337. Dr Crighton was asked about her experience in IPC at the time of her appointment as Chair of the GNB IMT on 23 August 2019 and she candidly explained that at that point she had not then worked in IPC in hospitals.

338. The details of how Dr Crighton came to become chair of the IMT, and what happened in its meetings, is set out in detail in the Narrative in Chapter 5 of these submissions. It emerged in questioning about how she planned to chair an IMT, that she had attended a pre-meeting immediately before the IMT but could not remember who was there (other than Sandra Devine).

339. Given the significance of this IMT, a range of explanations for the change of chair which had been the subject of evidence from other witnesses were put to Dr Crighton. These included that Dr Inkster had agreed to the change of chair; that Dr Inkster was asked to demit a week beforehand due to feedback from everyone at the last IMT on 14 August that the meeting was difficult; and that there had been a meeting that decided to replace the chair on 20 August 2019. Somewhat surprisingly Dr Crighton claimed not to remember being told any of these explanations and had not heard of the 20 August 2019 meeting until she got her papers for the Inquiry.[217] She also explained that she had been told what had happened with Dr Inkster at the

[217] Dr Emilia Crighton, Transcript, pages 15-20.

start of the meeting itself and had not been told about it at the pre-meeting.[218]

340. It is submitted that this evidence was incredible. Dr Crighton's version involves sitting through the pre-meeting, without learning or asking anything about why the IMT Chair was being changed or asked those briefing her why she was needed and then learning why the chair was changing (as she understood it) from Sandra Devine at the start of the IMT itself. That makes absolutely no sense. For this version of events to be correct, the issue of the change of chair would have simply not come up at the pre-meeting, which seems highly unlikely.

341. In respect of the IMT meetings for the balance of the year, Dr Crighton explained that her knowledge of the previous incidents, the previous hypothesis linking infections and the environmental type of infections among haemato-oncology patients had come from Dr Kennedy and not Dr Inkster, perhaps because of the fact that they were co-located in the same office.[219] Her developing understanding of the epidemiology and other data is set out in the section of Chapter 5 that deals with events from 23 August to 14 November 2019.

342. She agreed with the view expressed by Ms Devine in her paper for NHS GGC[220] that there might there be a connection between infections and deprivation in the population served by the hospital.[221]

343. Dr Crighton was asked about the SBAR of 25 August 2019[222] produced by all consultant microbiologists at QEUH (including Dr Peters and Dr Inkster). It was sent to Dr Crighton by Dr Peters on 27 September 2019[223]. Somewhat improbably Dr Crighton could not remember this SBAR.[224] She also appeared to be unaware of previous significant incidents, such as a case of Cryptococcus neoformans on Ward 6A as described in the SBAR.[225] She did recognise what appears to be the response document,[226] which she said was discussed at the IMT, but could not remember who

[218] Dr Emilia Crighton, Transcript, page 19.
[219] Dr Emilia Crighton, Transcript, pages 33-39.
[220] Bundle 25, Document 10, page 364 at 366.
[221] Dr Emilia Crighton, Transcript, page 118-120.
[222] Bundle 4, Documents 41 and 42, page 165, 168.
[223] Bundle 14, Volume 2, Document 149, page 574.
[224] Dr Emilia Crighton, Transcript, pages 121-122.
[225] Dr Emilia Crighton, Transcript, page 124.
[226] Bundle 4, Document 42, page 168.

wrote it.[227]

344. On 25 October 2019 Dr Inkster emailed Dr Crighton seeking amendments to the IMT Minutes of 8 October 2019[228] and the email was acknowledged.[229] Dr Crighton could not explain why the changes were not made, but more relevantly to the issues she claimed not to know why she had not sought to speak to Dr Inkster at this point, outside the IMT, to get some history and background. At this point Dr Crighton claimed to not have known that the Lead ICD of NHS GGC, Dr Inkster, had resigned and could not tell the Inquiry why she did not approach Dr Inkster for information.[230]

345. Dr Crighton was a remarkably unhelpful witness. She repeatedly claimed to not remember events in the IMT that she was chairing, at a point in time when the IMT was the centre of considerable public attention, attention from HPS and the Scottish Government and from patients and families. As discussed above there are points when her version of events is just not credible. It is difficult to place much reliance on her evidence when it is not corroborated by other evidence consistent with it.

Dr David Stewart – 19 September 2024

346. Dr Stewart adopted his statement which is incorporated into the Witness Bundle for the week commencing 17 September 2024 (vol 5). Dr David Stewart was a consultant in geriatric medicine and was Deputy Medical Director (Acute Medical Services) for NHS GGC before his retirement in 2019. In this role, he reported to the Chief Operating Officer for the acute sector which would involve making important decisions on issue such as waiting times, but he also separately reported to Dr Armstrong, in which he accepted that he occasionally acted as a bit of a 'gopher' for her rather than being focused solely on the envisaged strategic and planning matters[231]. For example, he was instructed to attend meetings on Dr Armstrong's behalf[232] and to liaise with Drs Inkster and Peters to address their concerns[233].

[227] Dr Emilia Crighton, Transcript, pages 125-128.
[228] Bundle 14, Volume 2, Document 154, page 599.
[229] Bundle 14, Volume 2, Document 163, page 621.
[230] Dr Emilia Crighton, Transcript, pages 127-132.
[231] Dr David Stewart, Transcript, pages 4 and 41
[232] Dr David Stewart, Transcript, page 21
[233] Dr David Stewart, Transcript, page 38

347. Dr Stewart did appear to be doing his best to assist the Inquiry, but his evidence was marked by a notable inconsistency in his ability to recall events. On numerous topics of relevance to the Inquiry, the witness professed an inability to remember details, often responding in vague or non-committal terms. However, his recollection improved markedly when addressing allegations made against him by other witnesses. In such instances, he was able to provide detailed accounts that sought to paint him in a better light.

348. This selective memory raises some concerns about the credibility and reliability of his evidence. While it is natural for memory to vary depending on the significance of events or passage of time, the contrast here appeared disproportionately stark. He also appeared to have a somewhat guarded demeanour throughout much of his evidence, which further undermined confidence in the frankness of some of his responses.

349. On balance, given Dr Stewart's largely hazy recollection of events, and his guarded answers on many topics of interest, his evidence must be approached with a degree of caution in relation to its reliability.

Dr Chris Deighan – 19 September 2024

350. Dr Deighan adopted his statement which is incorporated into the Witness Bundle for the week commencing 17 September 2024 (vol 5). Dr Deighan has, since January 2023, been Executive Medical Director, NHS Lanarkshire. Prior to that he was Deputy Medical Director - Corporate, NHS GGC from June 2019 to January 2023. His clinical background is a Consultant Nephrologist and as such he worked in the Glasgow Renal and Transplant Unit until his appointment as Deputy Medical Director- Corporate in January 2023.

351. He explained that as Deputy Medical Director- Corporate he was a deputy to Dr Jennifer Armstrong, and that his role was related to corporate and strategic issues rather than operational issues. He explained he was involved with staff governance, clinical governance, he chaired the E-health strategy board, became deputy responsible officer and also was involved in supporting medical education and realistic medicine. He explained that when Dr Stewart retired as Deputy Medical

Director his post was split into two: the deputy medical director corporate and the deputy medical director for acute services. The role was held by Dr Scott Davidson.

352. Dr Deighan explained that the first IMT he attended as Deputy Medical Director-Corporate was the Gram-Negative IMT of 25 June 2019[234] and that he would have attended at the request to Dr Armstrong.[235] He thought he might have been sharing the attendances with Dr Davidson.

353. Given he was relatively new to events at this point, he was asked about the impact of having relatively senior people at IMTs (like him, Prof Steele and Dr Armstrong) and accepted that it could it both show to the members of the IMT that senior management take the matter seriously and are interested, but also might cause some people to be a bit more reticent or nervous because senior people are around. He felt it might depend upon the personality of the senior manager and how well they know people around the table.[236]

354. Discussion of the meeting held in the absence of Dr Inkster on 20 August 2019,[237] about whether to change the chair of the IMT she was chairing, clearly caused Dr Deighan considerable discomfort. When it was put to him that it was not proper for a group of doctors and nurses to hold a meeting to discuss the then lead ICD's conduct of IMTs as chair, without giving her notice, and in her absence, he initially suggested that this question would be better directed at the chair of the meeting. When pressed about his own responsibility,he responded that he did not recall the email and did not recall the context in which the meeting was called or any of the details contained in the minute.[238] This seemed a rather unsatisfactory response from a senior doctor. It was later put to him that it must be quite difficult for someone three weeks into the job of Deputy Medical Director- Corporate to put their hand up and say, "We shouldn't do this," and he accepted that was a reasonable defence from his point of view.[239]

355. Dr Deighan had originally been included on the witness list because of the

[234] Bundle 1, Document 73, page 325.
[235] Dr Chris Deighan, Transcript, Page 88.
[236] Dr Chris Deighan, Transcript, pages 92-93.
[237] Dr Chris Deighan, Transcript, page 107-112.
[238] Dr Chris Deighan, Transcript, page 107-114.
[239] Dr Chris Deighan, Transcript, pages 151-152.

submission by NHS GGC in the December 2012 positioning paper[240] that the Report of Dr Deighan for Dr Armstrong in May 2021[241] would support the submissions made by NHS GGC that Dr Inkster had falsely suggested that "a clinician had been instructed to lie to the father of a patient" as Dr Deighan had "fully investigated" this issue. The balance of the time with Dr Deighan was taken up with his report.

356. Dr Deighan explained that at the start of October 2019, Dr Armstrong emailed him regarding three issues that had been raised by Dr Inkster in her letter of resignation. She asked him to take forward a review of the governance around the production of a Serious Clinical Incident (SCI Report) relating to Cryptococcus neoformans and the death of two patients, a duty of candour issue raised by Professor Cuddihy and Dr Inkster's concerns about specific actions not being followed, and the link between the Water Technical Group and the IMT and, really, the governance of decision making within the broader IMT and Water Technical Group. He explained that due to the pandemic it had taken him more than eighteen months to finish the review.[242] He was clear that the review or report was not part of any formal process.[243]

357. Dr Deighan was challenged on why he had not declared his involvement in the decision to remove Dr Inkster as IMT Chair, a decision which had precipitated her resignation and the writing of the letter he was being asked to review. He initially explained that he either felt that it had not been important, or it had completely slipped his mind, but that he now completely understood how it could be perceived that he might not be impartial in that context.[244]

358. In respect of the part of the report that related to the SCI incident, Dr Deighan relied upon Mr Andy Crawford, then Head of Clinical Governance, to review the governance issues around the changes that Dr Inkster had complained were made. Dr Deighan had also not actually seen the emails sent at the time in which Dr Inkster had complained about the changes being made, until they were included on his document list for the hearing.[245] He explained that he had also presumed that Dr

[240] Bundle 25, Document 62, page 1272.
[241] Bundle 27, Volume 6, Document 6, page 91.
[242] Dr Chris Deighan, Transcript, pages 121-123.
[243] Dr Chris Deighan, Transcript, page 125.
[244] Dr Chris Deighan, Transcript, page 126-127.
[245] Dr Chris Deighan, Transcript, page 127-129.

Inkster was now content with matters as she did not respond to an email he had sent in 2020.

359. Dr Deighan explained that he did not actually speak to Dr Inkster, but asked Dr Green to interview her was on 6 January 2020.[246] He also had not actually seen Dr Inkster's resignation letter to Dr Armstrong.[247]

360. In respect of the duty of candour incident, he did not speak to Professor Cuddihy, Dr Inkster, or Jamie Redfern and relied on Ms Green's report to him of her interview of Dr Inkster. It appears he had not reviewed all Professor Cuddihy's correspondence with the board where he describes repeatedly what happened.[248] He eventually, as he put it, "came down on the side that this was cock-up rather than conspiracy, if you don't mind me using that kind of phrase. That this was just poor communication, delayed communication, and I think the emphasis is on the delayed communication." He was unable to explain how and where this poor communication happened.[249]

361. It was put directly to Dr Deighan that the part of Dr Green's summary of her interview with Dr Inkster[250] where it says on the second page[251] that she was told, second line: "...by the Lead Nurse from Infection Control that she was not to tell [X] this detail" should have caused him to speak to the lead nurse from Infection Control. He explained that he had not. He accepted that it was a legitimate criticism, that it seems strange that you would not try and find out what the lead nurse for Infection Control thought.[252] Given that Dr Inkster's evidence is that no nurse was involved in the 'duty of candour incident' with Professor Cuddihy and Mr Redfern, and that she cannot understand why Dr Deighan's review reports that she said this, would seem a significant issue for Dr Deighan's review.

362. In respect of the governance of decision-making within the broader IMT and Water Technical Group, he had spoken to the Chair of the WTG and did not speak to other members. He did not see the Minute of the debrief from the 'Water Incident' IMT 15

[246] Dr Chris Deighan, Witness Statement, page 102.
[247] Dr Chris Deighan, Transcript, page 137.
[248] Dr Chris Deighan, Transcript, pages 140-143.
[249] Dr Chris Deighan, Transcript, pages 143-146.
[250] Bundle 27, Volume 6. page 102.
[251] Bundle 27, Volume 6 at page 103.
[252] Dr Chris Deighan, Transcript, pages 158-161.

May 2018.[253]

363. It is submitted that this report or review offers little assistance. It is difficult to describe this as a full investigation. Dr Deighan clearly had access to less information than the Inquiry now does and did little beyond reviewing those papers he had. The Inquiry should reach its own conclusions on those issues within the scope of his review, that engage its remit and terms of reference.

364. Dr Deighan was a rather unhelpful witness. Whilst he clearly keenly felt the difficulty of some of the questions he was being asked, his lack of memory of important issues around the 20 August 2019 meeting meant he frequently responded that he could not remember. Given this was clearly a significant event, these responses leave the distinct conclusion that he was not really trying to assist the Inquiry and therefore little weight should be placed on his evidence.

Dr Alan Mathers – 24 September 2023

365. Dr Alan Mathers gave evidence on 24th September 2024. He is a consultant obstetrician and gynaecologist. He became the Chief of Medicine for Women and Children when the RHC opened on the QEUH campus.

366. While Dr Mathers gave evidence on a number of topics of interest to the Inquiry, he was not a primary actor in any of them. He was not an expert in water or ventilation and decried any specialised knowledge in infection prevention and control. His perspective may thus turn out to have a particular value.

367. He explained that he would attend IMT's to understand what was happening. It was better than reading cold minutes. He spoke particularly highly of Professor Gibson.

368. By early 2019 he was no longer surprised about going to a meeting about yet another new organism. He thought anyone who took the view that' nothing was happening' in 2015 to 2019 at the QEUH would have to be breathtakingly naïve.

369. He offered a particularly useful insight into how to judge patient communications. They should not be judged from the perspective of the drafter but from the

[253] Bundle 14, Volume 2, page 211.

perspective of the recipient. They could decide whether they were effective.

370. Much of Dr Mathers' evidence was not given as a specialist, but his view as a semi-detached participant may be of value to the Inquiry.

Dr Jairam Sastry - Statement only, not giving evidence.

371. Dr Jairam Sastry is a senior clinician with NHS GGC.

372. The evidence provided to the Inquiry from Dr Sastry was focused on Cryptococcal infections and in particular the Cryptococcus case that he treated in June 2020. He narrated what steps were taken, tests taken, and treatment provided to the patient.

373. The evidence narrated in his witness statement explained that the patient had clinical signs of infection and tested positive for Cryptococcus both via antigen tests and blood tests (in both the local laboratory and a specialised laboratory in Bristol). He added that the patient was treated with intravenous antifungal treatment and the symptoms resolved completely. He was unaware of three negative lateral flow tests Professor Leanord referred to at an IMT on 2 July 2020. He did concede that air samples on numerous occasions in Ward 6A did not show Cryptococcal spores. Ultimately, in his view, he considered the infection to be new rather than latent but conceded that he did not have sufficient expertise to comment on false positive testing or the source of the infection.

374. He also provided evidence that Ward 6A was not suitable for immunocompromised patients due to lack of positive pressure and source HEPA filters.

3.6 Other NHS GGC Staff

Sandra Bustillo – 23 October 2024

375. Sandra Bustillo gave evidence on 23rd October 2024. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10), and also her supplementary statement which is in the same witness bundle. She was in charge of NHS GGC Communications and was the witness proposed by NHS GGC following criticism of communications in Glasgow I and II.

376. She dealt with a number of the issues which had been raised, including the use of Core Briefs, the time it took to deal with information releases and about whether there were differences between external press releases and information given to patients.

377. She accepted at points that mistakes had been made and acknowledged that there had been criticism of communications from the Oversight Board.

378. She argued that communication on the discovery of the DMA Canyon Report should have been dealt with through the IMT. She also discussed what was said about works to Ward 2A.

379. She also dealt with the controversial topic of social listening.

380. Perhaps understandably Ms Bustillo was clearly keen to present matters in the best light for NHS GGC. Unfortunately, that led her to evince reluctance to answer direct questions, and at time provide explanations which were challenging to accept. At least some of her evidence may have to be treated with some caution accordingly.

Shiona Frew - Statement only, not giving evidence

381. Shiona Frew was the Project Administrator for the QEUH/RHC project until February 2016 when she transferred to the Capital Planning Department and was allocated the post of Quality Control Officer. However, she continued to provide administrative support to the Estates Department and Capital Planning for the remainder of the GGC's contract with Brookfield/Multiplex. In this administrative role, she continued as Project Administrator to retrieve information from a variety of systems such as Aconex, ZUTEC, and A-Site as directed.

382. She provided evidence to the Inquiry that she assisted with tours of the new QEUH/RHC during the construction phase and provided a site induction to site visitors. She also noted her involvement in administering the dedicated email account for Risk and Method Statement (RAMS) approval on behalf of Ian Powrie.

383. Ms Frew provided evidence explaining the Early Warning Tracker (EW Tracker) which captured items that may impact on the contract price or programme. The EW Tracker was used on a web-based third-party system called "Spyro". She also

commented on the Zutec system which in her view could be clunky to use and slow. She also understood the Zutec system was not fully populated at handover.

Jennifer Haynes – 25 October 2024

384. Jennifer Haynes gave evidence on 25th October 2024. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10). She was currently employed at the Golden Jubilee Hospital, Clydebank, but had been the Board's Complaints Manager which had 'transitioned' into the title of Corporate Services Manager.

385. She explained the NHS GGC Whistleblowing prior to 2021 when a national policy emerged. She did not believe that Whistleblowers were 'unprofessional', quite the opposite. Dr Redding's Whistleblow had been her first. She would tend to draft the report and only rarely would the individual leading the process make changes.

386. Notwithstanding the appointment of Professor White, she had been nominated by NHS GGC as the point of contact for families.

387. Asked about the perception that the complaints system was being used to shut down enquiries by families the said that was 'absolutely not the case'.

388. While Ms Haynes' evidence was in relatively short compass, there is no reason not to accept it (with the possible exception of her reasoning for thinking patients wanting answers would get them through a complaints process they did not want).

3.7 Patients & Families

Beth Armstrong & Sandie Armstrong – 22 & 23 October 2024

389. Beth and Sandie Armstrong separately gave evidence to the Inquiry on 22 and 23 October 2024, respectively. They adopted their statement which is incorporated into the Witness Bundle for the week commencing 28 October 2024 (vol 11). They gave their evidence on circumstances arising out of the death of their mother, Gail Armstrong, on 7 January 2019. Gail Armstrong had been diagnosed with Lymphoma. She had initially been treated at the Victoria Infirmary as an outpatient but had taken ill when in Brighton visiting Sandie Armstrong. Gail Armstrong was then transferred

from Brighton to the QEUH, where she was admitted into a specialist room in Ward 4C on arrival.

390. Beth and Sandie Armstrong noted that the first significant issue which their mother faced, outwith her cancer treatment, was when she tested positive for Cryptococcus Neoformans. Mrs Armstrong was given a course of anti-fungal medication, and they were told that the infection seemed to have cleared.

391. However, their mother's health then deteriorated rapidly. They explained that their mother became very ill and was place on Intravenous anti-fungals. Mrs Armstrong became disorientated, could not speak properly, and that she lost the use of her legs. She eventually died on 7 January 2019. Beth and Sandie Armstrong were also critical of the lack of a post-mortem examination following the death of their mother.

Maureen Dynes – 22 October 2024

392. Maureen Dynes gave evidence to the Inquiry on 22 October 2024. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10). Mrs Dynes gave her evidence arising out of circumstances in which she lost her late husband, Anthony Dynes, in 2021. Mr Dynes had been in the QEUH following a diagnosis of non-Hodgkin's lymphoma and had been admitted for a stem-cell transplant.

393. Mrs Dynes explained that Mr Dynes had been unwell during admission and had contracted a cough which the doctors could not explain. She recalled hearing reference being made by medical staff to Aspergillus, which she had not heard of previously. She further explained that Mr Dynes was eventually discharged to Hairmyres Hospital in East Kilbride as an outpatient. Mrs Dynes noted that Aspergillus was again mentioned by medical staff at Hairmyres Hospital.

394. Mrs Dynes explained that her husband's stem-cell transplant failed, and he was then admitted to the QEUH for CAR T-Cell therapy. Mrs Dynes noted that she was subsequently told that the CAR T-Cell therapy had also failed. She was critical of the lack of a post-mortem examination to investigate the cause of Mr Dynes' death.

Lousie Slorance – 22 October 2024

395. Louise Slorance gave evidence to the Inquiry on 22 October 2024. She adopted her Witness Statement and her Supplementary Statement both of which are incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10). Mrs Slorance gave her evidence arising out of the circumstances in which she lost her late husband, Andrew Slorance. Mr Slorance was a civil servant with the Scottish Government who was head of communications for the Scottish Government's emergency response unit. He had been diagnosed with Mantle Cell Lymphoma.

396. Mrs Slorance gave evidence that her husband had been referred to the QEUH in 2020 for a stem cell transplant. Mrs Slorance had concerns at the time about the transplant taking place during the Covid pandemic.

397. Whilst Mr Slorance had a successful stem cell transplant, he died in hospital in November 2020 after contracting Covid whilst in hospital. Mrs Slorance noted that, after his death, she had learned for the first time that Mr Slorance had also been treated for Aspergillus. She noted that if an autopsy had been carried out, it would have been possible to ascertain if Aspergillus had been part of the cause of death.

HIS March 2022 Report

398. Healthcare Improvement Scotland ('HIS') undertook an in-person inspection at the QEUH in March 2022. They stated that they had been instructed to carry out a review of infection prevention and control measures at the QEUH by the Scottish Government.

399. Their report referred to the national guidance for ventilation which recommends six ACH, but states that the ventilation system throughout the hospital has three ACH. Neither the report nor the action plan contains a requirement or recommendation to change the ventilation to meet national guidance.

November 2022 Final Report

400. The final report was published in November 2022. It recorded that the inspectors had not identified any significant concerns with water management or ventilation. Despite this overall finding, the report contained a list of concerns. Particularly in respect of:

- Governance structures and reporting in relation to the built environment

- Black markings on window seals
- Build up dust of ventilation grills
- Outstanding maintenance in a high-risk patient area
- Flushing of water outlets
- Cleaning of clinical wash hand basins since 2019 (no recommendation or requirement)
- Risk assessments for water safety had not been carried out for years (no recommendation or requirement)
- Governance reporting structure policy not being followed by BICC for water management
- Ineffective electronic system to report repairs

401. Mrs Slorance also noted that, whilst some general recommendations were made, there was no assessment of the risk of Aspergillus to patients housed in the QEUH campus, which she said was the report's objective.

402. Mrs Slorance had many concerns about the report by HIS. What period, data, and comparable data was used? Had they compared the QEUH with the Beatson, and had HIS considered clinical diagnosis as well as blood culture positive results? She also queried the level of expertise within HIS in respect of ventilation and water systems, and whether they had access to historical data from when the QEUH opened. Mrs Slorance questioned if the inspectors saw environmental sampling results for water and air, and whether they sought any sort of expert opinion to allow them to reach the conclusion that the hospital was safe.

403. Had HIS received assurances from NHS GGC regarding the room specifications in respect of the updated patient placement policy? Further, what was the basis on which the inspectors satisfied themselves that 3 air changes per hour was satisfactory and safe?

404. Mrs Slorance had been invited to attend a meeting with NHS Lothian and NHS GGC

to discuss the findings of the report. Several dates were agreed and then cancelled on the basis that they would not attend any meeting with her solicitors or Jackie Ballie, MSP.

405. She has not had any meeting with Scottish Government, NHS GGC or NHS Lothian to discuss Mr Slorance's care or case reviews.

406. Mrs Slorance considered that the report by HIS reads like a reassurance document, with the news release focused on a positive message and remaining silent on the original issue it was instructed to investigate.

3.8 Scottish Government

Professor Craig White – 24 October 2024

407. Professor White gave evidence on 24th October 2024. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 22 October 2024 (vol 10). He was a psychologist by profession. He had held a variety of roles, including some related to palliative care. He was currently Associate Director, Healthcare Quality and Improvement, in the Directorate of the Chief Operating Officer of NHS Scotland. He also did sessional work as a clinical psychologist and acted as a skilled witness.

408. He was initially involved in 2019 to focus on ensuring the voices of the families affected by events at the QEUH well held and that they got information as a priority.[254] He then chaired the Communications and Engagement Subgroup of the Oversight Board. His role was to act as a single point of contact for patients and families, to ensure they got the information they wanted and to focus on making communications 'patient centred'.

409. Having been involved in the legislative process which produced the statutory organisational duty of candour, he was also involved in discussions with NHS GGC to review and in due course substantially amend their policy on the statutory duty.

410. Much of his work inevitably found its way into the section on communications in the

[254] Bundle 27, vol12, page 12.

Interim Report of the Oversight Board.

411. It was clear that Professor White had prepared very carefully before his appearance at the Inquiry. He was obviously keen to assist. There is no reason not to accept his evidence.

3.9 The Case Notes Review

412. On 28 January 2020, the then Cabinet Secretary for Health and Sport announced that she had commissioned a Case Note Review ("CNR"), to be undertaken by a panel of independent experts. The CNR was instructed to determine how many children and young people within the Schiehallion cohort of patients were affected by Gram-negative environmental (GNE) bacteria from the time the paediatric haematology oncology service moved into the new RHC in 2015, to the end of 2019, to decide, as far as it is possible so to do, whether these infections were linked to the hospital environment; and to characterise the impact of the infections on the care and outcome of the patients concerned.

413. The Expert Panel of the Case Note Review eventually comprised: Michael Stevens, now Emeritus Professor of Paediatric Oncology, University of Bristol; Gaynor Evans, formerly Clinical Lead for the Gram-negative Blood stream Infection Programme, NHS Improvement England and Mark Wilcox, Professor of Medical Microbiology, University of Leeds and Leeds Teaching Hospitals.

414. In February 2021 the CNR Expert Panel produced a draft Overview Report and shared that with NHS GGC[255] and after receiving comments from NHS GGC[256] published their Overview Report in March 2021[257]. It should be noted that whilst the Overview Report is a summary of their findings in respect of whether infections were linked to the hospital environment in respect of 84 patients who, between them, had

[255] Bundle 25, Document 2, page 45
[256] Specifically: GGC Comments on CNR Draft – Bundle 27, Vol 6, Document 25, page 245.
Appendix 2, Data System Clarification – Bundle 27, Vol 6, Document 26, page 294.
Appendix 3, IMT Summary – Bundle 27, Vol 6, Document 27, page 303.
Appendix 4 -Bundle 27, Vol 6, Document 28, page 306.
Public Health Commentary – Bundle 27, Vol 6, Document 29, page 310.
Jane Grant's letter 1 March 2021 – Bundle 25, Document 3, page 151.
Jane Grant's letter 4 March 2021 – Bundle 25, Document 4, page 155.
[257] Bundle 6, Document 38, page 975.

118 episodes of infection, the individual assessments for each patient were not published or provided to NHS GGC. The Inquiry does not hold these individual assessments, and they have not been considered by the Inquiry Team or placed in hearing bundles.

415. The individual reports were shared only with the respective families and it was left by the Scottish Government to the families and patients to decide if they wanted to share the reports with their clinicians or any other party.[258] The Inquiry understands that the individual assessments were sent from the CNR team's Objective Connect workspace to the Scottish Government between July 2021 and April 2022 and are held there in a restricted access electronic record within the Scottish Government ERDM system. Control of who can see each individual assessment is therefore held by the relevant patients and families.

416. The overall conclusion of the CNR Expert Panel as set out in the Overview Report was that whilst eight infection episodes were unrelated to the hospital environment, and in one case they were unable to determine the relationship, of the rest 76 (70%) could possibly relate to the hospital environment and 33 (30%) probably did relate to the hospital environment. The CNR Expert panel were unable to identify evidence that unequivocally provided a definite relationship between any infection episode and the environment.

417. In addition to those conclusions on infection link, the CNR Expert Panel looked at how NHS GGC had itself assessed, responded and reported the situation at the time, and also looked for evidence that common themes were identified and pursued during its investigations. The conclusions that are relevant to the Inquiry are as follows:

- They critiqued the quality and adequacy of the information provided to them and formed an assessment of the availability and integration of relevant data within existing NHS GGC systems.
- They were critical that, despite over five years of experience in investigating outbreaks of GNE bacteraemia and concerns about the hospital environment,

[258] CNR Overview Report, Bundle 6, Document 38, page 975 at Section 7.3.

NHS GGC had not, by February 2021, established an electronic database of microbiological typing results and consequently had no ability to easily relate potentially linked bacterial isolates.

- They examined how possible outbreaks of infection were investigated and managed within NHS GGC. They were particularly concerned that, despite the continuing existence of concern about GNE bacteraemia over several years, there was less evolution in the approach to the recognition of an outbreak than they might have expected. They believed there was too much emphasis on standard definitions, inappropriate reassurance from the use of SPC methodology and even an unwillingness to accept that there was a problem.

- They concluded that communication between microbiologists, ICDs and the rest of IPCT may not have been as robust or cohesive as it should be. It seemed that the teams appeared to work independently and that communication between these staff groups was sometimes not as good as would be required for effective IPC.

- They recommended a systematic and structured approach to the investigation of all future bacteraemia using Root Cause Analysis methodology. They understood that RCA was introduced at the end of 2019, but they could not see why, given the experience of repeated GNE bacteraemia over five years, this was not introduced earlier.

- They had a concern that NHS GGC could be an organisation that promotes a focus on process (i.e. that a report was received) rather than ensuring clarity about the cause or consequences of a situation.

What use can the Inquiry make of the conclusions of the CNR?

418. The issue arises of what use the Inquiry can make of the Case Notes Review. Individually the three members of the CNR Expert Panel clearly meet the requirements to be expert witnesses as summarised by the Supreme Court in *Kennedy v Cordia* (Services) LLP 2016 SC (UKSC) 59 from para. [48], in that their evidence would clearly assist the Chair in his task, they have the necessary knowledge and experience so to do, they are independent and impartial in their

presentation and assessment of the evidence placed before them, and there is, in the case of each member of the CNR Expert Panel within their field, a reliable body of experience to underpin their evidence. Together they are clearly an appropriate expert panel to reach conclusions on the issues within their remit and covered within their Overview Report.

419. The difficulty is that expert evidence cannot be a mere assertion or 'bare ipse dixit' as Lord President (Cooper) explained in *Davie v Magistrates of Edinburgh* 1953 SC 34 at page 40 and, in the case of the CNR Expert Panel, the detail of why they consider that 30% of the infections probably have a connection to the hospital environment is contained within those 84 individual assessments to which the Inquiry does not have access, and which in any event cannot easily be discussed in public without exposing the personal medical information of those children to the public eye.

420. It is important however to recognise that the Chair is not, in the Inquiry, presiding over civil proceedings in a court. Section 17 of the 2005 Act provides that the evidence and procedure of the Inquiry is such as he may direct. However, that discretion is not unfettered. Section 17(3) provides that the Chair is obliged to act with fairness and that he must "have regard also to the need to avoid unnecessary cost (whether to public funds or to witnesses or others)". Fairness will very often require that a person who may be adversely affected by a decision should have an opportunity to make representations on their own behalf with a view to producing a favourable result.

421. The requirement to act fairly would at first examination militate against giving weight to the conclusions of the CNR Expert panel on infection link where the Chair and Core Participants cannot see and examine all the detail of their reasoning. However, other factors suggest that evidence of the conclusions of the CNR Expert Panel should nonetheless be taken into account. Firstly, the evidence of the CNR Expert Panel in Glasgow III has enabled the Inquiry to understand the methodology of the CNR with greater clarity than can be found within the Overview Report itself. Secondly, a significant period of time has passed, and any unfairness to NHS GGC caused by using the CNR Expert Panel's reasoning on infection link in the Inquiry can surely be countered by the response that NHS GGC have singularly failed to

carry out their own parallel case notes review of the same cases to which it could be compared. Thirdly, the CNR must have been an expensive exercise to carry out, and it would be a great waste of public funds to ignore it completely.

422. It is submitted that the Chair should take the following approach to the evidence of the CNR Expert Panel.

423. Full account should be taken of the expert opinions and assessments of the CNR Expert Panel expressed collectitvely in the Overview Report and individually in their statements and oral evidence on all matters, except their core conclusions on infection link. A large amount of useful material was generated by the CNR from an intensive and detailed analysis of a wide range of materials that can assist the Chair in reaching his conclusions.

424. The Chair should not use the CNR Expert Panel's core conclusions on infection link as an initial factor in reaching an initial conclusion on Key Question 4. He should first reach his own reasoned conclusion on that question, using all the other evidence before him, and then, once he has reached a provisional conclusion, compare his answer and his reasons for it with those of the CNR Expert Panel as, in essence, a cross check as to his conclusions reached without taking account of those core conclusions on infection link.

Expert opinion of the CNR Expert Panel to be used in Glasgow III

425. The balance of this section of the submissions sets out the key material that comes from the CNR Expert Panel, expressed in the Overview Report and in their statements and oral evidence, which should be (a) used in Glasgow III and (b) raises issues that require to be considered in Glasgow IV.

426. The following parts of the Overview Report are opinion evidence of experts and should be used by the Chair to reach conclusions on both the substance of Key Questions 1 to 4 and to assist in reaching conclusions on matter of fact that are in dispute within the evidence:

Paragraph or source	Substance	Relevance
4.3.5	"while it is not possible to state this with certainty, the frequency of [the Gram-Negative Environmental bacteraemia in the CNR cohort] appears to be higher than would be expected" and that "the cluster patterns identified ... occurring by chance is small"	Epidemiology Analysis Key Question 4
5.2	The retrospective review of a large database of logs and documents provided by NHS GGC that offered data related to the maintenance of the clinical environment with a particular focus on Wards 2A and 2B and 6A and 4B	Key Question 1, 2 and 3
5.4	"Overall, we were unable to conclude that the organisation had a systematic approach to environmental sampling in the context of either a specific, unusual infection or an outbreak of a more commonly seen infection."	Key Question 1
5.5.2	"There did not appear to be a systematic water sampling process in place, or a consistent water system related response to clusters of infections caused by (often unusual/uncommon) GNE bacteria."	Key Question 1 and issues of credibility and reliability around certain IPC and Estates witnesses
6 (Whole Chapter)	The Impact of Infection on Patient Outcomes (Summarised at 10.3)	TOR 8
8.2.2.1	"We perceive that part of the problem confronting NHS GGC was a relatively small number (small in relation to the overall IPC workload) of patients presented with unusual infections and our concern is that opportunities to instigate early investigation may have been missed because of too great an emphasis on 'standard' definitions for an outbreak."	Key Question 4 and issues of credibility and reliability around certain IPC witnesses
8.2.2.4	The CNR Expert Panel's concern that NHS GGC could be an organisation that promotes a focus on process (i.e. that a report was received) rather than ensuring clarity about the cause or consequences of a situation	Key Question 4 and issues of credibility and reliability around certain IPC witnesses a
8.2.3, Ms Evans and Professor Stevens	Discussion of aspects of the Review of NHS GGC Paediatric Haemato-oncology data (HPS October 2019).	Epidemiology Analysis
8.3.1	"Notably, however, the Telepath system did not systematically offer the basis for recording the results of typing bacterial isolates (mainly derived from reports provided by the Public Health England reference laboratory at Colindale, London but some data also from the Scottish Microbiology Reference	TOR 9 and in particular errors in the recording of Mycobacterium

Paragraph or source	Substance	Relevance
	Laboratories), either by annotating the original specimen results page or within a patient's results at a later date (when the typing information was received)."	chelonae in the 2018 case.
8.3.1, Professor Wilcox and Professor Stevens	The discussion of WGS and its utility in proving or demonstrating the absence of an infection link. Opinion evidence on the number microbiological sample picks that need to be taken to be sufficient to say you have a representative sample and the reliability of WGS to prove the absence of a link	Key Question 4
8.5	Issues around patient location recording.	Epidemiology Analysis
Professor Wilcox	Number of Stenotrophomonas cases in 2018 is not a coincidence.	Key Question 4
Professor Wilcox and Professor Stevens	That it is unlikely there was Potential role for Meropenem resistance in the number of Stenotrophomonas infections.	Key Question 4
Professor Stevens	Evidence about suitability of selected comparator units in Mr Mookerjee's report and HPS November 2019 Review.	Epidemiology Analysis

Expert opinion of the CNR Expert Panel relevant to Glasgow IV

427. The following parts of the Overview Report are opinion evidence of experts and should be taken on board by the Inquiry Team as work proceeds towards Glasgow IV:

Paragraph	Substance	Relevance
5.2	"… that the data systems used within NHS GGC to record facilities maintenance activity are better designed to manage workload than to provide information of potential relevance in the management of clinical situations, particularly IPC events."	TOR 9
5.3.4	"The documentation we have reviewed does not assure us there was a robust enough culture of continuous improvement for IPC within the organisation during the period of our Review or that the Enhanced Supervision process for IPC had sustained impact. We were unable to determine a strong governance and assurance process for IPC and formed a view that the focus of the organisation appeared to be	TOR 9

Paragraph	Substance	Relevance
	directed more towards the task of audit than to the achievement of quality improvement outcomes."	
8.2 (Whole Section)	Managing, investigating and reporting infection outbreaks	TOR 9
8.4.2	ICNet Alerts: "We found little evidence, even as late as summer 2019, that the GGC alert list had been modified in light of the evolving experience with bacteraemia caused by Gram-negative environmental infections."	TOR 9
10.4	Recommendations	TOR 9 and potential Inquiry recommendations

Summary of the conclusion of the CNR Expert Panel on Infection Link

428. The CNR carried out 85 separate case notes reviews, where they considered whether each of the infections in their cohort were linked to the hospital environment. The list of patients and infections was the same as (with one additional case added) a that developed by HPS in their October/November 2019 review. NHS GGC clearly had input into those reviews and have relied on what that review says. It is not now rational to re-open whether a particular case should have been included in the CNR and thus ask the question of whether the CNR 'looked at the right infections'; not least because the identification of those patients and cases for inclusion was a decision of the Scottish Government in January 2020 that could have been challenged at that time and was not.

429. In order for the CNR Expert panel to reach these separate conclusions for each patient and infection, their support teams reviewed the medical notes for each child, blood test results, water testing results, IMT and PAG minutes, such maintenance and cleaning records as they could find and the 'tableau timeline' to produce a data synthesis for infection using the template reproduced in Appendix D to the Overview Report. The PPT was not used to inform which patient should be included in the CNR, but as a checklist to identify adverse events that should be included in each data synthesis.

430. This systematic process of data collection resulted in a set of data that the three members of the CNR Expert Panel considered (and reconsidered) in order to reach

an assessment of the likelihood that infection episodes were linked to the hospital environment. They initially created eight categories and placed 33 of the 118 infection episodes into the “probable” or “strong probable” categories, as for those infections it was more likely than not that those infection episodes were linked to the hospital environment. That is 28.8% of the cases. As explained by Professor Stevens, the definition of the ‘possible’ category as being one where for each infection episode they could find no evidence of alternative causal routes (like gut translocation), but were they considered an environmental link possible, is also of significance. These 118 separate conclusions were then aggregated into Chapter 5.6 of their Overview Report.

431. As discussed above is not possible for the Chair, Core Participants or the public to understand in detail why the individual conclusions were reached in respect of each infection episode, but the Chair can be certain that those assessments by the CNR Expert Panel were individually and collectively rigorous and systematic, and were carried out by experts using all available information; including access to medical notes to which the Inquiry does not have access.

3.10 Evidence of the CNR Expert Panel

Professor Mike Stevens – 30 October 2024

432. Professor Mike Steven is presently retired. He adopted his statement which is incorporated into the Witness Bundle for the week commencing 29 October 2024 (vol 11), and also his supplementary statement which is incorporated into the Witness Bundle for the week commencing 04 November 2024 (vol 12). He holds an emeritus chair at the University of Bristol as a Professor of Paediatric Oncology. He was the chair of the CNR and brought significant experience to bear in that role.

433. He adopted his principal statement[259] and his supplementary statement[260]. He also adopted the Overview Report of the CNR[261] as part of his evidence.

434. Professor Stevens first became aware of the proposed CNR when he received a call

[259] Witness Bundle, Volume 11, Document 4, page 105.
[260] Witness Bundle, Volume 12, Document 2, page 6.
[261] Bundle 6, Document 38, page 975.

from the Chief Medical Officer, Catherine Calderwood. The call was 'out of blue' and was to discuss whether he was interested in the role and providing brief background to the concerns.[262]

435. The initial call did not cover any structural methodology. It hinted at a term of reference, but there was no granularity in the conversation. The next step was a conference call with Fiona McQueen (the Chief Nursing Officer). In January 2020, Professor Stevens paid a couple of visits to Edinburgh and Glasgow to shape the engagement and his thoughts. He also met with the people involved.[263]

436. He first met Professor Wilcox and Ms Evans at the first meeting of the panel on 21 February 2020 at a hotel in Edinburgh. The meeting was their only in person meeting, as all subsequent meetings were via Teams due to the pandemic. Prior to their involvement, Professor Stevens had no contact with them. Their names were given to him as people who had agreed to be on the panel. They met in a round-table format and then started to discuss how to undertake the task.[264]

437. The task for the initial meeting was to agree the data set which been presented to the group, but they were asked to endorse it. The meeting was also attended by representatives of HPS, Scottish Government, Pat O'Connor who led the PTT team, Lesley Shepherd (infection advisor to the Scottish Government), Phil Raines, and Marion Bain, who Professor Stevens understood was part of the Oversight Board and had been asked to take an interim role in overseeing IPC and NHS GGC.[265]

438. NHS GGC were not represented at the first meeting. There was a concern that there was no representative of NHS GGC. Professor Stevens met with Kevin Hill and Jamie Redfern, managers of the RHC, in January 2020. He also met with Jennifer Rodgers, senior nurse for haematology and oncology, Professor Leanord, Pamela Joannides and Marion Bain. These were essentially briefing meetings. On his visit he saw Wards 2A and 2B. He did not meet anyone at board level. He explained he was there to ask questions and to get a feel for the issues.[266] Professor Stevens

[262] Professor Mike Stevens, Transcript, page 3.
[263] Professor Mike Stevens, Transcript, page 3 and 4.
[264] Professor Mike Stevens, Transcript, page 5.
[265] Professor Mike Stevens, Transcript, page 4 to 6.
[266] Professor Mike Stevens, Transcript, page 7 and 8.

remembered meeting the haemato-oncology consultants on that visit to the RHC. He felt that they were inevitably suspicious of him. He recognised that they had been having a difficult time. It was put to Professor Stevens that the Inquiry has heard evidence that in September 2019 several consultants had written to senior managers and suggested an external review. He was not aware of that. None of these meetings dealt with the nature of the methodology or the remit or terms of reference of the CNR. He was there to ask questions to understand the challenges from their perspective, as well as their IPC process.[267]

The selection of patients and infections for inclusion in the review

439. Professor Stevens was taken to the draft HPS Review Report of October 2019[268]. He had seen this before. It did cause him confusion from the outset. He stated that it was initially referred to as a report in November 2019. He only recently became aware that there were two versions[269].

440. Professor Stevens understood that HPS had defined the cohort the CNR were to investigate. It was his belief that this was the right cohort. There was a clear concern about the water system at QEUH/RHC. So, the CNR felt that to explore the potential for environmental transmission, they needed to look at a group of bacteria that liked wet environments, which is gram-negative environmental bacteria, but also, enteric bacteria, bacteria routinely found in the gut, like Klebsiella.[270]

441. Professor Stevens explained that there is no perfect method to determine if an infection is enteric in origin. One looks for some common complications of patients receiving chemotherapy, such as damage to mucosa, abdominal distension, radiological change. There are a constellation of clinical signs and symptoms one is looking for to try to ascertain from the case notes when making that judgment.[271]

442. As it is referred to at section 3.2 of the Overview Report, Professor Stevens was taken to the CNR Epidemiology and Clinical Outcomes Protocol.[272] He explained

[267] Professor Mike Stevens, Transcript, page 8 and 9.
[268] See Bundle 7, Doc 5, page 214.
[269] See Bundle 7, page 250 for the next version of the HPS report.
[270] Professor Mike Stevens, Transcript, page 13 and 14.
[271] Professor Stevens, Transcript, page 14 and 15.
[272] See Bundle 27, Volume 6, Document 24.

that he probably saw this in January or February 2020. He did not feel that the large appendix was informative. It could be described as a shopping list of the data one wanted and a plan of how to deal with it. Professor Stevens had also written his own list, and he worked with HPS to bring the two together.[273]

443. He explained that most of the data in the protocol is from NHS GGC. He did not understand HPS to have a role in extracting some of the information that they had identified. They eventually teased out who was to provide what. He was not aware if the protocol had been shown to NHS GGC.[274]

Privacy of Data and Results

444. The background and reasons for the decision to give patients and families control of the results of the CNR was discussed with the Professor. He explained that about one-quarter of families chose to share that patient reports by the CNR with their clinicians. The CNR Expert Panel produced a final report,[275] and wrote to the Cabinet Secretary, and summarised feedback from the families after meeting with them. They appended a redacted letter to the families.[276]

445. It was put to Professor Stevens that to truly understand the reasons for the conclusions of the CNR, one must read all 85 individual reports which were produced, or at least the data summaries, if not the letters to the families. Professor Stevens said this was true. To understand the reasons, one would need to look at the data synthesis output reports for each patient and try to follow the reasoning by which the CNR allocated different levels of potential link between infections and the hospital environment.[277]

The CNR Overview Report[278]

446. Professor Stevens accepted that the Overview Report does not fully narrate the terms of reference but summarises them. He explained that there was a document

[273] Professor Mike Stevens, Transcript, page 15 to 17.
[274] Professor Mike Stevens, Transcript, page 17 and 18.
[275] The Overview Report, Bundle 6, page 999.
[276] Professor Mike Stevens, Transcript, page 19 and 20.
[277] Professor Mike Stevens, Transcript, page 21.
[278] See Bundle 6, page 999.

that sets out the terms of reference, which were reproduced. These are the terms of reference; the CNR Expert Panel did not tamper with them.[279]

447. Professor Stevens described the CNR as 85 separate root cause analyses, and then a synthesis of those 85 root cause analyses. He was not clear why a comparison to a comparable unit was not part of the terms of reference. The Scottish Government produced the terms of reference.[280]

448. Professor Stevens explained the process by which the CNR reached a conclusion on infection link in each case with reference to Figure 3.2 within the Overview Report[281]. He described a process by which people in their wider team collected the data from NHS GGC and other sources. The process of collecting information was organised to ensure consistency when conducting the exercise 85 times. He had originally anticipated being physically in Glasgow to review each patient's case notes himself. However, the pandemic meant that was not possible. He explained that you ensure consistency by using a pro forma and discussed this in some detail in his evidence by reference to the blank pro-forma at Appendix D to the Overview Report[282]. He noted that some of the labels in the pro forma relate to the way the items were organised in previous versions of their system as the methodology developed.[283]

449. Appendix D, the first major section, covered the child's cancer diagnosis. The fourth row of that section (Labelled 8.0) was 'Treatment protocol' which he described as quite information heavy. He explained that, in children's cancer care, children are treated on the same protocol across the country.[284] The row (Labelled 10.0 and 10.1) would include details of the patient's treatment in the past thirty days. The data that the CNR Expert Panel were looking for was whether there had been chemotherapy, radiation, or surgery. They considered that thirty days was a sufficient period before the infection for any treatment variation or implementation to have had an influence. Professor Stevens noted that if a child had surgery within thirty days of an infection,

[279] Professor Mike Stevens, Transcript, page 22 and 23.
[280] Professor Mike Stevens, Transcript, page 23 to 25.
[281] See Bundle 6, page 1015.
[282] Bundle 6, Document 38 at page 1109.
[283] Professor Mike Stevens, Transcript, page 26 to 28.
[284] Professor Mike Stevens, Transcript, page 26 to 29.

that would raise a question for him about the influence of that intervention.[285]

450. The next major section was "Microbiology". Professor Stevens explained that the microbiology data was essentially delivered to the CNR by HPS. HPS extracted and presented the nature of the infection, genus, and species. He noted a small point under Row 12 about category for inclusion as there were three groups within the cohort. The largest group were the children with gram-negative environmental enteric infections. The second group was the three children with Mycobacterium Chelonae. The third group was for if a family asked for a child to be included in the review. One family asked to be included as the child had a severe Pseudomonas infection, had never had a positive blood culture, but had multiple cultures of Pseudomonas. Apart from Row 12, all other rows in Appendix 1[286] to the CNR report were provided by HPS, pulled from hospital records and refer to that particular patient. [287]

Use of the Paediatric Trigger Tool ("PTT")

451. Professor Stevens did not understand why they were obliged to have the PTT as part of the CNR. It had been decided by the Chief Nurses Directorate that they should use it. They felt it was an opportunity to use an accredited tool to look at measures of potential alerts within the care of patients, to identify if there could be lessons for the organisation for the future improvement of healthcare. Professor Stevens did not see how this lay alongside what the CNR was trying to do. The trigger tool was looking across a whole range of markers.[288] Referring to the Paediatric Trigger Tool Score Sheet produced in the Overview Report at Appendix C,[289] Professor Stevens explained that some of the triggers were not relevant to the work of the CNR, as they described events which were routine in paediatric haemato-oncology. He felt the PTT was a distraction.[290] However, as he saw it the PTT became a check list. It enabled the team to extract data using this separate template. It produced a worthwhile output. When looking at a record of a child, the exercise carried out by the CNR was a similar one, as the application of the PTT is designed for. They were looking at the

[285] Professor Mike Stevens, Transcript, page 29 and 30.
[286] Bundle 6, Document 38 at page 1109.
[287] Professor Mike Stevens, Transcript, page 30 to 32.
[288] Professor Mike Stevens, Transcript, page 33 and 34.
[289] Bundle 6, Document 38, page 1107.
[290] Professor Mike Stevens, Transcript, page 34 to 36.

medical records for events considered significant in the history of the child. Professor Stevens knew what he was looking for in patients who had infections. The PTT has a template that can apply for a child with any condition. It can be used as an audit tool widely. However, the CNR created its own list of data and there was not an overlap with the PTT. Some things in the PTT one would expect to happen in patients anyway. Professor Stevens noted that the CNR produced an infection episode list[291]. The list was a framework around which the CNR were looking to see if a child admitted for chemotherapy was well on admission, and then three days later developed a fever and was found to have a bloodstream infection. The place admitted from could be home or another hospital. The reason for admission could be planned or something mundane like having a temperature at breakfast. He noted that the date of onset matters, as infections within 48 hours may not be hospital acquired.[292]

452. There was a separate report to the Oversight Board using the wider data from the work using PTT, although he noted that that separate PTT report was never published.[293] He produced it, and that report has now been included in a Hearing Bundle.[294]

The likelihood that infections were linked to the hospital environment.

453. Professor Stevens gave evidence the day after Ms Evans and Professor Wilcox. By reference to Section 5.6 entitled, “The likelihood that infections were linked to the hospital environment”,[295] he was asked about the different categories of likelihood within Table 5.3.

454. He explained that the ‘unrelated’ category was for a small number of episodes of infection where the CNR Expert Panel were convinced there was another story at play. One clear example was of a child with a blood disease who needed repeated intravenous treatments. The child presented three times with an unusual blood stream infection. IV treatments were given at home. They had no difficulty in thinking

[291] Bundle 6, Document 38, page 1109.
[292] Professor Mike Stevens, Transcript, page 40 to 43.
[293] Professor Mike Stevens, Transcript, page 36 to 38.
[294] Bundle 25, Document 9, page 304.
[295] Bundle 6, Document 38, page 1043.

it was not due to the hospital environment. In that case the treating team had suggested water sampling from the home environment.[296]

455. He explained that the "possible' category meant that the infection was with a bacteria found in the environment, where there was no evidence that it was an endogenously acquired infection. There were no gut or mouth symptoms; there was no sign of inflammation around the central line exit site; there was no other sign of infection. They were left with a child who got an environmental infection with no other apparent cause. It became a 'possible' as it was not supported by the finding of any matching environmental cultures.[297]

456. It was put to Professor Stevens that the Inquiry had heard evidence from Dr Crighton that the public health meaning of 'possible' would mean features are compatible with there being a connection, but other diagnoses are possible. He explained that the CNR Expert Panel definition of 'possible' was by excluding other reasons for the infection.[298]

457. Regarding the 'weak possible' and 'weak probable' categories, Professor Stevens explained he wondered whether in creating them they had tried a bit hard. It is not a binary decision whether the infection was related to the environment or not. They were working on a gradient of probability. 'Weak possible' is where a patient perhaps had very infrequent contact with the hospital. The pattern of contact with the hospital is important. A patient that comes in six times in six weeks is in a different position from a patient who comes in once in six weeks. 'Strong possible' almost certainly relates to clustering of infections.[299]

458. In face of questions Professor Stevens explained that the CNR Expert Panel were now worried about how they could have better illustrated the depth that they went into the clinical circumstances of the patient. The blank form at Appendix D was a rather poor representation of what they had done. This was why he sent two worked examples to the Inquiry but recognised that it would be difficult to make these public because every child's clinical course is a footprint that could lead to them being

[296] Professor Mike Stevens, Transcript, page 43 to 45
[297] Professor Mike Stevens, Transcript, page 45 and 46
[298] Professor Mike Stevens, Transcript, page 72 and 73
[299] Professor Mike Stevens, Transcript, page 46 to 50

identified.[300]

459. Professor Stevens was asked how the detail and rigour required for a medico-legal report compares to the detail in each of the CNR reports prepared for each of the 85 children. He stated that it would have to be the same. If one is looking at something as serious as whether a child got an infection from the environment, you must be rigorous in the acquisition of data. He went to meet the IPC team in his own hospital and talked about Stenotrophomonas, and that there seemed to be a lot in this cohort. He could only remember one or two he had ever treated. He was surprised by the number of infections. The response from his IPC team was that they almost never saw Stenotrophomonas in this population of patients. He considered that one must be alert as to whether what you are dealing with is in line with everyday practice or outwith your own experience in your centre.[301]

460. Professor Stevens was asked how the CNR Expert panel would understand the context, independent of individual patients, and work out whether there is another case in close time. Professor Stevens referred to the 'Tableau Timeline'[302]. He explained that HPS built this tool that was an interactive spreadsheet. Every one of the 118 infections is listed horizontally and by child. For each infection there is a horizontal axis from May 2015 to Dec 2019. Across that axis for every child there is every encounter with the hospital. Overlaying that was the date of every infection. There was a selection capability to allow one to see how many were infections by organism, and to relate the dates of infection to contact with the hospital and the dates of the contact. The data came from NHS GGC. He noted that the narrative text enabled them to check if the date for the CNR aligned with the clinical record. It allowed them to identify and record the potential for clustering. They could also input comments.[303]

461. Professor Stevens was asked how an infection gets into the 'probable' category. He explained that what underpins it is that it had crossed the threshold of balance of probabilities. There is enough evidence to say the infection is linked to the

[300] Professor Mike Stevens, Transcript, page 50 to 53
[301] Professor Mike Stevens, Transcript, page 55 to 57
[302] He explained that notes derived from it would appear in the Tableau Timeline row in the form at Part 2 of Appendix D - Bundle 6, Document 38 at page 1110.
[303] Professor Mike Stevens, Transcript, page 58 to 63.

environment. What would take you there is if you had convincing environmental data, such as a sample from a drain or tap in proximity of the patient. They had access to scant information about water samples. They had little information about maintenance of the wards. They looked at Ward 2A and could see plumbers had come 15 times but couldn't tell where they went. One of the difficulties was tracking where work was done. What put patients into the 'probable group', apart from an absence of other hypotheses, was an emphasis being put on clusters.[304]

462. Professor Stevens explained that there was not a threshold as to the clustering required, or how many environmental samples of the same species before a case become probable. There is no defined threshold. The CNR looked at the pattern of clustering and discussed the pattern in relation to the nature of the bacteria and the likelihood it could be found in the environment. For instance, Enterobacter and drains is not uncommon. There was some striking clustering of patients over a relatively short period of time with the same infection.[305]

463. Asked about the three 'strong probables', Professor Stevens explained that in these cases there was almost certainly an emphasis placed on the clustering.[306]

464. Professor Stevens was taken to Table 5.4 in the CNR report[307]. It was put to him that the CNR grouped together 'strong possible', 'probable', and 'strong probable' into 'most likely' in table 5.4. Regarding the organisms that appear at the top of the table, Professor Stevens stated that he had already commented on the number of Stenotrophomonas cases. Klebsiella is more common. Nevertheless, there are still a lot of these cases. Gut translocation with Klebsiella is possible. The numbers struck him on an individual level as high.[308]

465. Regarding, Klebsiella, Professor Stevens noted he was straying out of his area of expertise, but he understood Klebsiella was possibly not normally identified in water sampling. From a haemato-oncology perspective, he noted that Klebsiella is seen in gut translocation and from the environment. His own experience suggests it is more

[304] Professor Mike Stevens, Transcript, page 63 to 65.
[305] Professor Mike Stevens, Transcript, page 65 and 66.
[306] Professor Mike Stevens, Transcript, page 66.
[307] See Bundle 6, page 1044.
[308] Professor Mike Stevens, Transcript, page 66 and 67.

common in gut translocation, but not always.[309]

466. It was put to Professor Stevens that whilst the CNR have identified 10 episodes of Klebsiella as 'most likely', that could that miss the prospect that they may be gut translocation. He stated that there are eighteen cases of Klebsiella in all other episodes. He would have thought those other cases of Klebsiella were gut translocation case. It was an exercise in discriminating between the two. Looking at those two columns is helpful to see the relative proportions of organisms.[310]

467. Professor Stevens also pointed out that the table shows entirely unusual infections, which are not all in the 'most likely' group. Elizabethkingia did not come up in his day-to-day practice. He would have encountered Serratia. There was something about the pattern. He referred to Figure 9 in the unredacted October 2019 HPS Review[311]. He explained that one looks at the table, there is a distribution of different organisms found in Yorkhill, 2A, 2B, 6A and 4B and that these periods are all very different. One can see the contribution of Stenotrophomonas to overall infections has increased. The same can be said of Enterobacter. He did not know why this was redacted when the report was given to them. He thought it contributed to the story. He noted the changing nature of the infections. They were seeing infections occurring more frequently.[312]

468. Professor Stevens was referred to a discussion in his witness statement about the weighting of factors[313]. It was put to him that this describes a subjective assessment that is maybe an amalgam of the expertise of the CNR panel. Professor Stevens explained that that whilst it is possible when undertaking a process to pre-emptively apply a weighting and, for example, take evidence of clustering as twice that of gut translocation, they had no pre-established rules. They tried to synthesise information and make a judgment. It is partly subjective.[314]

Limitations of the CNR Overview Report

[309] Professor Mike Stevens, Transcript, page 68.
[310] Professor Mike Stevens, Transcript, page 68 and 69.
[311] Bundle 7 Document 6 at page 233.
[312] Professor Mike Stevens, Transcript, page 69 to 72.
[313] Professor Mike Stevens, Witness Statement, paragraph 92.
[314] Professor Mike Stevens, Transcript, page 73 and 74.

469. Professor Stevens was referred to his witness statement concerning the limitations of the CNR[315]. He noted that the primary limitation was the inability to obtain data which would have usefully illuminated aspects of environmental exposure. It was either not available or they could not track the implications. He noted challenges relating to coding and with dates. The IMT Minutes sometimes said information was available, but they could not find it in the data set they had been given.[316]

470. It was put to Professor Stevens that the Inquiry had heard evidence from Dr Armstrong, where she stated that the CNR had concluded that 70% of the cases were 'possibly' or 'probably' related to the environment and yet she was not clear how the CNR reached its conclusion. He stated that the key message was not the 70%, but the figure of the 30% of the 'most likely'. He was surprised to hear the medical director using the 70% figure.[317]

471. The Professor was then challenged that it could not be clear how the CNR Expert reached the conclusions because the details are not available to NHS GGC and are not in the Overview Report. He was sympathetic to that. He posited a scenario where all 118 data synthesis could be provided, poured over, and challenged. He believed that if one gave the 118 root cause analyses to another group there would not be unanimity about all those cases. They had to use judgment on the data presented to them. He could understand the frustration. The challenge is that NHS GGC could have done this themselves. He wondered why the CNR Expert Panel were asked to do this in 2020 when NHS GGC had been struggling for five years with a background of unusual infections. The CNR recommended root cause analyses in its report. NHS GGC had said they had been doing them, but only two were done in 2019.[318]

Response by NHS GGC to the Draft Overview Report

472. Professor Stevens explained that a draft of the Overview Report[319] was sent to NHS GGC, the Oversight Board, and HPS.[320] NHS GGC provided an extensive response.

[315] Professor Mike Stevens, Witness Statement, paragraph 137.
[316] Professor Mike Stevens, Transcript, page 74 and 75.
[317] Professor Mike Stevens, Transcript, page 78 and 79.
[318] Professor Mike Stevens, Transcript, page 79 and 80.
[319] See Bundle 25, Document 2, Page 48.
[320] Professor Mike Stevens, Transcript, page 80 and 81.

This was presented in a document[321] where the CNR Expert Panel had recorded the NHS GGC response to the draft by reference to the lines in that draft, with the internal response of the CNR Expert Panel alongside in the right-hand column. The purpose of giving stakeholders the draft was they were inviting comments on points of factual accuracy. He anticipated there would be push back on the conclusions, so they were clear that they were only inviting views on things that stakeholders thought were wrong.[322]

473. It was put to the Professor that there were points of disagreement from NHS GGC about methodology. He had been expecting to receive quite a lot of that. It was a challenge to them because they were working to a tight deadline. It was a substantial piece of work on their part.[323] He was invited to respond to the suggestion that NHS GGC never got an opportunity to input into the methodology. He could understand that was their perception. The reality was the CNR was an independent, external group appointed by the Scottish Government to do the work. There was no justification for asking the organisation they were looking into to comment on the approach. He did not think they had an opportunity to influence the process. Fundamentally, the cohort was based on the HPS 2019 work. He would be surprised if they were critical of the cohort as NHS GGC have used the HPS 2019 work to support their position.[324]

474. Professor Stevens was taken to the part of the response[325] where NHS GGC referenced their Public Health Commentary prepared by Dr Crighton, which contains several suggestions about methodology[326]. Professor Stevens was asked if there had been any discussions about doing an epidemiological comparison with other units. He explained that it was only discussed as far as acknowledging that HPS had already done some work on that. It was not in their terms of reference. They had been asked to identify if individual children had acquired an infection from the environment. They were not being asked to comment on the rate of infection.[327]

[321] Bundle 25, Document 5, Page 157.
[322] Professor Mike Stevens, Transcript, page 81.
[323] Professor Mike Stevens, Transcript, page 82 and 83.
[324] Professor Mike Stevens, Transcript, page 83 and 84.
[325] Bundle 25, Document 5, Page 158 (Line 127).
[326] Bundle 27, Volume 6, Document 28, Page 310.
[327] Professor Mike Stevens, Transcript, page 85 and 86.

475. Regarding the reference within the Public Health Commentary to the Bradford-Hill criteria, Professor Stevens noted that the time, person and place algorithm was important. He was surprised when saw the reference saying that the CNR should have discussed the Bradford-Hill criteria. It is embedded in epidemiological practice. He felt it was implicit and there was no need to comment on them.[328]

476. Again, by reference to the Public Health Commentary, it was put to Professor Stevens that there was a risk of creating a self-fulfilling prophecy because they were focusing on clusters. He stated that the cluster was a reality, not a construct. He could see where there were periods of clustering. It was inevitable they were going to reinterpret sequential patients in that context. It was not applicable to every infectious episode. They were driven by the terms of reference regarding the likelihood the infections were derived from the environment. Knowing the overall increase in the infection rate would have shone a stronger light on it. However, he did not think it would have changed the observations.[329]

477. Professor Stevens was also asked about the aspect of the NHS GGC response that related to the number of Mycobacterium Chelonae cases and the response of the CNR Expert Panel,[330] where NHS GGC stated that there were only two cases not three. Professor Stevens explained that the answer was in the CNR Overview Report[331]. It notes one case in 2016, two infections in 2018, and one in 2019. One patient had two infections in 2018. He noted that the case in 2016 was in the data set provided to the CNR. He did not know why NHS GGC thought only two patients had been infected.[332]

478. Professor Stevens was then again referred to the response by NHS GGC to the overall conclusions of the CNR[333] and the argument that those conclusions contradict the October/November 2019 HPS Reports, which talk of a lack of evidence of a single point of exposure. He responded that it depends on what you mean by that. He always took the view that it was unlikely there would have been a

[328] Professor Mike Stevens, Transcript, page 87 and 88.
[329] Professor Mike Stevens, Transcript, page 88 to 90.
[330] Bundle 25, Document 5, page 159 (Line 228).
[331] Bundle 6, Document 38, page 1030.
[332] Professor Mike Stevens, Transcript, page 100 to 103.
[333] See Bundle 25, page 167, lines 1206-1220.

single point of exposure.[334]

479. It was put to Professor Stevens that NHS GGC seemed to think that the CNR could have made better links with more and better data[335]. He thought it was right to say that if they had more data, they would have been able to make more sophisticated conclusions, but the data was not there.

Meeting with NHS GGC on 4 March 2021

480. Professor Stevens was referred to the letter to him from NHS GGC Chief Executive, Jane Grant, dated 1 March 2021[336].This was followed by a meeting on 4 March 2021[337] where a substantial number of people were present from NHS GGC, including Jane Grant, Dr Armstrong, Dr de Caestecker, Scott Davidson, Alan Mathers, William Edwards, and Elaine Vanhagen.[338]

481. Professor Stevens explained that the meeting had been preceded by a request for a discussion about how the meeting should be managed. He had a call with Ms Grant the day before, which was a perfectly cordial conversation. He said this was their opportunity to say to us what they wanted to say about the report. He made it clear that the CNR Expert Panel would listen but would not guarantee to change anything in the report.[339]

482. Professor Stevens described it as a tense meeting. Ms Grant opened the meeting. He had prepared a statement about what the CNR Expert Panel had been tasked to do. Then most of the NHS GGC team was given the opportunity to say something and came at it from different perspectives. William Edwards was concerned about difficulties the CNR had with clinical records. He was keen to say they had responded adequately. Professor Stevens described Dr Armstrong as being forceful about the CNR Expert Panel essentially reaching the wrong conclusion. He thought she was exercised by the fact that the report identified a significant proportion of patients in the most likely group. He thought she felt the process of data recording

[334] Professor Mike Stevens, Transcript, page 105.
[335] Bundle 25, Document 5, at page 180, Line 1621-1626.
[336] Bundle 25, Document 3, page 151.
[337] Professor Mike Stevens, Witness Statement, para 133 and page 143.
[338] Professor Mike Stevens, Transcript, page 128 to 130.
[339] Professor Mike Stevens, Transcript, page 130 and 131.

was unfair. Dr Davidson picked up some points. Dr Mathers' contribution was more about the team having a difficult time in haemato-oncology. Ms Grant wanted to ensure it was a balanced report to shore up patients and families. She wanted to move forward from this. He could not remember if the issue of the Board not being able to understand the reasons for the conclusions came up in the meeting. The pushback was more about the conclusions themselves.[340]

483. Professor Stevens was taken to the letter of 1 March 2021 from Jane Grant, sent before the meeting, and the section on the third page that dealt with the culture within NHS GGC and its IPCT. [341] It says that they cannot see the evidence, but he does not remember the issue being rehearsed in the meeting. The CNR Expert Panel did come to meet with Dr Inkster and Dr Peters. He recalled discussing with Phil Raines that they should hear from the Whistleblowers. He considered that they should not meet with them until they had reached their own conclusions. That is why they did not meet with them sooner. He did not recall if he said in the meeting that he was worried it might introduce bias. He felt it was important not to introduce their views into consciousness until they had written the report.[342]

484. It was put to Professor Stevens that he had heard from Professor Leanord at the beginning, which ran the risk of introducing bias. He agreed it could seem that way. However, the conversation with Professor Leanord was more factual. He did not remember there being opinions expressed. He did meet Professor Leanord again, at least a couple of times during the frequent meetings in October and November 2020. The meetings were about getting information. One turned into an exposition of whole genome sequencing. He presented part of his data to them.[343] Professor Wilcox addressed this in his evidence discussed below.

485. Professor Stevens was taken to a second letter from Jane Grant of 5 March 2021[344]. He was surprised to receive the letter. He did not feel it was needed. He did not do anything with the letter. He felt rather cross about it. There was no necessity to write the letter. It made him feel it was a further nudge to move the final written report in

[340] Professor Mike Stevens, Transcript, page 131 to 136.
[341] Bundle 25, Document 3 at page 153.
[342] Professor Mike Stevens, Transcript, page 136 to 138.
[343] Professor Mike Stevens, Transcript, page 138 and 139.
[344] Bundle 25, Document 4, Page 155.

the direction NHS GGC wanted it to go. He felt it 'hardened their hearts' a bit. It made him feel that someone was trying to turn the screw on him. To get a letter 24 hours after a meeting, he did not understand it. He could only think of one reason to do it.[345]

486. Professor Stevens was asked if, in future, Whole Genome Sequencing ("WGS") should be used when there is a cluster of infections in a particular unit. He explained that if you think you are dealing with something difficult or unusual, you should use all the tools you have to sort it out. However, he could not envisage it would become part of routine practice day to day. It was used in the unit at the Bristol from time to time.[346]

487. It was put to Professor Stevens that there was what appears to be an attempt to prove the absence of a link as opposed to seeing if there is a link. His interpretation would be if one wants to prove the absence of a link you have to process many samples. If you want to prove a link, and you get lucky, you might be able to do it in 5 cases or 500 cases. Trying to prove an absence of a link is a bigger task. One of the key elements of a useful study is do it prospectively. You set out with a structure that is predefined that you have designed in the hope it will answer the question you're asked.[347]

488. Professor Stevens considered a prospective study was more helpful because if you manage the study well you get the data you want. It takes time. The advantage of a retrospective review is you can do it quicker. Prospective studies are better for quality of data, but retrospective reviews have a place as they take advantage of data already collected. You could do a retrospective study to prove the absence of a link if the sample size is big enough.[348]

Comparative epidemiology

489. Given his experience in the field of paediatric haemato-oncology in the UK, Professor Stevens was asked about what one would look for if attempting to identify a

[345] Professor Mike Stevens, Transcript, page 139 to 142
[346] Professor Mike Stevens, Transcript, page 109 to 111
[347] Professor Mike Stevens, Transcript, page 112 and 113
[348] Professor Mike Stevens, Transcript, page 113 and 114

comparator hospital for RHC. He suggested that what one would need to do is identify ideally more than one or two other hospitals that are broadly similar in size of the population they treat, case mix, treatments they deliver, and the manner in which the treatment is delivered. The shorthand for determining the size of a children's cancer centre is new patients registered per year. Nobody has a unit with thousands of patients because childhood cancer is relatively uncommon. Glasgow is a larger than an average centre, but not the biggest. It is a centre that delivers BMT. Patients who need BMT are the most vulnerable. If you have a service that delivers BMT, you tend to attract more complicated cases of leukaemia. The final component is the concept of shared care. One of the challenges of delivering care to children with cancer is it is aggressive, persistent, and demanding. Many units in England have evolved a pattern of delivery of care where routine delivery is devolved to district hospitals. Children with common leukaemia have intense treatment early on, then chemotherapy settles down to a more manageable, outpatient-based pattern. It can be readily devolved to another hospital. The very far southwest of England is four hours from Bristol. Sending patients back to Truro or Plymouth is something they routinely did. If you were worried about the environmental risk being in Bristol, it would dilute things out. Professor Stevens explained that he would match on the size of the unit, whether they do BMT, whether they do shared care, and what the age distribution is, because most children's cancer units have an element of teenage/young adult service which pushes the ages beyond the normal paediatric age. If you do the study prospectively, you could collect information to take account of these things in the analysis.[349]

490. Professor Stevens was referred to the Quantitative Report by Sid Mookerjee[350]. It was explained to him that Mr Mookerjee sent out Freedom of Information requests to many units and made certain requests and Professor Stevens was referred to the list of hospitals which were contacted[351]. He considered this list to be comprehensive. As far as how the hospitals who responded compare to the Schiehallion unit, Professor Stevens noted that GOSH is much busier and bigger, but it has a restricted age range. It takes all the babies from London and the southeast. Cardiff and Oxford

[349] Professor Mike Stevens, Transcript, page 115 to 120.
[350] See Bundle 21, page 21.
[351] See Bundle 21, page 22.

are both relatively small units and don't do BMT. Leeds is an above average sized unit that does do BMT. It is quite a good fit.[352]

491. Regarding magnitude of difference, Professor Stevens was referred to Mr Mookerjee's first report and his comparisons[353]. It was put to Professor Stevens that Mr Mookerjee would say there was a large difference in the rate of infections. Professor Stevens stated that magnitude of difference is such that he would be surprised if the differences he has explained regarding a lack of a complete comparison with other units would change the message. It was Professor Stevens' evidence that the scale of the excess of infections seen at NHS GGC is so substantial that the differences could not take away the distinction.

492. When referred to the comparative sections of the HPS reports from 2019[354] it was put to the Professor that the Inquiry had heard evidence that one of the difficulties in conducting this work was it was done quickly, and it is hard to get this data. Professor Stevens agreed. He also noted that HPS had pooled the Scottish hospitals for the purpose of comparison. The RHC, Grampian and Lothian children's hospitals are very different. You compare things with what you have got, but you must bear these things in mind. He thought there was a rather casual assumption these comparisons were comforting. In any event, he considered that there were differences. He did not consider that NHS GGC should have taken as much comfort from the HPS 2019 report as it did. When he discovered the change in wording at the end of the Summary and Recommendations Section between the draft and final version[355], it pushed that observation to a stronger position. [356]

493. He was asked about the selection of the denominator for use in calculating infection rates. He considered that both admissions and occupied bed days have issues. It is time spent in hospital that matters. What also matters is the frequency that you bounce back into that environment from outside. Hospitals are not the healthiest place for anyone. If you spend 20 days in hospital continuously, you are more at risk than if you come to a day unit 20 times. It is not easy to say clearly that occupied bed

[352] Professor Mike Stevens, Transcript, page 120 to 122.
[353] Bundle 21, Document 1, page 86.
[354] Bundle 7, Document 6 at page 231 and Document 7 at page 267.
[355] Bundle 7, pages 236 and 272 - Fourth and fifth bullet points.
[356] Professor Mike Stevens, Transcript, page 90 to 95.

days is better. You must include the day cases. The frequency of the day cases matters too.[357]

Possible Impact of Meropenem Resistance

494. As Professor Stevens had considerable experience as a paediatric haemato-oncology consultant, the evidence from Professor Leanord where he discussed the use of Meropenem as a cause of later spikes of infections because of antibiotic resistance was put to him. He noted that he had seen that happen. Professor Stevens explained that all antibiotics convey risks as well as benefits. The risk is principally in inducing multidrug resistance. He was aware of a hypothesis that suggests Meropenem might drive the appearance of Stenotrophomonas. He had looked at the literature but not done a robust review. He found very little that addressed that specific point. The most recent thing he had read looked at Stenotrophomonas pneumonia, which is not the same as a bloodstream infection. He had seen another paper that said there was no evidence Meropenem drove it. In his experience, Meropenem was part of what they used, and they almost never saw Stenotrophomonas. If you were using Meropenem as a primary antibiotic for two or three years and it was driving Stenotrophomonas appearance, you would expect to see it appearing regularly and not in surges.[358]

Use of Control Measures

495. Professor Stevens was referred to his witness statement in respect of use of control measures by NHS GGC[359]. It was put to him that NHS GGC suggest that the fact that major changes were made are examples of the precautionary principle and cannot be used to find a link to the environment. He agreed it did not provide a direct link, but it is very strong evidence that the management of NHS GGC acknowledged that there was an issue in the environment. It was not just chlorination of the water supply; it was a complete rebuild of the children's cancer unit. It was not just driven by the precautionary principle, but also by the thought that there might be a

[357] Professor Mike Stevens, Transcript, page 122 to 127.
[358] Professor Mike Stevens, Transcript, page 75 to 78.
[359] Professor Mike Stevens, Witness Statement, paragraph 55.

problem.[360]

Opinion on Infection Link

496. Professor Stevens was referred to the executive summary of the Overview Report[361]. He was asked for advice as to how the Inquiry should work out how the environment impacted on the risk of infection link. Professor Stevens explained that it was difficult to do it either retrospectively, or prospectively. He supposed he would say that you must recognise that there is no absolute, specific test or statistical trick or piece of information that is going to completely nail the environment to infections. However, circumstantial information and judgment regarding the patterns of what you see is important.[362]

497. Asked an adapted version of the Inquiry's own Key Question 4, Professor Stevens considered that the conclusion of the CNR report is that for 30% of cases there were infections they thought were derived from the environment. He stands by that conclusion. He has seen nothing that weakens it. However, he has seen emerging evidence of the problems with the water and ventilation systems that seems to support the position.[363]

498. Professor Stevens was asked, in coming to a decision on the categories of 'probable' and 'possible', if he attached considerable weight to instances where they had identified clusters of infections. He explained that clustering is a surge in observations of an event over a compressed period. Clustering matters because when one considers the transmission of infection, it is not a pure situation of the environment infecting a single patient. There are also interactions between patients and staff members. If one is encountering a little surge, then there is an increased chance that inadvertent transmission of infection can happen to other patients.[364]

499. It was put to the Professor that if one might suppose a random instance of an infection, or that a particular patient suffers an infection that has an endogenous explanation, might that not produce a cluster if that patient has interactions with staff,

[360] Professor Mike Stevens, Transcript, page 127 and 128.
[361] See Bundle 6, page 984.
[362] Professor Mike Stevens, Transcript, page 142 and 143.
[363] Professor Mike Stevens, Transcript, page 144 and 145.
[364] Professor Mike Stevens, Transcript, page 145 and 146.

the environment or other patients. Professor Stevens said this was correct. One could see that in an alternative setting, e.g., in outbreaks of Rotavirus or Norovirus. However, the behaviour of highly transmissible viruses is not the same as the bacteria looked at in the CNR. He would be surprised if one saw a cluster of Klebsiella that derived from the exposure of a single patient with a damaged gut. There must be a more continuous exposure into the environment that would come with a contaminated water supply.[365]

Assessment of the Witness

500. Clearly an expert, Professor Stevens was able to give cogent evidence about the process which the CNR underwent its work, how it prepared its report, how it reached its conclusions, and the response from NHS GGC to those conclusions. Professor Stevens was also able to give helpful evidence in respect of the use of Meropenem and WGS.

501. He answered the questions asked of him in a straightforward and honest manner. He readily accepted that there were limitations to the type of work that the CNR carried out. He was able to explain the report's methodology, and that the conclusions were based on probability as opposed to any sort of definitive basis.

502. At all times, Professor Stevens sought to assist the Inquiry. His helpful advice in relation to how the Inquiry should approach Key Question 4 was particularly of note. In all respects, the evidence of Professor Stevens was credible and reliable.

<u>Gaynor Evans - 29 October 2024</u>

503. Gaynor Evans is a deeply experienced IPC Nurse Consultant. She adopted her statement which is incorporated into the Witness Bundle for the week commencing 29 October 2024 (vol 11), and also her supplementary statement which is incorporated into the Witness Bundle for the week commencing 04 November 2024 (vol 12). She started to work in 1997 and has held a range of important roles in IPC across England culminating across the whole of England from 2017. She explained that E. coli had then by far the highest rate of gram-negative infections. Most cases

[365] Professor Mike Stevens, Transcript, page 146 and 147.

are related to UTIs, hydration, and problems with lines. Her role was to work with organisations to put improvement programmes in place.[366]

504. Ms Evans adopted her principal statement[367] and her supplementary statement[368]. She also adopted the Overview Report of the CNR[369] as part of her evidence.

505. Ms Evans saw the experience and skills of each member of the CNR Expert Panel as complementary: Professor Stevens' role as an expert in paediatrics and oncology; Professor Wilcox as a microbiologist with great expertise of organisms and the frequency with which they appear and her own expertise is in considering what practices look like, what the environment is like, how to review the environment, and the practices at ward level.[370]

506. Ms Evans stated that she had not come across a potential scenario of gram-negative environmental bacteria at the scale that the Inquiry is dealing with. She is not aware of it happening at this sort of scale.[371]

The CNR Patient Cohort

507. The cohort was designed and agreed from work done by HPS in 2019. They had undertaken a review and produced a paper[372]. It was a useful cohort because once they had done the analysis, it appeared that the number of children infected were a manageable group of patients. The CNR agreed with their definitions, they were looking at a defined area, and the cohort were defined by gram-negative bacteria that their bloodstream infection had been identified as. M. Chelonae had been added into the cohort by the CNR. The cohort started as a group of 85 with 118 bacteraemia.[373]

508. Ms Evans was referred to the protocol produced for the CNR[374]. She first saw this in her papers for the Inquiry hearing. Professor Bain was the Director of IPC for NHS

[366] Gaynor Evans, Transcript, page 6 and 7.
[367] Witness Bundle, Volume 11, Document 2.
[368] Witness Bundle, Volume 12, Document 3.
[369] Bundle 6, Document 38, Page 975.
[370] Gaynor Evans, Transcript, page 9 and 10.
[371] Gaynor Evans, Transcript, page 9.
[372] See Bundle 7, Doc 5, page 214.
[373] Gaynor Evans, Transcript, page 11 to 13.
[374] Bundle 27, Vol 6.

GGC and was a conduit between the expert panel and NHS GGC. She was the link between the Scottish Government and the Oversight Group. The CRN panel reported to Fiona McQueen, but shared information with Professor Bain.[375]

Information Supplied to NHS GGC

509. It was put to Ms Evans that one issue that might arise is NHS GGC have not seen all the material and have some concerns about the methodology of the review. Ms Evans was not able to confirm if NHS GGC were given a copy of the protocol. The Overview Report was given to NHS GGC in draft. The conclusions of the CNR would be found in the detail of the report that they wrote to the families. In each case they would tell the family why they had drawn their conclusions. A lot of the conclusions are based on probability.

510. Ms Evans was taken to a table with the demographic details of the cohort[376]. She was then referred to table 4.2 of the report[377]. All the information would have come from NHS GGC. All that the CNR did was present it in a different way. Ms Evans was then referred to Table 5.3[378] where the overall conclusions had been set out. Regarding why there were 17 labelled as weak positives, and whether one would need to read all 17 individual family reports, Ms Evans confirmed that to be the case. The information in the table was in aggregate. There would be difficulty in discussing the individual reports in a public setting because of confidentiality. Ms Evans confirmed that the consequence is that one cannot look at the CNR's workings. The CNR set out at the outset that none of the children would be identifiable from what was written. The children cannot be identified, except in the individual family reports. The CNR used the information in a slightly different way because did not want this to be a trauma to families afterwards.[379]

511. Ms Evans explained that the 85 individual reports were sent to the families. They spoke to every family that wanted to speak to the CNR. The CNR asked the families if they would like to share the report with their clinicians. Ms Evans did not know how

[375] Gaynor Evans, Transcript, page 15 and 16.
[376] See Bundle 6, Doc 38, page 1026.
[377] See Bundle 6, Doc 38, page 1028.
[378] Bundle 6, Doc 38, page. 1043.
[379] Gaynor Evans, Transcript, page 17 to 20.

many did. It was for the families' information to share at their discretion. Ms Evans did not know if the Oversight Board or Scottish Ministers shared the reports with NHS GGC. The individual reports were sent to the families by administrators for the CNR. They were then sent directly to the families.[380]

512. Ms Evans explained that the CNR were working for the Scottish Government. Professor Craig White was involved with how the CNR liaised with the families. The CNR Expert did not share their conclusions with Professor Bain as she had left the organisation. Ms Evans could not remember if they had shared their conclusions with anyone other than Professor Craig White. She considered that their 'customer' in an administrative sense was Elaine Vanhagen of NHS GGC. Ms Vanhagen was not supplied with the individual reports, nor were they shared with NHS GGC as they were discrete reports. Ms Evans thought that the information was stored with the Scottish Government.[381]

Methodology of the CNR on Infection Link

513. Ms Evans was referred to Figure 3.2 of the report of the CNR[382]. Regarding the process that the CNR had carried out, Ms Evans explained that they were a group of investigators not dissimilar to an IMT process. They used root cause analysis to identify risk factors, anything that contributed to infections, and were doing that on an individual case basis. The CNR were not looking at an outbreak, because an outbreak is investigated through an IMT. They reviewed all data, in hindsight, and used root cause analysis to determine what caused the infection and whether there was a link to the hospital environment. In essence, they were looking to prove or disprove the hypothesis. She considered that they had done a full investigative review of all the care that the children had and whether due process had been followed.[383]

514. There were two sub-teams feeding in data to the CNR: one from HPS and a PTT team. The CNR were looking for any environmental samples, water samples, maintenance records, environmental audits, risk managements, HAI-SCRIBEs.

[380] Gaynor Evans, Transcript, page 20 to 22.
[381] Gaynor Evans, Transcript, page 22 to 25.
[382] See Bundle 6, page 1015.
[383] Gaynor Evans, Transcript, page 25 to 27.

When they looked at risk assessments, they did not really tell them what work had been undertaken. She found it more beneficial to look at the exact maintenance records. When the CNR requested maintenance data, there were large numbers of works undertaken in Wards 2A and 2B, which were presented to them in a complex way. There were no dates or rooms noted. There was an example of a blocked sink, and if she wanted to link that to Patient A, she would expect the record to say it was in Room X and where the blocked sink was. However, the record would just say it was on Ward 2A, which was not helpful when there were so many sinks. HPS helped them to refine the data.[384]

515. Ms Evans explained that 'PTT' stood for Paediatric Trigger Tool. The PTT identifies any triggers that may present concern for the management of a patient. Ms Evans stated that she had not used the PTT previously. The CNR used an intermediary who reviewed the notes and applied them to the PTT. She confirmed that the PTT was not used to identify patients for inclusion in the cohort of cases considered by the CNR. It was used to determine if there were any triggers that would have given an indication that the person was at risk of infection. If looking at, for example, tissue damage, PG2, one would look to see if there were observations like a raised temperature that would give an indication that something was amiss. The triggers are risk factors that could indicate higher risk of developing infection.[385]

516. Ms Evans explained that the data synthesis template in the CNR report[386] is where they brought together all the information. The PTT team consolidated the medical notes and were looking for things in the tool and putting them into the format of the template.[387]

517. Regarding the clinical timeline, Ms Evans explained that this was created so that the CNR could follow the patient journey. They wanted to look at the environment, and the patient's history. This was then brought together into the data synthesis. At times there were gaps, and they had to go back and ask for further information. For each case, the CNR followed the clinical timeline from when the patient was admitted, to

[384] Gaynor Evans, Transcript, page 27 to 29.
[385] Gaynor Evans, Transcript, page 29 to 31.
[386] Bundle 6, page 1109.
[387] Gaynor Evans, Transcript, page 31 and 32.

when they were ill, to what their management was, and their outcome. Ms Evans confirmed that all 85 of the individual reports have their own timelines.[388]

518. Ms Evans was referred to the Part 2 summary of the CNR Report[389]. This is a summary of what is on the preceding page. The Tableau timeline is important as it gives not just the infection but allows one to see if there are any other cases that were related in that period.[390]

519. Regarding the Part 2 summary, Ms Evans explained that ICNet is an IPC database that pulls information on certain organisms out of the laboratory and triggers a response. ICNet has a prescribed list of organisms it pulls from, and you can add organisms if there is a local alert organism. Telepath recalls conversations and advice that microbiologists have given. In respect of IMT and PAG Minutes, they are a summary of the relevant bits of the IMT minutes and deal with what was relevant, if there were any recommendations, if there was a decision or action log, if any results were provided and if there was an IMT or PAG. Ms Evans noted that the environmental biology would tell you if there were any samples taken and if they were able to link the results. The HAI-SCRIBE was where you would detail if there was a risk assessment undertaken for any building works. Lastly, there were any other observations. The conclusion was written after the expert team meeting, which met at least twice. They met twice because they got data late on and they had to reconsider the cases again against some of that data. She confirmed that there is a conclusion sheet for each case.[391]

520. Regarding the criticism that the approach of the CNR was subjective, Ms Evans noted that they reviewed all the cases in line with specific tools, like the PTT. They looked at the case against their own policies and procedures at the time and tried to keep that as stable as possible. It was difficult to decide around ‘possible’ or ‘probable’, but it was all based on the evidence the CNR were given. The decision reached was based on the evidence and the probability. Whether it was more likely to have happened or not. This was a professional judgment about probability and

[388] Gaynor Evans, Transcript, page 33 and 34.
[389] Bundle 6, page 1110.
[390] Gaynor Evans, Transcript, page 35 and 36.
[391] Gaynor Evans, Transcript, page 37 to 39.

causation. It was an iterative process. If the group were not in agreement, they would seek further evidence and then go back and discuss. Ms Evans stated that their opinion was reached based on the facts that they were presented with, and that they applied the same criteria to each case.[392]

The CNR's assessment of probability

521. Ms Evans was taken to the CNR's section on the likelihood of assessments[393]. It was pointed out to Ms Evans that the test that the Inquiry needs to apply is the balance of probabilities. Regarding the categorisation of 'possible', Ms Evans explained that something is possible because there are no other risk factors that they could identify, but there could be an alternative reason for the infection. It was possible that it could relate to the environment, but there could be an alternative they had not found yet. She noted that the threshold for possibility involved there possibly being other cases related that might have occurred at a similar time in that environment. It was possible, but they do not have the evidence to make a further conclusion. For instance, that they did not have the results that link to a specimen from a drain or a swab, but it possibly came from the water.[394]

522. If one looks at an unrelated case, because there is an alternative explanation for those cases, one cannot exclude the environment. If one cannot exclude, it becomes possible. Ms Evans noted that the environment can be excluded if you can find an alternative source for the infection or an alternative reason, such as infections that come from within, or children who have come from another hospital, or the timing of the infection. For instance, if the infection appeared immediately on admission. Quite often these infections can be explained by other means.[395]

523. Ms Evans noted that possible is not the default. She stated that there must be some basis to say it is possible that it came from the environment. Time, place and person is important. If you have some evidence that the organism existed, but cannot connect where it came from, there is some alternative, and there is no other

[392] Gaynor Evans, Transcript, page 39 to 42.
[393] Bundle 6, page 1043.
[394] Gaynor Evans, Transcript, page 42 to 44.
[395] Gaynor Evans, Transcript, page 44 to 46.

hypothesis, then it is possibly linked to the environment.[396]

524. Regarding the difference between 'possible' and 'strong possible', Ms Evans noted that 'strong possible' might involve there being a little more information. For instance, there might have been a specimen of the same bacteria, but from a different location within the ward. Such a scenario would be labelled as a stronger possible because there was slightly more information.[397]

525. Regarding 'probable', these cases usually involved more cases or a larger cluster, within a timeframe, and an absence of any other risk factors. There may also have been microbiological results that could be linked to the environment, but not the right environment, such as a different location. For instance, it could have been on the ward, but not in the room.[398]

526. To get to 'definite', one would need to be able to say that a specimen came from a particular sink, on the day that the patient was in the particular room. Ms Evans explained that if, for example, there was a possible case, but there were then two or three other patients in closely related time but in different rooms, but there was no sample from the sink, it would not be definite.[399]

527. Ms Evans stated that the difference between 'probable' and 'strong probable' is the degree of evidence that was available. If they had evidence that linked the infection to the environment, to that area, then it could be a strong probable.[400]

528. Regarding where 'more likely than not' is drawn in their table of conclusions, Ms Evans concluded that she thought it was' probable'. She considered that the line sits between probable and strong possible[401].

Root Cause Analysis

529. It was put to Ms Evans that in her initial witness statement she discussed root cause analysis and observed that it was instigated in late 2019 as a methodology for IMT

[396] Gaynor Evans, Transcript, page 47.
[397] Gaynor Evans, Transcript, page 49 and 50.
[398] Gaynor Evans, Transcript, page 50 and 51.
[399] Gaynor Evans, Transcript, page 51 and 52.
[400] Gaynor Evans, Transcript, page 52.
[401] Gaynor Evans, Transcript, page 53 and 54.

investigation.[402] Ms Evans was also referred to a report on the root cause analysis of 13 cases and 12 paediatric cases[403]. Ms Evans explained that she had seen the report for the first time that week. It was an SBAR based on a culmination of the author analysing the root cause analysis for those cases. Ms Evans noted that the report states that it has not identified a single environmental source. However, it also stated that there had not been an input to the report by a microbiologist or the clinical team. Ms Evans considered that what had been done was an analysis without all of the information. There had to be a microbiology input into a root cause analysis.[404]

530. It was put to Ms Evans that the then acting Lead ICD, Professor Leanord, would probably observe that when the decision was made to determine Ward 6A microbiologically safe, the sources of information comprised this root cause analysis, his report to IMTs including whole genome sequencing, the epidemiological presentation by Dr Kennedy, and the HPS paper. Ms Evans reiterated that a root cause analysis needs clinical input.

Unusual Organisms

531. Ms Evans stated that an unusual organism is determined by whether it occurs frequently. She had not seen some of these infections in her career in a bloodstream infection.[405]

532. Ms Evans explained that she was familiar with the concept of background rates. People sometimes get complacent, but one should be looking to reduce the background rates all the time. However, if one sees a novel organism, that should ring alarm bells.[406]

533. Ms Evans noted that one had to look at the overall rates of infection when within the group there are unusual organisms. One must look at the very unusual cases of infection. When you move to a brand-new build, which should have all the bells and whistles and design out the previous faults, you should see a decline in infections overall. She considered that the novel infections seen do warrant investigation and

[402] See page 45 and paragraph 36.
[403] Bundle 4, page 190.
[404] Gaynor Evans, Transcript, page 55 to 57.
[405] Gaynor Evans, Transcript, page 59.
[406] Gaynor Evans, Transcript, page 59 to 61

should be treated. It was an unusual situation because it was not just one, it was several.[407]

Clinical Review or Root Cause Analysis

534. Regarding the clinical review carried out by Sandra Devine, Ms Evans explained that a clinical review would typically involve reviewing medical notes, and a root cause analysis is the questioning of why something was done, or why something happened. Regarding an example of an RCA on a line infection, one considers why the patient got a line infection. If the line was not inserted correctly, why? If the individual was not trained properly, why were they not trained properly? The recommendation would then be to implement a training programme. Ms Evans noted that it is usually a series of questions asking why, why, why…etc…until you get to the very bottom. On the other hand, a clinical review might ask some questions but is really looking at a series of records. Ms Evans questioned what one could learn about the environment if you are simply considering clinical records.[408]

Are Microorganisms involved unusual?

535. Ms Evans was taken to the CNR's list of microorganisms[409]. Ms Evans identified Achromabacter, Chryseobacterium, Aeromonas, Elizabethkingia, Delftia, Herbasperillum, Paucimobilis, Raoultella, Rhizobium, Roseomonas, Sphingomonas, Acinetobacter ursingii, baumannii, Brevundimonas as novel microorganisms as she had not come across these previously. When you meet things that are unusual you should ask questions.[410]

HPS Comparison with Other Hospitals

536. Ms Evans was taken to the October 2019 draft report by HPS[411]. The section comparing the RHC with the other two Scottish children's hospitals was put to her. This data is discussed in the CNR Report[412]. Ms Evans stated that what concerned

[407] Gaynor Evans, Transcript, page 61 and 62
[408] Gaynor Evans, Transcript, page 63 to 65
[409] Bundle 6, page 1028, table 4.2.
[410] Gaynor Evans, Transcript, page 65 to 69
[411] See Bundle 7, page 267
[412] See Bundle 6, page 1068.

her about the HPS report, was that it was trying to justify the levels of infection by looking to see if the RHC was the same as everyone else. What she struggled with is the merging of the two organisations to make the same amount of information. This is not the same as looking at a different hospital with similar demographics. Ms Evans did not think it appropriate to take two small hospitals and put them together because the demographics are different. She felt it would have been better to look at a hospital with a similar patient cohort, possibly in another area, to consider where the hospital sits with its peers.[413]

537. Ms Evans stated that the CNR did not carry out its own epidemiological comparison with other hospitals because the report was not meant to be an analytical study. They were asked to do a descriptive study rather than an analytical study.[414]

Alert Organisms

538. Ms Evans explained that as far as they could see there were no regular meetings or verbal communications between IPC and the microbiologists because of prior complaints. Ms Evans was referred to a letter from Jane Grant of 1 March 2021[415]. Ms Evans stated that there was a clear disparity between the IPC nursing team and microbiology. The IPC team gathered information into ICNet, but because of the altercation with the microbiologists there was no direct or very little direct communication. Ms Evans had conversations with ICNs and microbiologists. It was put to Ms Evans that the Royal College of Nursing had been involved in 2015. She confirmed that she knew about that and had also heard about the issues in conversations.[416]

Dr Inkster and Dr Peters

539. Ms Evans did not know why the CNR met with Dr Inkster and Dr Peters so late in their process. They had also spoken to other microbiologists.[417]

[413] Gaynor Evans, Transcript, page 69 to 74
[414] Gaynor Evans, Transcript, page 74 and 75
[415] See Bundle 25, Doc 4, page 151
[416] Gaynor Evans, Transcript, page 75 to 77.
[417] Gaynor Evans, Transcript, page 77 and 78.

Meeting with NHS GGC on 4 March 2021

540. Ms Evans discussed the teleconference on 4 March 2021 with Ms Grant, Dr Armstrong, Dr Davidson, Mr Edwards and Ms Vanhagen of NHS GGC. NHS GGC had given them lengthy amendments, of about 60 pages of things that they thought were errors or things to be adjusted in the draft CNR report. She considered that it was all about how the report made the organisation look bad. She felt that NHS GGC wanted to dictate to them what was written in the report. The group pushed back several times and Professor Stevens did most of the talking. The conversation was uncomfortable. NHS GGC vociferously disagreed with the information that was in the report.[418]

541. When the CNR's methodology was being agreed, Professor Bain was part of the conversation. Ms Evans felt that there was an opportunity then for NHS GGC to query the methodology. Professor Stevens met regularly with the paediatric oncology teams and the core project team, such as Marion Bain or Craig White, to explain the methodology. Professor Bain was employed by NHS GGC at the start of the CNR, though she did change roles to Scottish Government at one stage.[419]

CNR Report Executive Summary

542. Ms Evans was taken to the second bullet point of the executive summary to the CNR report[420]. The CNR said that they had found little evidence that the alert list had been modified following the evolving experience of gram-negative bacteraemia. The CNR had noted that some organisms were added to ICNet in 2018, but when the organisms were found in 2019, they did not elicit an alarm, which meant that the alarm was added and not activated correctly, or it was not added. This was based on someone interrogating ICNet.[421]

543. Ms Evans said that the criticism that she makes in her witness statement about the IMTs is a criticism of process. When one looks at the process of IMTs you look at time, place, person, the PAG, risk assessments, if there is one, do they go on to

[418] Gaynor Evans, Transcript, page 78 and 79.
[419] Gaynor Evans, Transcript, page 79 and 80.
[420] Bundle 6, page 982.
[421] Gaynor Evans, Transcript, page 81 and 82.

instigate an IMT. Ms Evans' concern was that once you have got that, sometimes the IMT doesn't take place until some time after (e.g., 11 days) and you could have several other infections in that time. Time is of the essence. The process was often difficult to follow. She did not regularly see an agenda for the IMT. The agenda is an important part of the process because you want to know who is around the table and if the right people are there. It was an important to have a communications person present.[422]

544. In light of evidence that Professor Williams and Dr Inkster had both been Consultant Microbiologists with five (out of ten) of their sessions for ICD work Ms Evans felt that a half-time Lead ICD for the whole Board was light, given the complexities and what had been going on, and the significant concerns about the safety of the environment.[423]

545. It was put to Ms Evans that a criticism of the CNR is that it was nothing more than seeing clusters which makes a link inevitable. Ms Evans explained that they spent a considerable amount of time interrogating the data, and spreading it out into a timeline, which goes back to time, place and person. The conclusions were based on the evidence, not just saying there's a cluster. The CNR looked for other possible routes for transmission, such as if the child was treated elsewhere, if there were links with family members, or symptoms of gut translocation. She noted that one of the biggest problems is lines, either a central line or anything else that invades the skin. The details of the work of the CNR are in the individual reports, taken together with what they observed from the environment, such as environmental audits. The CNR looked at if there had been sub-standard cleaning, the fixtures and fittings, or cracked sinks.[424]

546. Ms Evans could not recall having seen the reports by DMA Canyon at the time but has seen them since. There was a risk assessment and an action plan of what should be done. However, there was no accountable person, no date for the works to be completed by, and no assurance that the actions had ever been completed. She would have expected some of those recommendations to be picked up by the Water

[422] Gaynor Evans, Transcript, page 83 to 85.
[423] Gaynor Evans, Transcript, page 88.
[424] Gaynor Evans, Transcript, page 89 to 92.

Safety Group. Whilst IPC nurses are not experts, they have a background working knowledge about what should happen in the environment. Had the IPC team known about the risk assessments at the time, it would have had an impact on how they managed planning.[425]

547. Ms Evans explained that it was not always possible to identify a link for an infection. Sometimes, if one has taken all the samples as directed, when you take the water specimen you do not always collect the bugs you expect to see. For instance, the sink may have been cleaned. That does not mean it was not there; it is just not in that specimen. Without any other hypothesis, there is a probability. They could not confirm it, but there is no other available explanation.[426]

548. It was put to Ms Evans that there are two other explanations put forward in submissions by NHS GGC. One is that the nature of the population from which the cohort came was from Glasgow, which has high urban deprivation. Ms Evans considered that she was not experienced enough to know if that was a factor.[427]

549. It was put to Ms Evans that the other explanation is that it could be the case that what you were seeing was a larger, but not surprising, increase in infections passed between patients or translocated from guts and the CNR is simply assuming a link. Ms Evans explained that translocation would show other symptoms like raised temperatures or pain. She noted that there was an absence of other hypotheses.

550. The CNR answered the question as to whether there is a link between infections in the patients and the environment by giving the number of cases more likely to be linked to the environment than not. The CNR cannot confirm a definite link to the environment, but in terms of probability, more likely than not more than half of the children were linked to the environment.

Assessment of Witness

551. Ms Evans has a wealth of experience in infection prevention and control. She has worked in this area since 1997 in a variety of locations and institutions in England

[425] Gaynor Evans, Transcript, page 92 to 94.
[426] Gaynor Evans, Transcript, page 94 and 95.
[427] Gaynor Evans, Transcript, page 95 and 96.

and Wales. Ms Evans brought that considerable experience to bear as part of the Case Notes Review panel. As part of that panel, Ms Evans assisted in conducting a review of patient files to determine the origin of paediatric patient's infections. She did so with two other equally qualified individuals, whose various experiences complimented each other.

552. Ms Evans gave her evidence to the Inquiry in a straightforward and plain manner. She was clear as to the limitations that one could place on the work of the CNR. She was clear as to what the remit of the CNR had been, and how the CNR had carried out its work. Ms Evans provided great assistance to the Inquiry in this regard, and by being able to comment on other reports which had been done into similar topics, such as the report by HPS from 2019, or the clinical review undertaken by Sandra Devine. By doing so, Ms Evans was able to assist the Inquiry in putting these reports into their proper context and in being able to differentiate those works from that of the CNR.

553. Ms Evans always sought to assist the Inquiry. She asked the questions which were put to her in an independent and clear way, which assisted the Inquiry in contextualising many of the issues for which the Inquiry is concerned. In those circumstances, the evidence of Ms Evans was credible and reliable.

Professor Mark Wilcox - 29 October 2024

554. Professor Wilcox adopted his statement which is incorporated into the Witness Bundle for the week commencing 29 October 2024 (vol 11), and also his supplementary statement which is incorporated into the Witness Bundle for the week commencing 04 November 2024 (vol 12). He is a Professor of Medical Microbiology at the University of Leeds where he holds the Sir Edward Brotherton Chair. He also holds positions at the Leeds Teaching Hospitals, which are affiliated to the University of Leeds, and works two days a week for NHS England as an anti-microbial resistance and IPC expert.[428]

555. Professor Wilcox adopted his principal statement[429] and his supplementary

[428] Professor Mark Wilcox, Transcript, page 101 and 102.
[429] Witness Bundle, Volume 11, Document 3.

statement[430]. He also adopted the Overview Report of the CNR[431] as part of his evidence.

Location of the reasoning of the CNR on infection link

556. Professor Wilcox explained that the rationale for any conclusion of the CNR about the probability of an infection lies within the individual case records and their assessment for each of those records. There would be another source via the letters sent to each of the families, copies of which were sent to NHS GGC, if, and only if, the families agreed. He did not know who did or did not agree. He confirmed that there was no automatic transmission of those letters to NHS GGC.[432]

Whole Genome Sequencing ('WGS')

557. Professor Wilcox was asked about the way that WGS was dealt with in the report of the CNR[433]. He explained that he has been practicing as a consultant for nearly 30 years, and the last 15 to 20 of those, as the technique became available, he became used to using it. He has authored papers on the subject in the New England Journal of Medicine and the Lancet.[434]

558. He described how data can be used as the ultimate fingerprinting technique to determine relatedness, and one is interested in exploring any of the data available. He met with personnel from NHS GGC during the CNR, such as microbiologists (including Professor Leonord) to view their WGS data.[435] It should be noted that Professor Leonord's evidence about this report can be found in Chapter 5 in the narrative at it relates to the IMT of 11 October 2019.

559. Professor Wilcox was able to discuss his views of Professor Leanord's work on Enterobacter, Cupriavidus and Stenotrophomonas. He explained that in turn with the three groups of microorganisms, he had been through the data available to look at the robustness of the analysis carried out. The most convincing evidence of a

[430] Witness Bundle, Volume 12, Document 1.
[431] Bundle 6, Document 38, Page 975
[432] Professor Mark Wilcox, Transcript, page 102 and 103.
[433] Bundle 6, page 1069, paragraph 8.3.1.
[434] Professor Mark Wilcox, Transcript, page 104 and 105.
[435] Professor Mark Wilcox, Transcript, page 105.

relationship between the environment and patient infection was for Cupriavidus. For the other two groups, there were issues with the analysis that means that it is not possible to conclude with any certainty that the environment is not linked to the infections.[436]

560. He disagreed with the conclusion by Professor Leanord that, by analysing the relationships between isolates from patients and the environment, one can draw a conclusion as to how closely related the samples are and then draw another conclusion that there is not a connection. There are some very clear omissions, drawbacks, and limitations as to how analysis was performed[437]. He noted that the first issue is whether one has fingerprinted all the relevant isolates at your disposal. If one looks at Stenotrophomonas, a third of isolates causing infections, 8 of 23, were not included in the analysis[438].[439]

561. Regarding Professor Leanord's report[440], Professor Wilcox noted that it contained a Maximum Likelihood Tree, which is essentially looking at the relatedness of isolates from humans and various environmental, predominantly water, samples. If the samples are all related there would be a line next to the text and only one vertical line saying it is closely related. As one moves further away from right to left you have groups that are less or more connected. The higher you go up, the less connectedness there is. There is a greater number of genetic differences. For instance, Professor Wilcox looked at SMG-20-165 in the tree. He noted that the one immediately below that was very closely related. Then one can look at how related they are to other basement tank isolates, or human isolates. The more that you must go to the left to find the joining point, the less connected they are.[441]

562. Professor Wilcox stated that in the CNR report there were 84 different isolates of Stenotrophomonas[442] obtained from a variety of sources, some from patients, and some from different environmental factors. These are the same 84 as are contained in Professor Leanord's report. He knows from the review that there were 23

[436] Professor Mark Wilcox, Transcript, page 105 to 107.
[437] Bundle 6, page 1070.
[438] Bundle 6, page 1071.
[439] Professor Mark Wilcox, Transcript, page 107 and 108.
[440] See Bundle 6, page 1218.
[441] Professor Mark Wilcox, Transcript, page 108 to 111.
[442] Bundle 6, page 1071.

Stenotrophomonas infections in children. Only 15 of those Stenotrophomonas from the 23 children were included in Professor Leanord's analysis. If one looks at the dendrogram[443] and counts the ones highlighted, you see 25, but only 15 were from the CNR cohort. One third are not within the cohort. He explained that they could be other children, adults or from other hospitals.[444]

563. Professor Wilcox does not recall why the concerns about the analysis of Professor Leanord were not detailed at this level of detail in the CNR Overview Report. He did not remember if he had as detailed a copy of the figure at the time. On one level, it was beyond their remit, but at another not. Regarding his concerns, Professor Wilcox explained that it is well known that drains in hospitals can be a source of contamination and infection, such as gram-negatives. He explained that the peak of Stenotrophomonas was in 2018 where there were 12 infections. Of the drain isolates considered in Professor Leonord's work, none came from 2018. Only eight were from the relevant wards. In 2018, only two samples, from shower mixers, came from the cohort wards. Professor Wilcox stated that was the total isolates from water sources on the wards in 2018 when there were 12 infections in that year, clustered together. That is why he concluded that it is not possible to exclude that water being related to any of the 12 bloodstream infections that occurred in that year.[445]

564. Professor Wilcox explained that he had a greater level of confidence in the work in respect of Cupriavidus. There is the information in the CNR report, and IMT information, which inferred that the same strain was obtained from a water source where a patient had been briefly. The patient went on to get a bloodstream infection. Professor Wilcox noted the peer reviewed report from NHS GGC authors about Cupriavidus relationship between water sources and infection. He also noted another report in relation to M. Chelonae. However, in respect of Cupriavidus, out of 263 isolates taken, only 18 made it into the whole genome sequencing. He was clear that the analysis was limited due to the lack of samples from the key place and time.[446]

565. Professor Wilcox did consider that Professor Leanord's exercise established that

[443] Bundle 6, page 1218.
[444] Professor Mark Wilcox, Transcript, page 112 to 115.
[445] Professor Mark Wilcox, Transcript, page 115 to 117.
[446] Professor Mark Wilcox, Transcript, page 118 to 120.

there was not a single strain. However, the premise that there would be a single strain responsible for all the infections and the contamination is naïve. Biofilms are effectively collections of organisms. As such, it is far more likely that if a system is colonised and if that contamination went on to cause infections, you would see a range of organisms causing the infections; both genus and species.[447]

566. Regarding Enterobacter, Professor Wilcox explained that it seems Professor Leonord undertook an analysis of 42 isolates[448]. Only 6 came from the environment. He also noted that there are two IMTs referred to in the report; one in 2018 and one in 2019. One said the water was the source (i.e., the drains), yet there is a grand total of 6 environmental isolates. Given that there is such a small number, it would be incredibly good, or bad, luck to match one of the 6 isolates with any one of the 36 patient isolates. Professor Wilcox said that the needle in a haystack analogy was pertinent. He stated that you were not going to find a match, but the fact that you do not does not exclude a working hypothesis of the contamination from the water causing infections in patients.[449]

567. Professor Wilcox explained that, if you knew nothing else about the cases, but the Enterobacter was involved in 27 infections, he would not expect one Enterobacter strain to be responsible across five years.; he would expect multiple types of Enterobacter. In a contaminated system, you would expect many different types over time. If one looks in the literature where people have sequentially sampled water or drain samples, you will find a variety of different organisms across genera and species. He stated that it was a microbiological zoo in the water.[450]

568. It was put to Professor Wilcox that Dr Crighton took the view that whilst a lack of typing doesn't rule out infection, it makes it less likely. Professor Wilcox stated that it would be perverse to claim that data had no value in refuting that hypothesis. His point was such are the limitations that it only gives a very limited refutation to the hypothesis. It in no way goes a long way to excluding the environment as a

[447] Professor Mark Wilcox, Transcript, page 120 and 121.
[448] Bundle 6, page 1070.
[449] Professor Mark Wilcox, Transcript, page 122 and 123.
[450] Professor Mark Wilcox, Transcript, page 123 to 125.

source.[451]

Sampling Picks

569. It was put to Professor Wilcox that one issue that had come up in the Glasgow III hearing was that at some point you have to pick the colony off the plate and decide what to analyse and there seemed to be debate about how many colonies should be picked off a plate for analysis. Professor Wilcox explained that this is one sample at one time point, and then you are growing 24-72 hrs down the line from that. There will be several colonies growing on a plate. Taking one colony is certainly not sufficient to say you have a representative sample of the 100 colonies growing. The greater number of colonies that are growing, the greater number you need to pick off to have confidence. To convince one's peers, you'd expect at least a double-digit number of colonies picked off the plate.[452]

570. Professor Wilcox described that if what you were taking was a clinical sample from a patient, one would normally see one type of bug in the blood. In that context you can just pick one. When you move to environmental samples, because of the zoo analogy, by inference one would need more picks if you want to see if there is anything else there.[453]

Stenotrophomonas

571. Professor Wilcox was asked about the 14 Stenotrophomonas cases that were listed by the CNR in the most likely category[454]. Professor Wilcox explained that the peak of environmental connection was in 2018, with 12 cases. However, in 2015 there were none. To see that is significant, you just must look at those numbers in time and place. It was unlikely to be a coincidence that a relatively uncommon organism is present. Professor Wilcox noted that a lot of the 12 cases were clustered into one week or month. That is a red flag. One of the criteria for determining how likely the CNR judged the connection with the environment was clustering in time and place.

[451] Professor Mark Wilcox, Transcript, page 125 and 126.
[452] Professor Mark Wilcox, Transcript, page 126 to 128.
[453] Professor Mark Wilcox, Transcript, page 128 and 129.
[454] Bundle 6, page 1045.

With Stenotrophomonas, what one sees is a cluster.[455]

572. Professor Wilcox indicated that there must be an explanation for the extremely marked clustering seen in the samples. There are other clear clusters in time and place. Clustering is either very bad luck or there is an explanation. If one sees symptoms of leaky gut, then you are building up evidence against the environment as a potential source. However, this does not represent absolute proof. Professor Wilcox explained that routine IPC analysis on a day-to-day basis is based on time, place and person, which is the golden rule about how one sets a hypothesis and then tries to refute that hypothesis. He opined that there are too many pointers for clusters to refute with any confidence a relationship with environmental contamination.[456]

573. Professor Wilcox was asked about his criticism of the lack of before and after systematic sampling around the time of fitting the ClO_2 system. Professor Wilcox stated that this was a prime opportunity to look at before and after of the effectiveness of that intervention. If you don't take the opportunity, you just do not know. There was no systematic sampling.[457]

NHS GGC Comments on the Draft Report[458]

574. Ask about NHS GGC receiving the report in draft, without the individual analyses, Professor Wilcox responded that he could understand the frustration that they did not have access to all the material. However, the CNR spent 18 months doing the analysis. They had to do the analysis and review three times because of the problems with the supply of data asked for. Professor Wilcox considered that the analysis was extremely thorough, and at least two of the IMTs concluded that water contamination was believed to be responsible for infections. He does not think it could have been a surprise that the review potentially implicated the environment when the IMTs had done the same. He also noted that NHS GGC went on to move patients from two wards, treat the whole water system, try to decontaminate drains as well as bringing in expertise. He was clear that you do not do that if you do not

[455] Professor Mark Wilcox, Transcript, page 131 and 132.
[456] Professor Mark Wilcox, Transcript, page 132 to 134.
[457] Professor Mark Wilcox, Transcript, page 141 to 143.
[458] Bundle 27, Volume 6, Document 25, page 245.

suspect an environmental link.[459]

575. Professor Wilcox explained that there are other things one could have done if you were only mildly suspicious that the environment was involved. NHS GGC could have set up a systematic sampling system which would have looked in more detail daily or weekly for a period, and then intensively examined those samples to give confidence the samples were not contaminated. They did not do that. The CNR report was critical of the lack of systematic water sampling. However, getting historical samples and analysing them is piecemeal by nature. You must recognise the limitations of what you have done.[460]

576. Professor Wilcox did not know about the level of resources given to the estates team when the hospital opened. He did not recall seeing the DMA Canyon reports. He also did not receive any information about where the responsibility lay for deciding the water testing levels between the LICD, the Water Safety Group, or the Head of Estates.[461]

Resourcing of the ICD Team

577. The opportunity was taken to ask Professor Wilcox about the levels of resourcing in NHS GGC in terms of ICD sessions. It was put to him that the Inquiry had heard evidence from Dr Inkster that when she was LICD, she had 10 sessions, including 5 as LICD for the whole health board. There would have also been sector ICDs. Professor Wilcox stated this was not enough sessions for a LICD, but that it was not beyond what one would see to this day in large hospitals. It was the same order of magnitude in the Leeds Children's Hospital.[462]

Possible Comparative Epidemiology

578. It was put to Professor Wilcox that there has been a criticism made of the work of the CNR by Dr Armstrong, that a weakness of the approach is that the work was done without looking at a comparator hospital. Professor Wilcox explained that their brief started with the Minister. However, the CNR did go further than simply looking at

[459] Professor Mark Wilcox, Transcript, page 134 and 135.
[460] Professor Mark Wilcox, Transcript, page 136 to 138.
[461] Professor Mark Wilcox, Transcript, page 138 and 139.
[462] Professor Mark Wilcox, Transcript, page 139 and 140.

each case. In any event, he wanted to know where you would get the data from to do a comparison because you need to have a similar case mix. NHS GGC is a regional referral centre. There is not another centre of that size in Scotland. You would need to go to England. The CNR had no access to do that. Even if it had, finding another unit that had an identical case mix, or similar case mix, would be a tall order. The interventions that happened in Glasgow, such as the use of prophylaxis, pre-treating patients with radiotherapy, represented a variety of variables. He explained that the scientifically sound way of doing it would be to use a propensity matrix. You look at the risk factors and try to adjust the data to take account of risk factors for infection. However, you can only adjust for the risk factors you know about.[463]

579. Professor Wilcox explained that in his opinion one need to look qualitatively and quantitatively at the numbers. You would work out the rate in NHS GGC, and the rate in another place, just looking at gram-negatives. You would need to look at which gram-negative infections you see. He noted that some risk factors could drive down some gram-negatives but possibly encourage others. However, you must look amongst the infections to see if a particular organism is overrepresented. Professor Wilcox stated that this was not their brief and that they had no access to the data needed.[464]

Potential role of Meropenem resistance

580. It was put to Professor Wilcox that one of the things Professor Leanord raised was an observation that Meropenem resistance might have caused an increase in some infections. Professor Wilcox described that it was plausible that microorganisms could select, but getting an excess of blood stream infections is a bit more tenuous. He noted that you would not expect the clustering in 2018, which then goes away because the selection pressure from resistance would still be there. Further, if the infections were in the patients' own flora, you would not expect clear clusters in time and place. If that did happen, it is feasible to get clustering in time and place, but when you typed those organisms, you would expect to find the same strain. What we

[463] Professor Mark Wilcox, Transcript, page 143 to 146.
[464] Professor Mark Wilcox, Transcript, page 147 to 149.

can see is more analogous to organisms coming from a more diverse population.[465]

Discussion of whether certain bacteria have an environmental source.

581. Professor Wilcox explained that gram-negative bacteria like warm, wet conditions like plug holes and pipes. You do not find them on dry skin. So, if one is looking for an environmental source of gram-negative bacteria, one would naturally hypothesise it would be water type sources. Bugs have very preferred habitats.[466]

582. Professor Wilcox was asked if the CNR assumed there was an environmental source. He stated that their remit was to examine the cohort of cases and determine if they could deduce a likely link to the environment. He accepted that there is a risk of an assumption in the remit. He liked to believe that the CNR Expert Panel were natural sceptics and looked for reasons to reject a hypothesis.[467]

Interactions with Whistleblowers

583. Professor Wilcox was asked about why the thought the CNR Expert Panel had to be careful in their interactions with the Whistleblowers.[468] He stated that one must be cautious in giving and receiving information in a Whistleblowing context.[469]

584. Professor Wilcox explained that when the report of the CNR noted gaps in information, that was all drawn from the documents and not from interviews with senior members of the board of NHS GGC. They were not being briefed. He was upset when he was told that key staff involved in IPC at NHS GGC felt that they had been denied access to water sampling and testing information despite multiple requests. He had never come across a colleague telling him that they had been denied access to core information to enable them to do their job.[470]

Environmental Link

585. It was Professor Wilcox's opinion that the Inquiry was unlikely to get to absolute

[465] Professor Mark Wilcox, Transcript, page 149 to 151.
[466] Professor Mark Wilcox, Transcript, page 151 to 153.
[467] Professor Mark Wilcox, Transcript, page 153 and 154.
[468] Professor Mark Wilcox, Witness Statement, page 99, para 75, Hearing bundle page 99.
[469] Professor Mark Wilcox, Transcript, page 154 to 156.
[470] Professor Mark Wilcox, Transcript, page 156 and 157.

proof. One must weigh up the evidence and make a conclusion. The CNR undertook an iterative process to try to ascribe a level of certainty around whether the environment was or not involved per case. Early on in that process, they were possibly over ambitious. It was done with good intentions to try and at least record real time the relative degrees of certainty or uncertainty in their conclusion per case. In the report they then condensed some of the six groups.[471]

586. When asked about the balance of probability Professor Wilcox concluded that 'probable' is 51% or above. Probable means that the CNR were concerned sufficiently that it was more likely than not connected to the environment.[472]

Opinion of management of major incident

587. It was explained to Professor Wilcox that the Inquiry had heard evidence from Dr Inkster that early in 2018 she had suggested there should be some sort of executive control group sitting above the IMT to make key decisions. When the Ward 2A decant happened in September 2018, there was evidence of a group of executive members making the decision to go ahead with the decant. When there was a small decant in 2019, there was some evidence of a meeting where an IMT decision was discussed with executive members. Regarding the connection between IPC and management, Professor Wilcox explained that you would expect some key individuals in the IMT process to be part of the managers group. Otherwise, how can the managers make a truly informed decision based on the facts. If that was not the case, he had a fundamental problem with that. The whole point of a robust system is that the IMT should be capable of managing the incident or escalation. To have another group between the IMT and the board seems odd.[473]

Key Question 4

588. Asked about his opinion on whether there was a link between the environment and the infections in the CNR cohort, Professor Wilcox concluded that the evidence suggests strongly that the clustering in time, person and place, and 2 or 3 species, is strongly suggestive of a link between some aspects of the environment, almost

[471] Professor Mark Wilcox, Transcript, page 159 and 160.
[472] Professor Mark Wilcox, Transcript, page 160 and 161.
[473] Professor Mark Wilcox, Transcript, page 162 to 164.

certainly waterborne, and some of the infections that occurred in children.[474]

Assessment of the Witness

589. Professor Wilcox has worked in microbiology for nearly 30 years. He has a wealth of experience which he brought to both the CNR and to his evidence to the Inquiry. He was a straightforward witness who answered the questions that he was asked in an honest and robust manner. He was forthright in his views yet was willing to accept the limitations of the work that he and his colleagues carried out, and the limitations of the conclusions that they reached.

590. He gave his evidence in a clear and comprehensible manner. He clearly understood and took seriously his role as an independent expert. Professor Wilcox was a credible and reliable witness whose evidence in particular areas filled in gaps in the Inquiry's knowledge in very helpful ways.

[474] Professor Mark Wilcox, Transcript, page 165 and 166.

4. INFECTIONS AND MITIGATION OF INFECTION RISK

1. The Closing Submissions of Counsel to the Inquiry following the Glasgow II hearing included a chapter entitled 'Infections and mitigation of infection risk', which focused the Inquiry Team's understanding of the risk of infection within the Schiehallion patient cohort. This chapter develops that discussion in light of the evidence in Glasgow III. It necessarily attempts to understand risk of infection with reference to both the wider group of immuno-compromised and organ transplant patients that includes adult patients in Wards 4B and 4C and the Cystic Fibrosis patients in the QEUH, but also any infection risks that might arise to staff and other patients from patients with infectious diseases.

2. Like its predecessor following Glasgow II, this Chapter considers the types of infections and how they are described and classified; the response of clinicians to infections and how risk should be understood, assessed and mitigated.

3. Given the focus of the Inquiry is on whether patients in the QEUH/RHC have had infections which are caused or have a connection to the built environment of the hospital, it is now clear that the focus will be on the species and genera of bacteria and fungi that might prosper in water and ventilation systems and could give rise to those infections.

4. Whether that causal link or association can be made is for later Chapters, but any discussion of those species and genera of bacteria and fungi also requires an understanding of how vulnerable patients might be exposed to infections. The Inquiry has required to understand the difference between endogenous and exogenous infections and recognise the impact that has on the process by which understands infections in vulnerable patients are understood.

5. Endogenous infections are caused when bacteria or fungi which are present on the patient's skin, or within their mouth, nose, gut or urinary system, cause an infection in the patient – quite often in the blood stream[475]. A commensal infection is an infection which has its roots in organisms that have been living on the patient's skin. An enteric infection has its source from within the patient's own intestine, where there

[475] Dr Sastry, Witness Statement paras 39-41

has been a breakthrough from the gut into the blood stream, perhaps due to the weakening of the gut lining as a consequence of treatment.[476] In contrast an exogenous infection has a source that is external to the patient[477]

6. Most of the infections that are of interest to this Inquiry are blood stream infections ('BSI') which, when caused by a bacterial infection, are described as bacteraemia. The Inquiry was provided by NHS GGC with a data set of all BSI blood culture samples at the QEUH/RHC from 1 January 2015 to 31 December 2022, which was then supplied to Mr Mookerjee, Dr Mumford and Ms Dempster. A similar data set was obtained by the CNR for their use.[478] However, whilst the Inquiry's experts and the CNR have focused on BSIs, bacterial infections take root in other parts of the body. Examples include urinary tract infections, respiratory infections and infections suffered by Cystic Fibrosis patients, caused by bacteria such as Burkholderia cepacian, within biofilms that form in their lungs[479].

7. The particular species and genera of bacteria that have been mentioned and discussed have been assessed by various authors to fall into a number of different categories, with a varying level of agreement amongst witnesses and authors of reports about the scope of the groups and the extent that they can be said to have a prospect of being connected to environmental sources of infection.

8. The primary division amongst the bacteria is between Gram-Positive Bacteria and Gram-Negative Bacteria. Although the distinction arises from the difference in the way the two groups respond to staining in the laboratory, there was evidence in Glasgow II about the distinction between these two groups. Evidence in Glasgow III has helped further refine the Inquiry's understanding.

4.1 Gram-positive Bacteria

9. In Glasgow II Professor Gibson explained that, most commonly, line infections are caused by gram-positive bacteria. Some gram-positive organisms naturally inhabit the skin. They may make their way from the skin into the bloodstream during line

[476] Professor Mike Stevens, Transcript, Page 14
[477] Professor Brenda Gibson, Transcript, Page 15.
[478] CNR Overview Report: Bundle 6, Document 38, para 3.3.2 at page 1010
[479] Dr Inkster, Transcript, Day 2, Page 113

insertion procedures. Good hand hygiene and line care can help to reduce the risk of these infections but will not eradicate that risk entirely[480]. If a line infection is caused by a gram-positive bacterium, a patient may become unwell but treatment with antibiotics is often successful. It may not be necessary to remove the central line[481].

10. It is however not the case that all gram-positive bacteria have an endogenous or commensal source. The Inquiry has heard substantial evidence in Glasgow II about Mycobacterium chelonae, which (as discussed within the narrative in Chapter 5) caused infections in three patients (in 2016, 2018 and 2019), prospers in water supplies and is, seemingly, not well controlled by Chlorine Dioxide dosing systems. There were also cases of Mycobacterium abscessus in the Cystic Fibrosis population in the summer of 2017, which was thought at the time to require decontamination of respiratory equipment.[482]

11. Dr Mumford explained that whilst there are gram-positive bacteria which are related to, or can be related to, the environment and water the gram-positive bacteria that are not so connected are much more numerous than the ones that are. The group is too diverse to make possible a generalised statement about environmental connection. She did accept that there is a slight element of gram-positive bacteria being associated with dry and hard surfaces and that gram-positive bacteria are more likely to be seen in a cross-infection episode.[483] Dr Mumford went on to explain that if your primary source of infection is in the central line, they will tend to be more gram-positive than gram-negative.[484]

12. That seems to be why in general rates of Gram-Positive Bacteraemia are seen to be best tackled by improvements of practice in line care.

4.2 Gram-negative bacteria

13. In Glasgow II clinicians explained that Gram-negative infections can have an endogenous or exogenous source, but that a number of gram-negative infections are

[480] Witness statement of Professor Brenda Gibson, para. 26; witness statement of Dr Shahzya Chaudhury, paras. 133 – 134.
[481] Witness statement of Dr Anna Maria Ewins, para. 244.
[482] IMT Minute, 20 July 2017: Bundle 1, Document 10, Page 42
[483] Dr Mumford, Transcript, Day 2, Pages 60-63
[484] Dr Mumford, Transcript, Day 1, Page 95-96

frequently associated with water and with soil[485]. In Glasgow III Dr Mumford explained the idea that Gram-negative bacteria have the potential to come from the environment is true, but not the whole story.[486] The Inquiry has now been able to see a nuance within the material that some gram-negative bacteria are described as being "environmental" in nature. This is most clearly seen from the various groupings of bacteria within the four HPS epidemiological reports and SBARs in 2019. That is:

- Appendix 4 to the HPS Situational Assessment RHC Wards 2A 2B Draft – 5 June 2019.[487]
- HPS SBAR: To support NHS GGC IMT Mycobacterium chelonae cases and the Incidence of gram-negative bacteraemia in the paediatric haemato-oncology, September 2019[488]
- Draft HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019.[489]
- HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019 - 29 November 2019.[490]

14. In each report descriptive epidemiology is applied to numbers and rates of BSI for groups of particular species and genera of bacteria described variously as 'Environmental'[491], 'Non-Environmental'[492] and 'Environmental including Enteric ENT'[493]. As Dr Mumford and Ms Dempster explained[494] it is the rate of bacteraemia in that latter group that may well be the one that this Inquiry should focus on as it and, perhaps unsurprisingly, it most closely matches the selection gram-negative blood stream infections considered y Dr Mumford, Mr Mookerjee and Ms Dempster

[485] See, for example, the transcript of evidence of Dr Dermot Murphy, p.73.
[486] Dr Mumford, Transcript, Day 1, Page 61
[487] Bundle 7, Document 5, Page 205
[488] Bundle 3, Document 16, Page 127
[489] Bundle 7, Document 6, Page 214
[490] Bundle 7, Document 7, Page 250
[491] Bundle 7, Document 5 at 205 and for a slightly different group of bacteria Bundle 7, Document 6 at page 219, Bundle 7, Document 7 at page 255 and Bundle 3, Document 16 at page 127.
[492] Bundle 7, Document 5 at 205
[493] Bundle 7, Document 6 at page 219 and Bundle 7, Document 7 at page 255
[494] See discussion of their evidence in Chapter 7.4

and the list of infections considered by the CNR.

15. If it is the case that the Inquiry should be looking at rates of infections that include bacteria such as Enterobacter and Klebsiella in a group named 'Environmental including Enteric ENT', there must be recognition that some of these infections will be both enteric and endogenous and therefore not related to the environment. This issue is best considered by remembering that, when a patient is found to have a gram-negative environmental, including enteric, bacteraemia, the primary focus is not on tracing a potential source of infection but treating the patient. As Dr Mumford put it when asked how to determine which Klebsiella infections were enteric, and which were environmental, [495]

> "You could only do it with clinical input and you would need the clinical input from the clinicians caring for the patients in order to be able to distinguish between the two. But interestingly, in all of the IMTs, it was hardly mentioned anywhere that a particular patient was thought to be a translocation rather than related to the environment."

16. Ms Dempster took a similar approach and reminded the Inquiry that the clinician looking after the child would make a clinical assessment of whether there was a gut translocation.[496]

17. When considering whether infections were enteric and endogenous we should not forget to ask whether the treating clinicians saw the infection as enteric and endogenous or whether they were looking more widely for ideas of a source and so the infection made it onto the agenda of IPCT and into a PAG, an IMT and a report to HPS/ARHAI.

18. The consistent evidence from the treating clinicians in Glasgow II was that gram-negative infections may not only be more difficult to eradicate but that they may also pose a greater danger to patients than gram-positive infections. Some gram-negative bacteria produce a biofilm that "sticks" to a line and prevents the penetration of intravenous antibiotics[497]. Flushing the line risks flushing the bacteria through the

[495] Dr Mumford, Transcript, Day 1, Page 71
[496] Ms Dempster, Transcript, Day 1, Page 79
[497] Witness statement of Professor Brenda Gibson, para. 26. Witness statement of Dr Anna Maria Ewins, para. 246.

patient's body (described as a "septic shower")[498]. The bacteria themselves can be resistant to antibiotics. Often, with such an infection the line has to be removed.

19. Gram-negative infections have the potential to make patients suddenly and severely unwell. They can cause rapid and unpredictable deterioration, requiring resuscitation and intensive care intervention[499]. An endotoxin producing gram-negative bacteria can cause the blood pressure to drop catastrophically, resulting in cardiac arrest[500]. Dr Murphy vividly described how, when on call, his fear is that a child will develop gram-negative sepsis.

20. In Glasgow III we had the benefit of the evidence of the Chair of the CNR Expert Panel, Professor Mike Stevens. Professor Stevens is an experienced paediatric haemato-oncologist and his evidence in this area is important. He was asked how a clinician would identify a patient with an enteric infection, and he explained that one "would look for evidence of damage of the mucosa of the gastrointestinal tract starting at the mouth and going to the anus, … children with severe mucositis – that's ulcers and soreness of the mouth and throat – patients who develop abdominal pain; sometimes, in severe infections, abdominal distention, … a radiological change that suggests that there is a serious inflammation of the gut mucosa, diarrhoea." He was clear that this "constellation of clinical signs and symptoms" would enable one to work out whether a child had an enteric infection.[501]

21. Not only are these clinical signs and symptoms profoundly significant for the patient, but the fact that they can and do exist as a real sign of enteric and endogenous infection is something that the Inquiry must take into account when considering the submission made by NHS GGC in respect of potentially enteric infections.

22. NHS GGC have made a specific submission that, for Klebsiella infections, "colonisation is significantly more likely to be the source"[502]. The logic expressed ignores the reality that the treating clinicians for patients with Klebsiella BSIs that ended up being considered by IMTs were at IMT meetings and were part of the IMT.

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498 Witness statement of Angela Howatt, para. 25.
499 Dr Murphy, Transcript, Page 112
500 Witness statement of Dr Anna Maria Ewins, para. 245
501 Professor Stevens, Transcript, Pages 14-15
502 NHS GGC Positioning Paper, April 2023 at para 61, Bundle 25, Document 10 at page 362.

It surely has to be presumed that if those signs of gut breakthrough that Professor Stevens described had been there, the clinical team would have (a) noticed and (b) said so at the time. To argue that academic research suggests that many Klebsiella BSIs are enteric in origin, and that one can presume that those Klebsiella BSIs suffered by these children are also enteric in origin unless the contrary be proved by WGS, is to discount and ignore the actions of NHS GGC's own treating clinical teams.

23. The same logic applies to the other potentially enteric bacteria, such as Citrobacter, Enterobacter, Pantoea and Serratia.

4.3 Fungal Infections

24. In Glasgow II Professor Gibson explained that fungal infections are difficult to diagnose, with treatment often being empirical in nature[503]. The evidence was clear that airborne fungal infections, particularly Aspergillus, present a significant risk to immuno-suppressed patients[504]. Dr Murphy explained that fungal infections tend not to result in acute deterioration but the consequences for a patient can still be devastating. Professor Gibson noted that fungal infections in particular may significantly interrupt treatment because of the need to maintain a neutrophil count[505]. For this reason, a range of mitigations are put in place to reduce the risk of these infections, including the use of anti-fungal prophylaxis[506]. As discussed in the narrative in Chapter 5, significant harmful impacts can occur when vulnerable immuno-compromised patients cannot be prescribed anti-fungal prophylaxis and are placed in rooms without HEPA filtration of supplied air.

25. The authors of Appendix 4 to the HPS Situational Assessment RHC Wards 2A 2B Draft – 5 June 2019,[507] looked at infection rates for Candida and Rhodotorula fungal infections without identifying any particular change to the rate of infections. As discussed in Chapter 7.3 rates of infections in a slightly wider group of fungi were included in Mr Mookerjee's work.

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[503] Professor Brenda Gibson, Witness Statement, Para 177
[504] Dr Alastair Hart, Witness Statement, Para 31
[505] Professor Brenda Gibson, Witness Statement, Para 31
[506] Dr Alastair Hart, Witness Statement, Para. 32.
[507] Bundle 7, Document 5, Page 205

26. Cryptococcus is a yeast found in soil throughout the world, particularly soil contaminated with pigeon guano. Infection is acquired by breathing in fungal particles, sometimes causing a latent infection that may be re-activated if the individual becomes immuno-suppressed, causing pneumonia. Cryptococcal meningitis has a mortality rate of up to 30%. The small size of the spores means that it can only be blocked by HEPA filters. It is rare in the UK and very rare amongst non-HIV patients.[508]

27. Aspergillus fumigatus is a fungus found widely in the environment. Infection is by an airborne route and commonly presents as a pneumonia. Usually, only people who are immuno-compromised or have chronic lung conditions are at risk from aspergillosis. It is capable of surviving in drinking water, can survive in stagnant water and forms biofilms in water systems. The formation of biofilms is thought to contribute to the ability of the fungus to cause disease and contributes to resistance to anti-fungal therapies. [509] Aspergillus is often linked to building works and demolition. Use of HEPA filters is a recognised control.[510]

4.4 Hospital Acquired Infection (HAI) or Healthcare Associated Infection (HCAI)?

28. In both the Glasgow II and Glasgow III hearings the Inquiry has heard a substantial amount of evidence about the differences between Hospital Acquired Infections (HAI) and Healthcare Associated Infections (HCAI). Whilst these have important defined meanings for the national reporting systems run by NHS NSS, and it is clear that NHS NSS has a strong and clear interest in preserving the integrity of these defined terms, it is submitted that they are not particularly helpful to the work of the Inquiry.

29. Before explaining why that should be the case, there is value in explaining what these two defined terms mean or at least what they are supposed to mean. In the Glasgow II hearing the precise difference between these terms and the related acronyms (HAI and HCAI) was not always stated with precision. As Dr Murphy noted, the definition of these two categories is difficult and can vary depending on the material consulted[511]. Following Counsel to the Inquiry's Closing Submission in

[508] Quantitative Report of Dr Mumford and Ms Dempster, Para 10.1: Bundle 25, Document 4, p 168
[509] Quantitative Report, Para 10.29: Bundle 25, Document 4, page 172
[510] Para 5.8 at page 625 Report of Mr Bennett: Bundle 25, Document 8, Para 5.8 at page 625
[511] Transcript of evidence of Dr Dermot Murphy, p.68.

respect of Glasgow II, NHS NSS referred the Inquiry Team to Chapter 3 of the National Infection Prevention and Control Manual (NIPCM) for a list of case definitions to be applied to incidents and/or outbreaks. This is a constantly evolving document, but a relatively recent edition was produced in Bundle 27, Volume 4 as Document 16. In essence a hospital or Healthcare Acquired Infection (HAI) is where a patient develops an infection having been in hospital for 48 hours or more, and a HealthCare Associated Infection (HCAI) is where a patient develops an infection having been in hospital for less than 48 hours but who had had a specified healthcare contact or intervention in the prior 30 days.

30. It is important to emphasise, as was explored in Glasgow II with Dr Murphy in respect of HAIs[512], that the term "HAI" or indeed "HCAI" does not indicate the hypothesised source of an infection. Rather, "HAI" or "HCAI" simply denotes a particular temporal correlation between an infection and a healthcare setting. It does not indicate that the source of an infection is the built hospital environment, although that may remain a possibility. Establishing the source of an infection is a different and altogether more complex exercise

31. The observation of the highly experienced CNR Expert Panel from outside the jurisdiction in Section 8.2.2.1 of the CNR Overview Report[513] is, it is submitted, particular apposite: "It is clear to us that the utility of the distinction offered by these two definitions is less informative in the clinical setting where, in addition to inpatient episodes, patients were attending for day care or outpatient appointments at the very high frequency seen in the patient group." That feature of the Schiehallion patient cohort in Wards 2A and 2B (and after decant in Wards 6A and 4B), is clear from the evidence of the Glasgow I and II witnesses and is well illustrated by the final set of admission data produced by NHS GGC for Mr Mookerjee. In 2017 there were 494 admissions to Ward 2A – a ward that only took in-patients – and 2266 to Ward 2B – the day unit.[514]

32. It is also notable that, with one exception, none of the epidemiological studies carried

[512] Dr Dermot Murphy, Transcript, pp.36-37.
[513] Bundle 6, Document 38 at page 88
[514] Bundle 21, Document 3, at page 88, Table 3

out at the time of these events[515] chose to focus only on HAIs and exclude HCAIs, presumably because infections in day case patients were something that the authors wished to consider. Rather strangely, the authors of the HPS Review from October/November 2019 noted that the case definition of NHS GGC's CLABSI dataset may have been excluding bacteraemia found within the first 48 hours of admission[516]. Unfortunately, this was not noticed by the Inquiry Team until after the close of Glasgow III, so questions could not be asked of Ms Devine or the Inquiry's own experts. Why it would be a good idea (if that is what occurred) to exclude patients who have a line infection less than 48 hours after admission, when such a high proportion of patients were day cases, is not obviously clear.

4.5 Community Acquired Infections

33. Infections acquired in a healthcare setting **may** fall to be distinguished from those acquired in the community or at home. In the evidence presently before the Inquiry, the latter appear sometimes to be referred to as community acquired infections[517].

4.6 Identifying, investigating and treating infections

34. There has been unanimity amongst witnesses both in Glasgow II and III that the broad shape of how infections are identified, investigated and treated is as follows:

- When a patient becomes unwell with an infection, there is a responsibility to establish what the infection is, its cause and what treatment is required. The treating clinicians have responsibility for treating an infection. ICDs, ICNs, microbiologists and biomedical scientists on the other hand have responsibility for monitoring, investigating and reporting infections. Blood samples are taken and analysed in the microbiology laboratory. If positive cultures are detected, microbiologists identify the virus, bacteria or fungus causing the infection and work with clinicians to identify the most appropriate treatment. Sometimes it will be necessary for the sample to be sent away to a reference or national laboratory. If the infection is thought to be endogenous, further investigation of a source is not usually required. If the infection is unusual, or caused by a rare organism, IPC

[515] The Eight Contemporaneous Epidemiological Reports described in Chapter 7
[516] Bundle 7, Document 6 at page 235
[517] Witness statement of Dr Jairam Sastry, paras. 39-41.

may decide that further investigation is required.

- The first stage of investigation is the formation of a Problem Assessment Group ("PAG"), comprising a small multidisciplinary team who will discuss the likely source of the infection. The NICPM does not actually require that a PAG always be established, as the need for a PAG is determined by whether a case definition described in chapter 3 of the NIPCM is met. This is an issue about which evidence was heard in Glasgow III and remains in dispute.

- An investigation may be escalated from the PAG to an Incident Management Team ("IMT"), if, for example, further infections occur or if there is a matter of particular concern, but this does not always happen.

- An IMT is a team and will likely have representation from a number of departments including, IPC, Estates and Facilities, clinicians and microbiologists. The objective of the IMT is to establish the source of the infection (or infections) and to put in place appropriate measures to remove the source of the infection or mitigate the risk. Clinical interventions may be informed by the discussions at the IMT.[518]

35. It seems clear from the evidence that the IMT and its Chair benefit from an amount of delegated authority to make decisions and recommendations relating to the incident under investigation, but it by no means clear that in the period from the opening of the QEUH/RHC to closing of the summer 2019 GNB IMT on 14 November 2019 the extent of that delegated authority was clear either to IMT Chairs (particularly Dr Inkster), other members of the IMT, NHS GGC managers or senior clinicians or HPS/ARHAI. Whilst it is clear that some major decisions were to be escalated to wider NHS GGC management, such as the Ward 2A decant, implementation of the Chlorine Dioxide dosing system, and the Ward 6A decant to the CDU, others did not seem to be – such as the decision to fit POUFs in February 2018 and the decision to close Ward 6A to new admissions before the IMT of 1 August 2019. The opinion evidence of Dr Mumford and Ms Dempster on the limits of the authority of the IMT chair in Chapter 7.4 are particularly apposite.

[518] NIPCM, Section 3.2.2 Bundle 27, Volume 4, Document 16 at page 178

36. The IMT minutes are taken to indicate a record of concerns raised and responses thereto. On most occasions when IMT minutes were put to witnesses, they agreed that the minutes were accurate. A note of caution was, however, sounded by Professor Gibson who thought that the minutes did not always capture discussions exactly as they happened[519] and there were clearly a number of disputes over IMT minute accuracy in August 2019 and at other times.[520] In their response to Counsel to the Inquiry's Closing Submission in respect of Glasgow II, NSS note that on occasion HPS had to ask that IMT minutes be changed to accurately reflect discussions,[521] and these requests for changes do appear in some minutes. It should be noted that the Inquiry Team had had access to the IMT and PAG minutes in Bundles 1 and 2 without reduction and on occasion these have been useful to illuminate matters further.

37. There was some dispute between Dr Inkster and Mr Walsh about changes to minutes, but after reflection it is submitted that there is no need for the Inquiry to resolve these disputes of detail. To deliver his remit and terms of reference the Chair does not need to go back and look at the various disputes over the minutes of IMTs. It is enough to note that the disputes exist as a further measure – if one is needed – of the tension that was building in 2019 within the IPCT and the wider response to infections in Ward 6A. It is submitted that the general approach of the Inquiry to the accuracy of IMT minutes should be to treat them as a broadly accurate record of what topics were discussed, what actions were taken and what information about events was reported to each IMT, but to be alive to the possibility that that at points they are not complete and (to give credit to Mr MacLeod who took most of the IMT minutes in Bundle 1 and was not called as a witness) were not ever intended to be minutes of a standard of formality that might be found in court minutes or formal meetings of companies and partnerships.

4.7 Risk of Infection to paediatric haemato-oncology patients

38. Clinician witnesses in Glasgow II emphasised that, as a consequence of the nature

[519] Professor Brenda Gibson, Transcript, Page 80
[520] The issue is discussed in Dr Inkster's Statement at para-134
[521] See the email from Annette Rankin dated 4 October 2019, and the email from Laura Imrie dated 11 November 2019.

of the health conditions concerned and the resulting treatment, infections are unfortunately to be expected in the paediatric haemato-oncology patient cohort. Steps are taken to mitigate the risk of infection, but that risk can never be completely eliminated[522]. A risk of infection is, simply put, an inherent feature of the paediatric cancer experience and one that requires to be tackled by active management and attempts to reduce rates of infection. However, it was emphasised by Dr Mumford and Ms Dempster that with all such infections a continual effort should be made to reduce the number of those infections.

39. Managing the risk of infection is a seam which runs through the care of paediatric cancer patients. All clinician and nurse witnesses spoke to this to some extent. The evidence contained in the statements is detailed and is not repeated in this narrative.

40. Those providing care in the Schiehallion Unit are specially trained in the requirements for looking after this vulnerable patient group. Nurses play an important role in managing infection and work closely with IPC colleagues. The development of expertise in safe line care is a prime example of this[523]. Thus, there is a programme of ongoing staff education, monitoring and audit of infection control practices[524].

4.8 Prophylactic medication

41. Prophylactic medication (prophylaxis) is intended to provide patients with a degree of protection against infection. There was clear and consistent evidence that the prescription of prophylaxis to paediatric cancer patients is standard practice, whether mandated by treatment protocols or in response to perceived risk[525].

42. Professor Gibson explains the use of prophylaxis in her statement. Prophylaxis can be primary or secondary. Primary prophylaxis is given to prevent infection because the risk of infection for a group of patients is considered high. Secondary prophylaxis is given to patients who have already had an infection, in order to prevent

[522] See, e.g. Witness statement of Professor Brenda Gibson, para. 25.
[523] See, for example, the witness statement of Emma Sommerville, paras. 63 to 65; transcript of evidence of Emma Sommerville, p.15.
[524] Witness statement of Emma Sommerville, paras. 20-25.
[525] Witness statement of Professor Gibson, para. 36.

recurrence.[526]

43. Prophylaxis can be antibiotic or antifungal depending on the risk being mitigated. Use of either type of prophylaxis may be specified in national and international treatment protocols and guidelines. Protocols specify use either when the patient group is particularly vulnerable, or where a treatment protocol is particularly intensive and associated with a high risk of infection.[527]

44. Anti-fungal prophylaxis prescribed in accordance with standard protocols includes AmBisome, Caspofugin or Posaconazole. A drug called Septrin is routinely prescribed as prophylaxis against PCP (a type of pneumonia) to all leukaemia patients during and after treatment. It is also prescribed to post- transplant patients.[528]

45. Patients who are thought to be at particular risk of gram-negative infections because of poor immunity may be prescribed Ciprofloxacin prophylaxis. One clinician indicated that, although there is only limited evidence supporting the use of prophylaxis to prevent gram-negative infections, there is evidence supporting the use of Ciprofloxacin in the context of allogenic HSCT and other high-risk patients[529].

46. Prophylaxis is also used in response to specific perceived risks as and when they arise. Examples include infection outbreaks or risks posed by building works. In Professor Gibson's view, the use of prophylaxis in either of these circumstances is not unusual or controversial. [530] This was a view shared by Dr Hart[531].

47. As with any medication, prophylactic medication comes with possible side effects. Septrin is associated with myelosuppression. AmBisome can cause anaphylaxis and renal impairment. Caspofungin and Posaconazole may cause hepatic (liver) toxicity. Ciprofloxacin can cause gastro-intestinal symptoms. All drugs may upset hepatic or renal functions[532]. However, a common theme in relation to the treatment of children

526 Witness statement of Professor Brenda Gibson, para. 34.
527 Professor Brenda Gibson, Witness Statement, para. 35.
528 Professor Brenda Gibson, Witness Statement, para. 37.
529 Dr Shahzya Chaudhury, Witness Statement, para. 151.
530 Professor Brenda Gibson, Witness Statement, para. 36.
531 Dr Alastair Hart, Witness Statement, para. 34.
532 Professor Gibson, Witness Statement, para. 38.

with paediatric cancer is that risks have to be weighed in the balance. The use of prophylactic medication is one such example.

48. The Inquiry team has attempted to incorporate details of when prophylactic medication was being prescribed in what appears to be a control measure or intervention in the Narrative in Chapter 5. In light of the evidence that emerged from Professor Leonord in Glasgow III, it is striking that Professor Gibson makes no reference to Meropenem antibiotic treatment.

4.9 Understanding the concept of 'risk' and therefore infection risk

49. It is useful to preface this discussion by reference to something said by the Infected Blood Inquiry.[533] That investigation started a review of risk by endorsing the statement that 'a first duty of a state is to keep its citizens safe. That was because, 'unless the safety of citizens is regarded as a first consideration there may be harm, and that harm may have been avoidable'. So, if harm could have been avoided but was not, the citizen has not been kept 'safe'.

50. The Oxford English Dictionary (online version) definition of risk is' the possibility of loss, injury or other adverse or unwelcome circumstance'. The Chambers Dictionary (11th edition) defines it as' hazard, danger, chance of loss or injury'. The Infected Blood Inquiry was content with, 'a real possibility that something might happen'.[534] Interestingly, that Inquiry went on to remind readers that a small chance of a serious risk – and one might instance the acquisition by an immuno-compromised patient of an airborne infection – 'plainly requires preventative action to be taken'.[535]

51. Then comes the question whether avoidable risk is tautologous? In one sense it is, because, by definition, if the risk exists it has not been avoided. In another, perhaps not. If an operation is to take place which involves invasive treatment, there is a risk of infection. To take a simple view, that risk cannot be avoided other than by not carrying out the operation.

52. Endless philosophising, interesting though it might be, will not advance the debate

[533] At Vol 3 p5
[534] VolI p20l
[535] Infected Blood Inquiry Vol 3 p6

which has arisen in the Inquiry. NHS GGC has challenged the assertion that particular features of the water or ventilation systems give rise to an avoidable risk of infection, because, they say, these cannot and should not be looked at in isolation from all the other protective and preventative features in play in a clinical setting.

53. To ensure the precise wording is in front of the reader, NHS GGC said (in this example in response to Mr Poplett's Report on ventilation and accordingly referring to that topic), -

> 'The mitigation of safety risk required attention to many factors, of which ventilation is only one: infection control; isolation with single rooms and en-suite facilities; antimicrobial prophylaxis; diagnostic laboratory tests and imaging techniques to aid rapid detection of infection; regular medical and nursing care; written policies with respect to all of these issues and systems to ensure all relevant persons are aware of these policies, all play a part in infection control… there remains a question about the practical effect of any non-compliance with SHTM guidance from the perspective of infection prevention and control and patient safety. It is necessary to consider all of the measures in place to determine whether there is any increased risk of infection beyond which would be accepted in a comparable hospital environment'.[536]

54. It is no doubt correct to say that all the listed features have a part to play. However, the question raised by NHS GGC is slightly different. If one protection is omitted can that be described as giving rise to a risk or avoidable risk? Is the NHS GGC challenge valid? On the contrary, it is submitted that the NHS GGC approach is misconceived.

55. Any analogy is no doubt capable of destructive criticism and analysis. However, with that caveat in mind, if one drives a car very fast in poor road conditions, it is suggested that one creates a risk of an accident. It may be that there is no accident in the particular instance. It may be that the hypothetical driver is possessed of superb driving skills and the application of those skills prevent an accident. It may be the hypothetical car is equipped with a wide range of safety features which operate to prevent an accident. Nonetheless it is submitted driving the vehicle very fast has created a risk. That risk was avoidable simply by not driving very fast. (While this

[536] Bundle 21, Vol 5 p44

analogy is the responsibility of Counsel to the Inquiry, a very similar one is deployed by the Infected Blood Inquiry.[537])

56. A similar analogy was deployed by Professor Humphreys, who gave evidence on the principles and practices of hospital ventilation in the Edinburgh I Hearing on 22 May 2022. He started to develop an analogy for healthcare risk in section 7.2 of his report[538] and was asked to expand upon it in oral evidence.[539] He explained it is as follows:

> "I've always taken some inspiration from….the approach to road safety in Ireland, … in terms of the emphasis on basically the physical structure in which we drive, so making roads safer…, using technology, for example, in the case of the car, the seatbelt and the airbag and various other measures in the car now which can tell us when we're too close to car in front. Then the most difficult one of all, I suppose, is the human behaviour, what we do as drivers in terms of, "what we should do when we're in the car?", in terms of not going into a car with alcohol, put on our seatbelt and drive within the speed limit and so on and so forth. I think there's a kind of parallel there in healthcare-associated infections. So, we have, if you like, the infrastructure, which we focused on in terms of space, ventilation, we have the technology, which we have in some instances in terms of more rapid diagnostics, …. and then we have, if you like, trying to improve human behaviour, which in some ways is the most challenging of all, but that's through education, through motivation and obviously having people accountable for their behaviour."

57. On a simpler level, if one applies a sharp knife to one's arm, that creates a risk that it will bleed. That might not happen if there was, immediately on hand, a highly trained nurse equipped with a readily available sticking plaster. Nevertheless, it is suggested that applying the knife creates the risk. What is more it is an avoidable risk. It can be avoided by one simple action. The other steps, nurse and all, may be helpful or useful or even sensible depending on the circumstances, but they do not prevent the initial act creating a risk.

58. So also, in relation to risk of infection. If lower air change rates, for instance, reduce the speed of dilution of potentially harmful microbes in the atmosphere. then it is

[537] Infected Blood Inquiry At Vol 3 p2
[538] Edinburgh I, Bundle 6, Document 1 at pages 21-22
[539] Professor Humphreys, Transcript, 22 May 2022, pages 71-73

submitted that has created a risk. No doubt it is true that excellent hand hygiene, superb nursing care, the wearing of protective clothing etc, will all contribute to whether the risk leads to harm. But they do not mean that the risk did not exist.

59. The point becomes even more focused when considering another possible action mentioned from time to time by NHS GGC, the prescription of antibiotic prophylaxis. In the hypothesis under consideration, it may well be correct to say that the acquisition of an undesirable infection may be avoided by the prescription of an appropriate prophylaxis. Again, the question is whether that possibility means there was not a risk -and an avoidable one? It is suggested not. In addition, why impose on a vulnerable patient the potentially unpleasant side-effects of a prophylactic drug when the risk can be avoided by appropriate steps to improve the ventilation? And that is not to mention the possibility that the prophylactic selected may not be suitable for the individual patient.

60. Look at the example of the flow straighteners incorporated into Horne Optitherm taps. Investigations in Northern Ireland in 2012 established that such flow straighteners gave rise to a risk of undesirable microbiological growth, which had in turn been implicated in neonatal deaths. That it was not known, and could not be known, whether any individual tap at any particular time harboured that growth, or whether a particular vulnerable patient would ingest the infected water, did not prevent the risk existing. Furthermore, it was avoidable by the expedient of using different taps, without flow straighteners. As it happened, that course was not adopted, the decision by NHS GGC and NHS NSS (both HPS and HFS) following the 6 June 2014 Special Meeting about the Horne Optitherm Taps[540] being to deal with the risk by the ‘routine management process’. However as set out in Chapter 5 that eventually became regular thermal disinfection but that form of planned maintenance of Horne Optitherm TMTs finally began in 2021; six years after handover.[541] In the absence of that step, of course, each tap carried with it a risk of infection.

61. The issue can also be turned round. If poor hand hygiene was deployed in a patient

[540] Bundle 15, Document 9, Page 692
[541] Glasgow III, Witness Bundle, Week Commencing 14 October 2024, Volume 9, Document 4 from Page 96

room, could it - or indeed would it - be argued that that did not give rise to a risk of infection, and an unavoidable risk at that? The answer is obvious.

62. In the circumstances, it is submitted that the NHS GGC approach conflates risk with whether that risk in any instance eventuates into the' harm or unwelcome consequence.' It also confuses risk with ways of managing - or mitigating to use NHS GGC's term - that risk. The point about mitigation is that the risk is there in the first place to need mitigation. The approach of the Inquiry's experts – and the approach it is submitted the Inquiry should adopt - is accordingly correct.

4.10 Risk and the search for certainty.

63. This discussion naturally leads to other questions intrinsically linked to risk. The one which is most obviously pertinent is the attempted use by NHS GGC of Whole Genome Sequencing to provide – as they saw it - certainty that the hospital environment was not the cause of the infection issues. That was to be achieved, it appears, by saying that the genetic clade in the patient sample could not be matched to environmental samples – and this was accordingly proof - or conclusive proof - of no link.

64. The rights and wrongs of using WGS in this way are discussed elsewhere. However, it is submitted that the NHS GGC approach was, in itself, flawed. By concentrating on the wrong objective, it itself caused a risk - that what should have been the focus was no longer front and centre. The question of why did environmental samples reveal organisms capable of causing infection, how did they get there and what should be done about them, became a secondary subject of interest; displaced by a desire to determine whether links could be demonstrated or disproved by WGS or even whether there was a background rate of infections for unusual microorganisms which few, if any, microbiologists let alone other clinicians had seen or in some cases ever heard of in decades of practice. The Infected Blood Inquiry – perhaps because of the context of that investigation – put it dramatically; they said,'…. a search for certainty can be …an enemy of achieving progress.'[542]

65. Does it matter that the precise mechanism by which the risk eventuates is not

[542] Infected Blood Inquiry at Vol 1 page 220

known? There are more than hints of that thinking in the NHS GGC approach. It is submitted that it does not. Again, the search for precision distracts from a focus on taking action.

66. Given the way in which some of the debates at the Inquiry have developed – particularly during the evidence in Glasgow III - a fresh focus on asking what may be the wrong question may be useful. The most obvious example is the apparent change of approach of the IMTs following the removal of Dr Inkster as Chair. As related in the narrative, clinicians recalled a shift to trying to prove that the infections were not linked to the hospital. Professor Leanord accepted that (albeit he defended it).

67. That was the wrong question. The focus should have stayed on how the infections were arising and what should be done about them. There being nothing new under the sky, we find the same discussion in the Infected Blood Inquiry. They said, 'Instead of the wrong question – Is there any conclusive proof this is the effect – the right question – Is there any conclusive proof that it isn't? – should have been the one that was asked.'[543] In another echo of debate at the present Inquiry, 'No evidence of effect is not evidence of no effect'.[544]

68. Before leaving the topic, one further cautionary note. NHS GGC had at one pointed wanted to put out a statement that a particular level of infections was 'acceptable'.[545] While that grossly insensitive communication was stopped in its tracks, it suggests an inappropriate general approach. (That was echoed in the NHS GGC attempt to argue, during a Duty of Candour discussion with Professor White, that infections in immuno-compromised patients were 'not unexpected''). As, in fairness most nurses and clinicians argued, the aim should always be on reduction. Indeed, if "…a consequence happens so frequently as to be 'inevitable'" this should not be a cause for comfort, but should, rather, be regarded as a challenge to take action in order to reduce or remove the risk of it happening'.[546]

69. And a tailpiece. At various points in the evidence, it is clear that assumptions have

[543] Infected Blood Inquiry Volume 1 page 203
[544] Infected Blood Inquiry Vol1 page 203
[545] Craig White, Transcript, Page 70
[546] Infected Blood Inquiry, Vol 1 at p204

been made. Purely by way of example, Mr Brattey ‘assumed’ everyone knew about pigeons on site, Mr Gallacher ‘assumed’ some issues would be dealt with by operational estates. The general point is merely a reminder that it is well-known in many fields – particularly Health and Safety – that making assumptions is – or at least often can be – a very dangerous thing. A point for future deliberations.

5. A NARRATIVE OF EVENTS

5.1 Introduction to the Narrative

1. This chapter sets out the proposed narrative of events at the Queen Elizabeth University Hospital, Glasgow ("QEUH") and Royal Hospital for Children ("RHC") that have been the subject of the evidence narrated in Section 1.2 above. It is a development of the narratives of events set out in the closing submissions from Counsel to the Inquiry following Glasgow I and II.

2. The part of this narrative of events from the handover of the hospital to NHS GGC on 26 January 2015 to the IMT of 14 November 2019[547] is intended to be sufficiently comprehensive to enable the Chair to reach conclusions in respect of Terms of Reference 1, 7 and 8. The events narrated before and after that period are necessarily covered in less detail and will (as discussed in Chapter 9) be addressed in future PPPs, statements, Bundles and the parole evidence in Glasgow IV.

3. It should be noted that the Inquiry has before it a significant amount of documentary and witness evidence. It bears repeating in this regard that, whilst what follows is intended to be a comprehensive narrative, it does not seek to recite the totality of the evidence. Rather, the narrative is principally concerned with the events that were focused upon in evidence, and this document must therefore be read alongside the supporting documentation.

4. It is anticipated that in their Closing Statements the Core Participants will have comments on this narrative, propose changes to this narrative and may identify evidence that they consider should be referred to. It would be of great assistance (and in conformity with the spirit of Direction 9) if when doing so, Core Participants could identify the paragraphs in this Chapter that are most closely related to the issue they raise and the date (at least to a month or months) when the event/evidence at issue occurs or is said to occur.

5.2 The History of Concern 2014 to 2023

[547] Bundle 1, Document 88, Page 402 (A37993497)

Year: 2014

Introduction to 2014

5. Why 2014, when the logical start date of narrative is at handover in January 2015? Largely because a small number of issues from 2014 provide a backdrop for later events (particularly the saga of the Horne Optitherm taps). As a preliminary point, none of the witnesses from Glasgow I spoke to events in 2014. The only evidence in relation to matters in 2014 therefore came from the clinical and managerial staff witnesses who gave evidence in Glasgow II and from the clinical, estates and facilities staff who gave evidence in Glasgow III.

6. A paper was tabled at the BICC on 6 October 2014 about the role of IPCT in the procurement of the QEUH[548]. A challenge – which spanned various dates – was the difficulty a range of witnesses found in getting information from the Project Team. They seemed on occasion to get no, or no satisfactory response. One step recounted by Professor Williams[549] (unfortunately without a precise date but possibly 1st December 2014) was where frustration with the lack of response led to a Project Team member, Fiona McCluskey, being requested to attend an AICC Meeting to explain about validation. His recollection was that Ms McCluskey assured the Committee it was all done according to HTM 03-01 guidance[550].

Pre-filling of the Water System

7. The water system was filled at least nine months before occupation, without the filters. Mr Powrie had concerns about the safety of this. He also felt that there should have been a water dosing or treatment system in place, because the system was so large and complex that it was always going to have challenges in terms of keeping the whole system at an equilibrium.[551]

8. Mr Leiper described the early filling of the water system as “just nuts. It's just

[548] Iain Powrie, Transcript, Page 41-42
[549] Professor Williams, Witness Statement, Page 26
[550] Professor Williams, Transcript, Page 111
[551] Iain Powrie, Transcript, Page 41-42

silly."[552]

9. Dr Inkster explained that the prefilling of the hospital water system a year before the hospital opened had allowed biofilm to accumulate. Over time the biofilm will become very complex and contain lots of different strains of bacteria. She commented that the biofilm is a slime lining all the pipes and it can be very difficult for disinfectants to penetrate the biofilm. In her view the biofilm in the QEUH/RHC was likely to be very extensive and very complex with multiple different types of bacteria and multiple different strains of bacteria. Such biofilm can become resistant to disinfection.[553]

10. Dr Lee gave evidence that best practice had not been followed in filling the water system, which made her really concerned. She shared Dr Makin's view that ideally water should be put into the system as late as possible[554]. His experience in dealing with newly built hospital premises is that contractors often failed to take the proper measures to avoid contamination.[555] Andrew Poplett's view on the issue was consistent with Drs Lee and Makin, he stated that filling a system too early and leaving it filled is a problem if it is not subject to regular flushing to avoid stagnation[556].

11. Dr Lee's conclusions were referred to by Dr Makin who expressed surprise that the system had been filled so early. While often a water system will have to be filled ahead of time to allow testing, it should be done as late as possible. A year ahead of time was too early, specifically because the opportunity for contamination was enhanced by the scope for free-floating microorganisms to enter the water system and establish biofilm; established biofilm being particularly difficult to remove.[557] Indeed Dr Makin subsequently said of biofilms: "it's almost impossible to get rid of them once they've become established".[558]

[552] Jim Leiper, Transcript, Page 87
[553] Dr Inkster, Transcript, Pages 127-128
[554] Dr Susanne Lee, Transcript, page 133
[555] Tom Makin, Transcript, page 18.
[556] Andrew Poplett, Transcript (Day 2), Page 94
[557] Tom Makin, Transcript at page 55
[558] Tom Makin, Transcript at page 57

12. In December 2014 and January 2015, the contractor arranged for testing of the water system. The results showed high Total Viable Counts (TVCs) in the water[559]. The contractor used Sanosil (silver hydrogen peroxide) to sanitise the water system due to the high TVC results[560]. The recommended dose of Sanosil was not used because of a warranty issue with an Optitherm TMT tap and the manufacturer said that the tap should not be chemically sanitised. Mr Powrie conceded that he should have challenged that at the time[561]. Dr Lee's view was that Sanosil is not effective in a highly colonised system[562]. The Lead ICD, Professor Williams, was in the Water Group but there is no evidence that the final water testing results were presented to or reviewed by the lead ICD[563].

Horne Optitherm Taps and their Maintenance.

13. In March 2014, GGC sought guidance from Health Protection Scotland ("HPS") about the taps which had been procured for the new hospitals. The NHS Guidance (SHTM 04-01) nor did the HPS recommend the use of the taps[564]. The HPS, Guidance for Neonatal Units (NNUs) and adult and paediatric ICUs, June 2013, stated; "*Bio film can develop on flow straighteners, and it is recommended that these are removed from taps*." This recommendation is also made within SHTM 04-01[565], suggesting that it should be applied universally in all clinical areas across the QEUH/RHC.

14. Dr Lee told the Inquiry her account of being involved in the 2011/2012[566] Belfast Pseudomonas outbreak which ultimately found that the flow straighteners in the hospital were heavily contaminated with millions of Pseudomonas. She explained the outbreak resulted in guidance being issued by the Department of Health to avoid the use of flow straighteners and

[559] Bundle 7, Document 1, page 8
[560] Bundle 7, Document 1, page 8; Ian Powrie, Transcript, Page 79
[561] Ian Powrie, Transcript, Page 80
[562] Dr Susanne Lee, Transcript, Page 128
[563] Bundle 13, Document 66, page 493, 499
[564] Guidance for neo natal units (NNUs) (levels 1,2 and 3) adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of pseudomonas aeruginosa infection from water).
[565]SHTM 04-01: part A Design, Installation and Testing, section 9.51, note 123.
[566] Dr Susanne Lee, Transcript, Page 128

aerators to reduce the risk of infection[567].

15. The Horne taps which were ultimately installed on all clinical wash hand basins across the QEUH and RHC were fitted with flow regulators, contrary to the advice within the HPS SBAR.[568] The taps were also not compatible with the use of silver hydrogen peroxide, which was to be used in the commissioning process to sanitise the water system.[569]

16. GGC, in its response to the History of Infection Concerns ("HOIC"), says that at a meeting on 5 June 2014 (at which HPS was represented), it was agreed that "there was no need" to do this and that "any residual perceived or potential risks would form part of the routine management process." The response from Currie & Brown indicates that it agrees with this understanding of what was said at the meeting. Dr Jimmy Walker, who was present at the meeting in his capacity as an adviser to Public Health England, and from whom a view had been sought, spoke to having given a presentation featuring "specific advice [which] would be to remove flow straighteners, as per the Department of Health guidance, but it always comes with risk assessing what you're doing and being aware and educating and training of staff, so they're aware of what the problems are and they can put their own practices and policies into place to reduce other opportunities and reduce a lot of patients being affected".[570] He spoke to Horne Engineering having given an alternative presentation[571], following which a decision was taken to retain the taps under risk management, although he did not recall risk management being a significant part of the meeting[572].

17. Mr MacMillan recalled that a meeting took place with DMA Canyon in around November 2014 in order to assist them with completing the L8 risk assessment which would ultimately become the 2015 DMA Canyon L8 risk assessment report. At this meeting, Mr MacMillan recalled asking Ian Powrie if

[567] Dr Susanne Lee, Transcript, pages 152 and 153
[568] Dr Christine Peters Statement – para 67.
[569] Dr Susanne Lee, Transcript, Pages 125 to 128
[570] Dr James Walker, Transcript, Page 68
[571] Dr James Walker, Transcript, Page 68
[572] Dr James Walker, Transcript, Page 72

they had flushing records and he confirmed they did, but Mr MacMillan does not remember seeing any records at the time[573].

18. Ian Powrie had raised the issue of the Horne taps with David Loudon and the project team. A large number had been ordered and many installed. In addition, the manufacturer's' recommendation for thermal sanitisation required a 20-minute flush at 60 degrees for each tap. Mr Powrie regarded that as unrealistic in an operational ward[574]. Eddie McLaughlan spoke to the NSS involvement in discussions. Interestingly, he made the point that the group discussing the issue at the time would have been working on the assumption that they were dealing with a brand-new water system in perfect condition[575] .On 9 April 2014, HPS prepared an SBAR[576] responding to the request from GGC for advice. They drew attention to recent guidance which identified a risk of biofilm developing in flow straighteners, and which recommended removal of flow straighteners from taps. The SBAR recommended to GGC that it either did not install taps with flow straighteners in high-risk units, or, alternatively, instruct the contractor to install new compliant taps (i.e., not including a flow regulator in the design) in high-risk areas.

19. NHS NSS, for its part[577], has said that it was "unaware that the advice in its SBAR had been contravened until March 2018." Mr McLaughlan agreed that the advice not to use the taps in areas where there were vulnerable patients did not change[578]. Ian Powrie explained that David Loudon decided to retain the taps and deal with the issue by managing a maintenance process[579]. Eddie McLaughlan was asked specifically whether that decision amounted to saving money by managing the taps. He felt that phraseology was not correct and preferred 'spending the money here rather than there'[580]. Ian Powrie had developed a proposal for taps to be replaced out, with those removed being

[573] Melville MacMillan, Transcript, Pages 157-158
[574] Ian Powrie, Transcript, Pages 85-86
[575] Eddie McLaughlan, Transcript, Page 13
[576] Bundle 3, Page.5
[577] NSS Supplementary Response to the HOIC, para 1.3.4
[578] Eddie McLaughlan, Transcript, Page 15
[579] Ian Powrie, Transcript, Page 85
[580] Eddie McLaughlan, Transcript, Page 18

taken to a bespoke location to be sanitised for 3 minutes at 70 degrees[581]. Unfortunately, due to pressure of work of the Estates team members, the construction and operation of that sanitisation facility had not been completed by the time the Water Incident intervened in 2018. Accordingly, the taps were not maintained during that time[582].

20. Glasgow II witnesses did not indicate knowledge in 2014 of concern about the use of flow straighteners in taps. However, Professor Gibson recalled that at an IMT meeting on 9 March 2018[583], the existence of the 2014 SBAR was discussed[584]. She recalled from that discussion that the SBAR was noted to have advised against the use of flow straighteners in taps in high-risk areas; she understood that to mean areas where immunocompromised patients were present. Dr Inkster was concerned that the taps were the reservoir of infection due to their complexity and the presence of flow straighteners which is a known risk for development of biofilm and risk of infection. Professor Gibson's understanding of the discussion was that the use of flow straighteners was thought to encourage the growth of biofilm which can in turn encourage infection; and that "*bugs*" can "*seed out*" from the biofilm and be difficult to eradicate.[585]

21. As associated issue in respect of the Horne Optitherm TMTs is that the design of the taps and placement of the TMV behind IPS panels appears to have created a particular burden of maintenance, as this would often require removal of those IPC panels to access pipework. Mr Clarkson, now Estates Manager for the whole QEUH campus, explained that a HAI-SCRIBE would be required for doing TMT maintenance in all areas that require removal of IPS panels. For high-risk areas, the patient would need to be removed from the room and all services would need to be protected. This resulted in the TMT maintenance taking 3-4 hours. These maintenance issues could be mitigated by installing taps with isolation valves or building a cabinet behind

[581] Ian Powrie, Transcript, Page 85
[582] Ian Powrie, Transcript, Page 87
[583] Bundle 1, Page 60.
[584] Professor Brenda Gibson, Transcript, Page 93
[585] Professor Brenda Gibson, Transcript, Page.49

the tap.[586]

22. The issue of the Horne Optitherm taps was reported as an AOCB to the Board Water Safety Group on 7 August 2014. However, despite this Dr Inkster reports that although she was aware a meeting was to take place in summer 2014 between NSS, GGC, the Horne company and external experts when she became ICD, she was not told what happened at the 5 June 2014 meeting. In around 2015 into 2016, she recalled that Mr Ian Powrie said that it wasn't possible to remove flow straighteners. Dr Inkster's preference was to remove the flow straighteners, and she would have implemented water testing, cleaning and maintenance of the taps. She was not aware of any maintenance being carried out on the taps in high-risk patient wards until 2018, although it was discussed at the Board Water Safety Group Meetings[587].

23. When asked about Planned Preventative Maintenance ("PPM") on TMVs and TMTs in 2015, David Watson of DMA was aware of the requirement for such maintenance and the need for it to be documented, but DMA were not shown such a plan when working on the 2015 DMA Canyon L8 Risk Assessment.[588] Mr Brattey explained that PPM was a computer generated facilities management tool which could allow a schedule to be printed out and given to maintenance technicians to go and carry out the task[589].

24. As current Authorised Person (Water) the evidence of Kerr Clarkson on these taps was significant. He explained that there was a lack of PPMs in relation to the Horne Optitherm taps when the QEUH/RHC opened. The PPMs for the taps would have involved flushing them at regular intervals and thermal mixing tap ("TMT") maintenance. He understood that the TMTs must be maintained every six months by a SLAM test to check a safety device works (i.e. if cold water is lost to the tap, then the tap slams shut to prevent scalding). Mr Clarkson stated that in March 2021, he escalated to senior management that the annual TMT maintenance was not being carried out. No TMT maintenance

[586] Kerr Clarkson, Transcript, Pages 42-45
[587] Dr Inkster, Transcript, Day 1, Pages 21-25, Bundle 13, Document 11 apt page 36
[588] David Watson, Transcript, Pages 80-82
[589] David Brattey, Transcript, Page 46

was carried out in 2020.[590] Following his evidence Mr Clarkson provided a supplementary statement on this issue which confirms that whilst there were some checks made to TMTs being made from the second half of 2016 no real start was made at scale to start planned maintenance of Horne Optitherm TMTs until 2021; six years after handover.[591] Susan Dodd gave evidence that she had seen no maintenance of the Horne Optitherm TMTs in 2018.[592]

25. Professor Gibson did not have direct knowledge of the response to this concern in 2014, but she did recall a discussion at the IMT that the tap specification had not been changed because of cost implications and practicalities[593]. Professor Gibson's recollection is that the IMT minute records the discussion accurately.

26. Then Chief Nurse, Jennifer Rodgers, also recalled the discussion about flow straighteners. Like Professor Gibson, she was careful not to stray into matters that were outwith her expertise (for example, in relation to the guidance relating to the use of flow straighteners). Ms Rodgers did not recall a discussion about cost at the 9 March 2018 IMT. She volunteered that, in her experience, cost was generally not a limiting factor in NHS GGC's response to the concerns that arose in the post-September 2015 period. She accepted that she could not speak to the period before then[594].

Water System Management at Handover

27. In early December 2014, Ian Powrie (at that stage allocated to the Project Team) contacted DMA Canyon ("DMA") to ask them to carry out a Legionella Risk Assessment (also known as an L8 Risk Assessment) for the QEUH/RHC building. The scope of this work was set out in a letter from David Watson of DMA to Mr Powrie dated 15 December 2014[595] with a detailed program attached to a further email of 30 December 2014.[596] This work was not in fact

[590] Kerr Clarkson, Transcript, Page 34-39
[591] Glasgow III, Witness Bundle, Week Commencing 14 October 2024, Volume 9, Document 4 from Page 96
[592] Susan Dodd, Transcript, Pages 33-34
[593] Professor Brenda Gibson, Transcript, Page 93
[594] Jennifer Rodgers, Transcript, Page 58
[595] Bundle 25, Document 40, Page 669 (A49139804)
[596] Bundle 25, Document 53 and 54, Pages 772 to 774

completed until 29 April 2015.[597] It should have been done pre-occupation. If it had, said Mr Leiper, perhaps problems could have been taken back to the contractor to fix.[598]

28. In January 2015 Mr Watson provided Mr Powrie with a template for a Written Scheme.[599] . He explained that a Written Scheme should have been prepared when the water system was filled[600] and that if were no Written Scheme or Water Safety Plan, then in his view that would highlight that nobody is taking responsibility for management of the water system.[601]

29. Mr Watson maintained that providing templates of this nature to a client was not unusual, however it is more than remarkable that NHS GGC employees needed to obtain such a document from DMA rather than having access to Written Schemes for other hospitals. Mr Watson was clear that at the time there was no Authorising Engineer for the QEUH.[602] This is significant as the requirement for a management structure arises in Part 6 of SHTM 04-01 Part B. [603]

30. The Inquiry holds the Board Water Systems Safety Policy that was in force when the hospital opens[604]. In addition to identifying the Director of Facilities and Infection Control Manager as co-chairs of the Board Water Safety Group it identifies the following roles and responsibilities at board level amongst NHS GGC employed staff:

- Chief Executive – Duty Holder
- Director of Facilities – Designated Person (Water)
- Infection Control Manager – Designated Person (Pseudomonas)

[597] Bundle 6, Document 29, Page 122 (A33870103)
[598] Jim Leiper, Transcript, Page 96
[599] Bundle 6, Document 47, Page 719
[600] David Watson, Transcript, Page 106
[601] David Watson, Transcript, Page 22
[602] David Watson, Transcript, Page 147
[603] Bundle 15, Document 5, Page 416
[604] Bundle 27, Volume 2, Document 1, Page 5

- Sector Estates Manager – Responsible Person (Water)
- Head of Capital Planning – Deputy Responsible Person (Water)

31. As Mr Watson explained the Duty Holder is the person ultimately responsible for water safety on the site and would be responsible for ensuring there is a management structure and for appointing the Authorising Engineer and Authorised Person. The role of the Authorising Engineer is to provide independent guidance to the board on how to manage the water system and ad-hoc technical guidance. The Authorised Person is responsible for day-to-day management of the water system and physically implement the recommendations. The other roles are Responsible Person and Designated Person, it would usually be someone in one of these roles that would be responsible for instructing an L8 risk assessment as indicated by the guidance.[605] Mr Watson explained his understanding that the purpose of a Water Safety Group ("WSG") in a hospital was to allow all the different parties (for example, infection control) who have an interest in the water system to come together to make decisions on how to manage the water system.[606]

32. In Dr Lee's view, the Duty Holder is the CEO and/or the Board. She told the Inquiry it was the person who has ultimate responsibility for health and safety on the site. She then explained that the Code of Practice is about Legionella primarily and the traditional control measure is temperature. If the primary control measure does not work, then there must be an alternative control measure and the responsibility for having that rests with the Duty Holder. In her view, there was no biocide and there were problems with temperatures, so the Duty Holder's obligation had not been fulfilled. She observed that NHS GGC was only focused on Legionella and not on the other potential waterborne pathogens and she considered this a 'bad thing' as other risks to patients were being ignored. They were not following the British Standard on Pseudomonas and from a practical perspective were not managing aspects of the outlets and the drain. The focus of NHS GGC, in her view, was solely on

[605] David Watson, Transcript, Page 16
[606] David Watson, Transcript. Page 18

the systemic growth of Legionella[607].The Inquiry heard evidence that Mr Walsh was the Designated Person (Pseudomonas) which included ensuring the Infection Control team were fully aware of the current guidance on Legionella control matters and the minimisation of the risk of Pseudomonas aeruginosa infection from the water. In reality, Mr Walsh said this amounted to testing at the tap end, management of waste, and awareness of the staff in high-risk areas[608].

33. Mr Walsh recalled that his main role in the group was around communications which involved making sure that all the questions from Health Facilities Scotland, Health Protection Scotland and the Scottish Government were being fulfilled as they undertook their own reviews of the water situation[609]. He acknowledged that he was co-chair of the Board Water Safety Group. The Group included Mary Anne Kane, and Jonathan Best. However, he agreed to demit from the role early in the life of the Group and another infection control doctor and Pamela Joannidis, an infection control nurse, represented infection control on the Group[610].

34. When pressed, Mr Walsh did not accept that it was his responsibility to notice there was no designated person (water) appointed at the QEUH. His understanding was that the designated person (water) is appointed by a member of the Estates and Facilities team[611]. However, he did acknowledge that although two senior infection control doctors were delegated to the Water Safety Group (WSG), his absence weakened the Group and reduced the opportunity to notice the absence of a pre-occupation Legionella risk assessment[612]. Mr Walsh did not accept there was a link between the quality of the water and the infection risk[613].

35. In the context of her evidence about the Water Incident in 2018, Dr Armstrong was asked what input she was getting from the ICM regarding Pseudomonas

[607] Dr Susanne Lee, Transcript, Pages 140 to 145
[608] Thomas Walsh, Transcript, Pages 68 and 69
[609] Thomas Walsh, Transcript, Page 70
[610] Thomas Walsh, Transcript, Page 73
[611] Thomas Walsh, Transcript, Pages 74 and 75
[612] Thomas Walsh, Transcript, Pages 77 and 78
[613] Thomas Walsh, Transcript, Page 82

given that she was the HAI Executive lead. Dr Armstrong said there was a Pseudomonas risk assessment that came through BICC. It was signed off by IPC, Estates, and the lead nurse. She didn't get regular reports from the Board Water Safety Group.[614] She seems to have relied on IPCT having a proper input into the Board Water Safety Group.

36. Mr Powrie explained that in 2015, around the time he had been in touch with DMA Canyon, he had written out a schedule of the nominated personnel that would fulfil the key roles for recording in the water risk assessment and the written scheme, and had forwarded that on to Ms Kane and asked her to verify that these would indeed be the post-holders, and asked her about appointments. He explained that she had said she would take that to the Infection Control Committee and would get back to him with confirmation.[615]

37. Mr Kelly gave evidence that the generic description of roles is a problem because there is a lack of clarity on who does what[616].

38. Mr Melville MacMillan recalled that his initial impression of the QEUH/RHC was that it was not finished as there were 200-250 contractors on site every day that had to be signed in and out by Estates. His recollection of that time was an extremely strenuous heavy workload and long work hours which lasted from November 2014 until late 2015[617]. The Inquiry heard evidence from Mr MacMillan of toilets backing up on the ground floor and blocked drains when the hospital opened. He added that behind the scenes the hospital was missing things that should have been done[618].

Requirement to carry out a HAI-Scribe at commissioning.

39. It seems from the terms of SHFN 30 - Part B: HAI-SCRIBE – Implementation strategy and assessment process – Version 3.0, October 2014[619] that there is an expectation or requirement that a HAI-Scribe process will be carried out on

[614] Transcript, Dr Armstrong, page 96
[615] Ian Powrie, Transcript Page 65
[616] Dennis Kelly, Transcript, Page 145 and Page 156
[617] Melville MacMillan, Transcript, Page 120
[618] Melville MacMillan, Transcript, Pages 123 and 124
[619] Bundle 27, Volume 4, Document 35, Page 365 (A3362208)

the commissioning of a new building This can be seen with SHFN 30 from para 3.35[620] onwards and at Appendix 2.[621] The terms of questionnaire "Development Stage 4: Review of Completed Project"[622] contain a significant number of questions which, if asked and answered, would likely have exposed later concerns about water and ventilation that the Inquiry has identified as Potentially Deficient Features before patients occupied the building. Key examples in that questionnaire include questions 4.7, 4.25 to 4.34, 4.37 to 4.40. The terms of paragraph 3.35 are clear that this 'Stage 4 – HAI-Scribe' applied equally to refurbishments as much as it did to new builds.

40. The Inquiry has not been supplied with a Stage 4 – HAI-Scribe for the new QEUH/RHC completed at or about handover and no witness who might have been expected to know of such a questionnaire asserted it existed. Mr Walsh, who was ICM on handover, accepted that if HAI-Scribe had been applied to the new hospital the IPCT would have realised that the hospital ventilation system, to a greater or lesser extent, wasn't built in accordance with guidance.[623] It was acknowledged by Dr Inkster that she did not look for a stage 4 HAI-SCRIBE for the new hospital at any stage. She assumed that it would be in place because it is very clear in the SHFN.[624]

Year: 2015

Introduction to 2015

41. Evidence of events in 2015 from patients and relatives at Glasgow I was not plentiful. The majority of evidence relating to events in 2015 therefore came from the clinical, nursing and managerial staff witnesses who gave evidence in Glasgow II and Glasgow III.

42. Before approaching the history of e.g. IMTs, some of which may appear to be fractious, or at least contentious, it may be useful to note the perception of Dr Alan Mathers, who, as someone who was not a main participant has a more

[620] Bundle 27, Volume 4, Document 35 at Page 429
[621] Bundle 27, Volume 4, Document 35 at Page 438
[622] Bundle 27, Volume 4, Document 35 at Page 431
[623] Mr Walsh, Transcript, Page 64
[624] Dr Inkster, Transcript, Day 1, Pages 51-52

detached view. He said,[625] "There was a universal desire to find an answer, engage in a collegiate manner, and intelligently look at potential short and long-term mitigations, some meetings where people robustly challenged information given, but always in a respectful way."

43. The Hospital was handed over to NHS GGC on 26 January 2015.[626]

The Culture of the IPC Team at Handover

44. Dr Peters joined the IPC team in NHS GGC in August 2014. She was appointed Sector ICD alongside Dr Pauline Wright (who resigned that role in the summer of 2015) for the South Sector which would include the new QEUH/RHC. Dr Peters maintained that there was no job description for the ICD role[627] and that soon after she joined, she had been told by Professor Williams not to put things in writing. She identified a particular conversation by telephone and maintained her position, notwithstanding that it was pointed out to her that Professor Williams denied it. When she asked colleagues, their response was, 'that's just Craig'.[628] She also spoke of attending an early SMT meeting and being told by a colleague that she should not ask questions. Both developments shocked her. The situation seemed unhelpful, with colleagues being fearful. Dr Peters also objected to ICD meetings not being minuted. She denied any suggestion that she did not seek or consider the views of others. Professor Brian Jones acknowledged that Professor Williams was not a team player[629]. In his view, the multiple roles and responsibilities that Professor Williams had undertaken was in fact a risk to the organisation due to the lack of oversight[630].

45. At handover the ICN was Claire Mitchell, and the lead ICD was Professor Williams.[631]

[625] Witness Statement of Alan Mathers Page 8
[626] Prof Craig Williams, Witness Statement, Para 107.
[627] Dr Christine Peters, Witness Statement, Para 15.
[628] Dr Christine Peters, Transcript, Page 20
[629] Professor Brian Jones, Witness Statement, Page 7 (Witness Bundle page 573)
[630] Professor Brian Jones, Witness Statement, Page 6 (Witness Bundle page 572)
[631] Pamela Joannidis, Transcript, Page 86

Estates at Handover

46. Mr MacMillan was on a daily walk around the site with Mr Guthrie, when they reached the water tank room. They both noticed a 2-inch alkathene tube or pipe connected to the Hardgate Road Scottish Water mains water pipe which bypassed the filtration units and was connected directly into the riser pipe. In his view, the unfiltered water would be possibly "seeding the system" and he could not think of a reason why someone would make such a bypass. He reported the pipe to Ian Powrie on the Friday and when they returned to the water tank room on Monday it was removed and sitting coiled up in the room[632].

47. Ian Powrie gave detailed evidence about the challenges which faced the Estates Team at the handover of the new hospital in January 2015. He had not been much involved before handover. He had been told that he should be kept away from discussions with contractors as 'every time he was there it cost the contractors money'.[633] Everything was new including much new technology. The challenges were many. He calculated a need for approximately 111 personnel. He ended up with 68, the efforts to obtain more via David Loudon having been unsuccessful, due, it was said, to budget constraints.[634] Even then he was compelled to lose 2 members of staff by an efficiency savings requirement in 2016. Remarkably he was told by David Loudon that the 'CEO/SMT' thought that Multiplex would be maintaining the hospital for the 2 years of the warranty period.[635]

48. There were a huge number of ongoing issues, ranging from the presence of contractors carrying out snagging work, through to problems with the pneumatic transport system and automated guided vehicles. In his witness statement he provided an extensive[636] - but not exhaustive[637] - list of firefighting which had to be done. The net result was that ordinary

[632] Melville MacMillan, Transcript, Pages 150 to 153
[633] Ian Powrie, Transcript, Page 67
[634] Ian Powrie, Transcript, Page 7
[635] Ian Powrie, Transcript, Page 161
[636] Ian Powrie, Witness Statement, Para 220
[637] Ian Powrie, Transcript, Page 21

maintenance could not be done and estates team members, including Mr Powrie, were working extraordinarily long hours (up to 14 hours a day, seven days a week).[638] Any complaints simply drew the response to' get on with it'. Mr Purdon recounted working 50 hours a week for the four and half years he was at the QEUH/RHC site, and he asserted that a number of managers were emotionally drained by the constant demands of the job. He also noted that the Estates Team were unable to cope with all the demands and had to rely on external contractors to carry out a lot of works and repairs[639]. It was accepted by Mr Brattey that he should have been more aware of the number of ongoing issues, but he too stressed that he was a pretty busy guy and had his work cut out on a number of fronts. He conceded in evidence that he was relying upon his colleagues bringing issues to him, but he contended they were very competent, and he had confidence in them[640]. He also complained of working long hours[641]. Mr MacMillan also spoke to so much work needing to be done in 2015[642], and described it as 'firefighting'[643] which was a source of a lot of stress[644].

49. In addition, the materials and systems which would have assisted estates to carry out their duties were either not available, or not adequate. The Zutec document management system was a cloud-based document vault that held all the documents generated during the construction phase[645] of the laboratory building and the QEUH/RHC. However, it was challenging to use, and documentation was often not in the correct place. Mr Purdon said he found it very difficult to find drawings and schematics in the Zutec system[646]. He also conceded that he could not confirm it contained all the documents he would have expected it to contain[647]. Ms Shiona Frew stated that Zutec could be clunky to use and moving between folders could be slow. She recalled that

[638] Ian Powrie, Transcript, Page 13
[639] Colin Purdon, Witness Statement, Page 76.
[640] David Brattey, Transcript, Page 62
[641] David Brattey, Witness Statement, Page 73
[642] Melville MacMillan, Transcript, Page 120
[643] Melville MacMillan, Witness Statement, Page 5 (p 271 of Witness Bundle Vol 2)
[644] Melville MacMillan, Witness Statement, Page 11 (p 277 of Witness Bundle Vol 2)
[645] Colin Purdon, Transcript, Page 63
[646] Colin Purdon, Transcript, Page 63
[647] Colin Purdon, Transcript, Page 63

the Zutec system may not have been fully populated at handover[648]. It was accepted by Mr Brattey that he had only had half a day of Zutec training and that this was a big ask[649]. He stated that the Zutec system was hard to navigate when trying to find a piece of equipment and believed there was more than a million entries for equipment data[650]. It was not made available until two months after handover.

50. The intention had been that there should be a CAFM (Computer Aided Facilities Management) system to control and enable maintenance tasks. That was critical for planned preventative maintenance. In Mr Leiper's view a PPM system should have been in place before occupation, tried and tested and ready to go. The systems here were dysfunctional. It was explained to the Inquiry by Mr MacMillan that he would make up the checks that he would carry out at the beginning of his shifts because there was no PPM system and other duty managers would do likewise[651]. A fully populated CAFM system was not in place by the time Mr Powrie retired. It was accepted by Mr Purdon in evidence that while there was CAFM system in place in 2015, it was maybe not working to its full potential[652]. Mr Andrew Wilson explained the other software system used by the Estates Team called FM First. He said it was used to manage issues being raised by service users, tasks were assigned to the Estates team and tracked until resolution of the task[653].

51. Thomas Romeo in his evidence painted a picture of chaotic arrangements in which the Estates Team had to carry out its functions. His initial routine was of receiving instructions electronically, and distributing those electronically to technicians[654], but the details of his role were new: “I had to learn as I was going along with the water. It was like a crash course, you know?”.[655] In particular he was unhappy at having to take on his role with the water system without having had adequate training to do so, his training having been in

[648] Shiona Frew, Witness Statement, Page 39
[649] David Brattey, Transcript, Page 25
[650] David Brattey, Witness Statement, Page 16
[651] Melville MacMillan, Transcript, Page 107
[652] Colin Purdon, Transcript, Page 73
[653] Andrew Wilson, Witness Statement, Page 81
[654] Thomas Romeo, Transcript Page 102
[655] Thomas Romeo, Transcript Page 126

previous roles and extending to legionella, ventilation and infection control only.[656] This was compounded later by DMA Canyon assuming him to be the Authorised Person for water, which he was unhappy about. He was untrained and unhappy at the suggestion that he might take on the role, and indeed informed Mr Brattey that he was unwilling to do so.[657] He did not consider that the duties carried out by him corresponded to those of an Authorised Person,[658] with his view being that that responsibility would rest with the Responsible Person, Mr Brattey.[659] Mr Kelly observed that he found it strange that someone such as Mr Romeo with no water training was responsible for a water system in that size of hospital[660]. Mr MacMillan accepted in evidence that not enough training was provided to technicians in the Estates team[661].

52. Phyllis Urquhart also spoke to her dissatisfaction around the Authorised Person for water situation at that time, as well as supporting Mr Romeo's account of being unhappy. She had been told by Ian Powrie and Alan Gallacher that Mr Romeo was filling that role, and although she was concerned at his lack of training and experience in water matters, she felt compelled to accept it. She was unhappy that he had been given those tasks hitherto – six months' experience in AP(W) matters would in her view have been appropriate in order to properly carry out the role.[662]

53. Ms Urquhart also spoke to having repeatedly raised the absence of a Designated Person (Water) with Alan Gallacher, and while she was pleased to learn in 2024 that the role had been filled, she was disappointed that it had taken so long.[663]

54. To add to the challenges facing the Estates Team, all assets relevant to the estates system should have been tagged with a unique reference recorded in the CAFM system. Without that PPM becomes more difficult and takes longer.

[656] Thomas Romeo, Transcript Page 105-9
[657] Thomas Romeo, Transcript page 120
[658] Thomas Romeo, Transcript page 124
[659] Thomas Romeo, Transcript page 128
[660] Dennis Kelly, Transcript, page 149
[661] Melville MacMillan, Transcript, page 115
[662] Phyllis Urquhart, Transcript pages 33-41
[663] Phyllis Urquhart, Transcript pages 45, 54

Asset tagging was not complete until 2017 according to Ian Powrie. Karen Connelly recalled it still being an issue when she took up her post in 2018.[664] Mr Brattey recollected that if the assets had been tagged that would have been helpful but, in his view, it did not stop PPMs being carried out[665]. The recollection of Mr Purdon was that the lack of asset tagging could lead to delays in identifying the correct maintenance procedures for individual assets or lead to the incorrect asset being maintained[666].

55. In Mr Powrie's view, Authorised persons and all other appointees under the water appointee structure should have been in place before handover. Alan Gallacher agreed but had done nothing on appointment in August 2015 to ensure appointments were made. None of these appointees were in place until at earliest 2017. Ian Powrie told the Inquiry he had given Mary Anne Kane a list of proposed names but got no response[667]

56. Mr Clarkson explained that there were operation and maintenance manuals from the builder in the ZUTEC system detailing the construction, drawings and schematics, although drawings did appear to be missing[668]. He clarified that the ZUTEC system was static whereas CAFM was a dynamic system. The Inquiry heard evidence from Mr Clarkson that the CAFM system manages PPM and reactive maintenance automatically. It will issue activities to service providers and in-house staff. Any reactive works can be issued to supervisors. Mr Clarkson claimed that there was no handover of PPM schedules at handover of the building, so that the Estates Team could provide appropriate resource and get started with the necessary PPM[669]. In Mr Brattey's view, the PPM was reactive, and cleaning would happen when people mentioned it to him and his team because the cleaning frequency in place was too long a duration[670]. He added that he did not know if PPM was in place when the hospital was handed over, but he recalled that his duty manager and supervisors were starting to create PPM, but he wasn't sure it had been done

[664] Karen Connelly, Transcript, page 17
[665] David Brattey, Transcript, page 56
[666] Colin Purdon, Witness Statement, page 20
[667] Ian Powrie, Transcript, Page 65.
[668] Kerr Clarkson, Transcript, Page 29
[669] Kerr Clarkson, Transcript, Pages 21-24
[670] David Brattey, Transcript, Page 71-72

by April 2015[671].

Commissioning of the Water System

57. DMA carried out their L8 Risk Assessment in April 2015. They were provided with access to the ZUTEC system containing drawings and commissioning records. DMA noted that there were gaps in the commissioning records and also no validations of the water system. There was still no Written Scheme.[672] Professor Steele explained in the course of his oral evidence that there was commissioning information in respect of all systems at handover, and that they were complete. As-built drawings were not universally available; Professor Steele did not know why the validation was not done for the new hospital. Those who could answer that question were no longer employed by NHS GGC.

58. It should be noted that, as explained by a number of witnesses (particularly Mr Clarkson), while commissioning and validation occurs in a ventilation system, it is only commissioning that occurs in a water system because it is the quality of the water that is the concern and this is managed by L8 risk assessments within the health and safety legislation that sits behind with L8, HSG 274.[673]

59. In respect of the requirement to carry out an L8 Risk Assessment for a new building Mr Watson gave evidence that his understanding as a water hygiene consultant was that the responsibility for procuring an L8 risk assessment would depend on the contractual agreement between the parties to the building contract. However, he did observe that once one party became the owner (presumably the Employer after handover) the responsibility for ensuring there is an L8 risk assessment would pass to the owner.[674]

60. Full details can be found in the 2015 DMA Canyon L8 Risk Assessment[675], but the key findings in April 2015 were that:

[671] David Brattey, Transcript, Pages 53-54
[672] David Watson, Transcript, Page 27
[673] Kerr Clarkson, Transcript, Pages 25-28
[674] David Watson, Transcript, Page 15
[675] Bundle 6, Document 29, Page 122 (A33870103)

- In the basement plant rooms a pipe was in place which bypassed the filtration plant; one of the water tanks in the basement plant rooms had been isolated resulting in stagnant water and single-entry expansion vessels were in use. The latter giving rise to further places for water to rest and become stagnant. Debris was found in the cold-water storage tanks. Mr Watson was of the view that the debris were still there in 2017 and in 2018.[676]

- In respect of the calorifiers that heated the domestic hot water, some were offline whilst other showed hot water temperatures in the mid-40s degrees centigrade (indicating insufficient heat from energy centre) with a risk that bacteria such as legionella could grow within the system, as the hot water was below the 50 to 55 degrees minimum temperature required to inhibit such growth.

- In the cold side of the domestic system, temperatures were found to be more than five degrees over the 20 degrees maximum temperature required to inhibit bacteria such as legionella and peaking at 30 degrees (indicating heat gain in the system) with a risk that bacteria such as legionella could grow within the system.

- Significant communication issues between subcontractors, Multiplex and NHS GGC where defects highlighted by NHS GGC's Estates team to other parties were being acted upon without the Estates team being informed to allow proper consideration of bacterial control or to review/sign off that actions have been carried out in a compliant manner minimising any potential bacterial control impacts.

- Out of specification microbiological samples at handover. The sample results were not provided to DMA Canyon and a responsive programme of flushing and local disinfection was already underway at the time. Stagnation in cold water storage tanks and the bypass pipework may have contributed to out of specification results.

[676] David Watson, Transcript page 112

- That a sampling programme (testing for TVC, E. coli, coliforms and Legionella) was being conducted and that daily flushing and local disinfections were underway where positive results were found, but neither the sample results, nor the disinfection process was provided to DMA to review.

- Flushing of bib taps (like garden taps) should be included in the flushing regime to prevent stagnation in the long pipes within the Trades water system and possible proliferation of Legionella and other bacteria.

- EPDM hoses (NHS guidance – not to be fitted except specific circumstances due to rubber lining cracking) should have been removed or replaced by WRAS approved hoses with linings other than EPDM considered or hard piped (stainless steel).

- Low turnover/dead legs should have been removed wherever possible. Where deadlegs were unable to be removed then they should have been incorporated into low use outlets flushing regime. Lines in the system that had low turnover should have been fitted with a double check valve to prevent potentially stagnant water contaminating the system.

- There was no Written Scheme, Water Safety Plan, formal management structure or communication protocols for the QEUH and there were significant communication issues between parties involved. There was an informal Written Scheme in place based on SHTM 04-01 and written guidance provided by DMA Canyon. A written scheme for controlling the risk from exposure of Legionella should have been properly implemented and managed. There were no personnel identified as having responsibility for Legionella control. A lack of defined communication between involved parties may have contributed to out of specification bacterial and Legionella results recorded by NHS GGC Estates.

61. Given the later decision in 2018 after the Ward 2A ‘Water Incident’ to fit a Chlorine Dioxide dosing system, it is significant the 2015 DMA Canyon L8 Risk Assessment contained a recommendation that NHS GGC fit

"supplementary control systems (e.g. background dosing such as chlorine dioxide) in order to maintain microbiological control … to assist in focusing remedial actions on to identified areas of microbial activity".[677] Mr Watson explained that this was because DMA Canyon had seen a lot of temperature deviation away from what was required by the SHTM 04-01 and the L8 guidance and thus additional control should be considered to help prevent microbiological growth.[678] It was put to Mr Watson that the terms of Paragraph 15.1 of SHTM 04-01: Part A[679] state that the fitting of a chemical treatment to the water supply was an admission that the physical installation and/or the management process is incapable of maintaining that water supply in a wholesome condition. He did not fully agree with that statement but took the view that the fact that he was proposing such a treatment system was both a precautionary act and also a bit of admission given the temperatures that were out of specification.[680]

62. Dr Lee claimed that the use of biocides will crack and corrode metal components over time in the water system. She also observed that the use of biocide will reduce the life cycle of the water system but that may be an acceptable risk to reduce the risk to patients[681].

63. Mr Watson's recommendation on Chlorine Dioxide dosing at such an early stage and indeed Ian Powrie's thoughts corresponds to Dr Makin's remarks in evidence, for different reasons. Dr Makin identified the size and complexity of the water system at QEUH as being such that, regardless of the fact that dosing may not be mandatory in terms of the relevant guidance, it should nevertheless have been in place during the construction phase.[682] A further element of complexity lay in the increased number of outlets caused by the single-room design philosophy at the hospital, which led to problems, particularly in ensuring adequate flushing.[683] These aspects of the water system featured in Tim Wafer's chlorine dioxide evidence in yet another way,

[677] Bundle 6, Page 151
[678] David Watson, Transcript, Pages 64-65
[679] Bundle 15, Document 4, Page 337
[680] David Watson, Transcript, Page 65-67
[681] Dr Susanne Lee, Transcript, Pages 127 and 128
[682] Tom Makin, Transcript, Page 47
[683] Tom Makin, Transcript, Page 52

noting that the sheer size of the system required the installation of more chlorine dioxide systems than any other location on which he had worked.[684] He also mentioned the difficulty posed by such a large system being served from a single plant room, with the potential for rapid diffusion throughout the whole system of any problem which arose there. The plant room itself appeared damp to him, with mould issues. This was particularly an issue with regard to components having been stored there, though he did observe that Estates had sorted this out once informed.[685]

64. The size of the hospital was a concern for Dr Lee as she observed that the larger the water system then the more difficult it is to control. She commented that there are thousands of outlets in a hospital, and it is impossible to make sure they are used all of the time. She stressed the importance of making sure the water flows right up to every outlet. She opined that it is better to have a smaller unique system for very high-risk patients[686]. She explained that a multiple barrier approach should be taken so if the primary control measure is temperature and it fails then there is a backup, for example, biocide, to protect patients. In her view, the QEUH/RHC could not be protected with just temperature control[687].

65. The 2015 DMA Canyon L8 Risk Assessment was hand delivered by DMA's Darren Waldron to Mr Powrie (2 x hard copies and a CD with report burned on to it) on 6 May 2015.[688] Mr Watson's view was that on receipt of the L8 risk assessment, Mr Powrie and his staff should have created an action to plan to investigate how to correct any of the recommendations made by the report. At that point and during the assessment the water system was not compliant with L8.[689] Following the assessment, DMA carried out a 'gap analysis' on the QEUH's Estates team's management scheme. A meeting was held with NHS GGC Estates Managers on 28 May 2015 and a quote issued by DMA on 9

[684] Tim Wafer, Transcript, Page 129
[685] Tim Wafer, Transcript, Pages 121 to 126
[686] Dr Susanne Lee, Transcript, Page 108
[687] Dr Susanne Lee, Transcript, Pages 109 and 110
[688] Bundle 25, Document 41, Page 706 and Mr Watson, Transcript, Page 83
[689] David Watson, Transcript, Page 151

June 2015.[690]

66. DMA Canyon Ltd identified serious concerns about the safety of the water supply in 2015[691] and made recommendations about steps which should be taken by GGC to address those risks. On the face of the report and noting what others such as Health Facilities Scotland (HFS) have said in its report of March 2019, it would be difficult to disagree with that assessment.[692].

67. The HFS Water Management Issues Technical Review assessed the DMA Report as highlighting "various risks associated with the water system at handover, with a significant number to be dealt with either immediately, as soon as reasonably practicable or within three months."[693]

68. Mr Powrie had noted that the disinfectant, Sanosil, had not been used at the recommended dose due to the possible impact on Horne taps. He had failed to challenge that process at the time.[694] He had suggested general system dosing but was told this was not acceptable as it amounted to an admission that the system was not engineered properly.[695]

69. The biocide Sanosil was explained to the Inquiry by Dr Lee, who said that it is a silver stabilised hydrogen peroxide. She explained that is a very strong oxidising agent and if there is lots of biofilm in a water system then it tends to get 'mopped up' and does not get far into the system. She described the Sanosil eating its way along the pipe until it runs out of energy and cannot go any further. Other biocides have more energy and last a lot longer so they can reach further down the pipe and get closer to the outlets. In her view, Sanosil is not effective in a highly colonised system[696].

70. Mr Powrie understood that Multiplex should have carried out the L8 Legionella pre-occupation risk assessment. He raised this at a project meeting but was

[690] Bundle 25, Document 37, Page 684 and David Watson, Transcript, Page 86
[691] Summarised at paras. 99 and 100 of the witness statement of Professor John Cuddihy; transcript of evidence (26 October 2021 (am)) at p. 8.
[692] Bundle 7, p.111.
[693] Bundle 7, Document 4, Page 111
[694] Iain Powrie, Transcrpt, Page 80
[695] Iain Powrie, Transcript, Page 72
[696] Dr Susanne Lee, Transcript, Page 126

instructed by David Loudon to get one done.[697] He accordingly instructed DMA Canyon. His view was that both Mary Anne Kane and Billy Hunter would have known of the need for an assessment and that one had been ordered.[698]. Obviously, the Project Team knew as well through David Loudon.

71. It was accepted by Mr Powrie that he had received the DMA Canyon report. He acknowledged that he should have read it, escalated it to more senior colleagues and advised IPC. He did none of these. According to his evidence, he met DMA Canyon, David Brattey and Jim Guthrie.[699] He asked his colleagues to produce an action plan and subsequently heard from David Brattey that they were working on it. Thereafter, other pressures meant that he did not follow it up (nor did he have a system in place to remind him to do so). He heard no more about it until it 'emerged' in 2018. It was accepted by Mr Brattey in evidence that if Mr Powrie had asked him to produce an action plan, then both he and Mr Guthrie would have done that, but he could not recall ever being tasked with doing that[700]. He did recall regular meetings in 2015 when the DMA Canyon report was discussed. The attendees at these meetings were himself, Mr Powrie, Estates Officers and an Infection Control Nurse[701]. Other Estates staff did not recall seeing or knowing of that report at the time.[702] Allyson Barclay, PA to David Loudon, recalled being aware of the 2015 DMA Canyon report during a meeting when she was in attendance taking notes[703].

72. Somewhat unusually, as he was not then responsible for the new QEUH in his then role working on the retained estate, Mr Purdon gave evidence that it was possible he become aware of the 2015 DMA Canyon L8 Risk Assessment before November 2016[704]. He conceded that he would have seen the number of red flags in the Risk Assessment but assumed that other colleagues would

[697] Ian Powrie, Transcript, Page 43
[698] Ian Powrie, Transcript, Page 109
[699] Ian Powrie, Witness Statement, Page 290
[700] David Brattey, Transcript, Pages 87-88
[701] David Brattey, Transcript, Pages 85-86
[702] Thomas Romeo, Transcript Page 132-4
[703] Alison Barclay, Witness Statement, page 13 (Witness Bundle page 521)
[704] Colin Purdon, Transcript, Page 66

carry out the remedial actions[705].

73. Mr Watson was clear that anyone who had instructed the assessment, received his emails and attended the gap analysis meeting would know the terms of the 2015 DMA Canyon L8 Risk Assessment.[706] Dr Lee observed that the 2015 DMA Canyon report identified really dangerous aspects of the water system which included E coli and Legionella. She argued that it should have been escalated to board level to make a decision on whether it was safe to put patients into the hospital. She concluded, having read the DMA Canyon report, that the hospital was not safe for its intended patient group[707].

74. Once the report 'emerged' in 2018, Jim Leiper was asked by the Chief Executive Jane Grant to find out what had happened to the 2015 report, who got it and where it went. He understood it had emerged somehow via HFS. So, who knew it had been instructed? Mr Leiper thought 7 or 8 people but apart from David Loudon was not sure who. He thought he had seen a note of a meeting where its instruction was discussed. It was possible that some knew about it in 2017 because the AE, Mr Kelly, had mentioned it, but again he was not clear who knew at that time. He carried out interviews of those who were available to him.

75. Mr Leiper was asked if he had not been appalled or horrified or shocked at the failure to deal with a report which could have had such serious consequences. His answer was 'all of the above'[708], but that was not the purpose of his report. Due to the pressure on the team, he felt 'that the whole circumstances dictated that it was inevitable that something was going to happen, and this was, unfortunately, what happened'. Whether that is an adequate reaction to such a serious event is for consideration. His actual words were 'Actions on the recommendations of the L8 risk assessment could have been better." He agreed it was probably an understatement. [709]

[705] Colin Purdon, Transcript, Page 68,
[706] David Watson, Transcript, Page 94
[707] Dr Susanne Lee, Transcript, Page 165
[708] Jim Leiper, Transcript, Page 77
[709] Jim Leiper, Transcript, Page 82

76. It was acknowledged by Mr Purdon that in November 2016 he may have volunteered to contact DMA Canyon to obtain a quote for an updated report[710]. Mr Powrie would have known about the request for an updated report[711]. A letter was received from DMA Canyon dated 8 November 2016 addressed to Mr Purdon which enclosed a quote to update the 2015 Assessment[712]. He did not dispute the content of the letter although he could not recall asking for the quote[713]. In Mr Purdon's view, the responsibility for approving the quote would have been either David Brattey or Ian Powrie[714]. While Mr Brattey accepted in evidence, that he had the authority to approve the quote, he could not recall ever seeing it[715]. There was a significant delay between the quoted L8 Risk Assessment update and it actually taking place in September 2017. Mr Purdon gave evidence that he assumed the delay was because it was a large hospital, and that it would take a significant amount of time to complete the risk assessment[716].

Patient Migration: April to June 2015

77. Patient migration commenced with the Southern General Hospital Outpatient department move to the new campus on 27 April 2015. Migration of patients from the Western Infirmary, Victoria Infirmary, Mansion House Unit, and Gartnavel General Hospital commenced on the same date. On 1 May 2015, the Inpatient departments of the Southern General Hospital moved to the new campus. On 6 June 2015 the BMT transplant team moved into Ward 4B from the Beatson[717]. On 10 June 2015, the Royal Hospital for Sick Children at Yorkhill moved into the new RHC building at the QEUH. By 14 June 2015, the move by all units and hospitals to the new campus was complete[718].

Water Safety

[710] Colin Purdon, Transcript, Page 66
[711] Colin Purdon, Transcript, Page 66
[712] Bundle 25, doc 35, page 678.
[713] Colin Purdon, Transcript, Page 65
[714] Colin Purdon, Transcript, Page 67,
[715] David Brattey, Transcript, Page 95
[716] Colin Purdon, Transcript, Page 67,
[717] Bundle 4, Document 2, Page 11
[718] HPS Report, 31 May 2018, Bundle 7, Document 1, Page 6

78. In June 2015, Dr Peters noted that Dr Wright asked for a regular program of Legionella Water Surveillance to be implemented to ward 4B, further exemplifying the lack of a monitoring program in place before the patients were moved.[719] In their response to PPP 5 NSS report that HFS did not receive any water tests results until April 2018.[720] The testing was carried out by two Estates managers with no training in taking samples. Thomas Romeo spoke to having continued with that practice for a couple of months before being dissatisfied that it was being done correctly and instructing DMA to take over.[721] Mr MacMillan said that Mr Powrie had instructed him to carry out the water samples although notably he could not confirm the testing complied with L8 and SHTM 04-01 guidance[722]. Mr Kelly expressed concern that he was unable to find an audit trail for out of spec results and temperatures[723]. He had not seen any evidence that the samples had been taken correctly or whether the staff taking the samples were qualified to do so[724].

79. Before the hospital opened, there was awareness of microorganisms such as Mycobacteria in the water system[725]. GGC refused to accept handover of the hospital until sanitisation of the water supply was undertaken, standing concerns about the high level of TVCs[726]. Ian Powrie spoke about an incident in April 2015 when the water system failed. It was refilled with mains water bypassing the filters. It was not then re-flushed and refilled due to lack of manpower. Blocked filters caused the problem. They had not been changed since installation, though weekly changes were recommended[727].

80. It was accepted by Mr Brattey in evidence that the recorded cold and hot water temperatures in the 2015 DMA Canyon report would have given rise to concerns. He insisted that the Estates team must have done something in response at the time as they could not have just accepted it, but he could not

[719] Dr Christine Peters, Witness Statement, Para 43.
[720] Core Participant Responses to PPP 5 - Response by NHS NSS to PPP 5, Page 57
[721] Thomas Romeo, Transcript, Page 113
[722] Melville MacMillan, Witness Statement, Page 23 (p 289 of Witness Bundle)
[723] Dennis Kelly, Transcript, Page 167
[724] Dennis Kelly, Transcript, Page 166
[725] Minutes of SMT of 25 March 2015 (not yet in a bundle- A40247643)
[726] Bundle 7, Document 1, Page 8
[727] Ian Powrie, Transcript, Pages 133 and 134

recall anything having been done. He found it hard to believe that they would have left the cold water at 30c[728]. Dr Lee stated that a cold water temperature of 30c is 'frighteningly high' as this is the exponential growth stage for Legionella[729], It was conceded in evidence by Mr Brattey that he should have been working on bringing down the red high risks highlighted by the 2015 DMA Canyon report and the gap analysis, but he was doing 101 other things, and it just bypassed him[730].

81. In his evidence during Glasgow III Dr Tom Makin spoke to having been engaged by GCC from May 2018 onwards to give advice as regards the introduction of a chlorine dioxide dosing system within the hospital. While he observed that the types of problems which were identified by the 2015 DMA Canyon Report were not necessarily uncommon in hospitals, it was a surprise to him that they had been picked up clearly by the report in 2015, but that no action had been taken to implement the recommendations.[731] The report had identified several risk areas at QEUH that could support the growth of Legionella and other waterborne microorganisms.[732]

82. Dr Makin also observed that, when compared against his previous experience of contamination within new-build hospitals, he would have expected the contamination to have been seen earlier than 2018.[733] He also speculated that, had routine testing for Pseudomonas been required in Scotland as it is in England (that being a point of difference between the HTM 04-01 and SHTM 04-01 guidance), then the need for remedial chlorine treatment might have come to the attention of the hospital sooner.[734]

83. What limited evidence there was from Glasgow I in relation to matters in 2015 did suggest that issues with water may have been apparent to patients shortly after the QEUH opened. A patient in the adult wards within QEUH recalled the

[728] David Brattey, Transcript, pages 89-90
[729] Dr Susanne Lee, Witness Statement, page 57 (Witness Bundle page 86)
[730] David Brattey, Transcript, page 100
[731] Tom Makin, Transcript at page 68
[732] Tom Makin, Witness Statement, Answer 14
[733] Tom Makin, Transcript, at Page 19
[734] Tom Makin Transcript, at Page 27

water being turned off for periods of time shortly after opening in 2015[735].

84. It was acknowledged by Mr Purdon that he was not aware in August 2015 of the appointed Authorised Persons for the QEUH site[736]. In his view, the lack of appointed persons for water made it difficult to assess water safety in certain situations[737]. Mr Purdon told the Inquiry that the management system within the Estates team to progress the L8 Risk Assessments relied upon people reacting to documents they were sent, conversations they had or telephone calls they had[738]. Ultimately, he concluded that there were clear gaps in the management of the hospital and improvements to be made[739].

85. None of the Glasgow II witnesses recalled having direct contemporaneous knowledge of any concerns about the safety of the water system in late-2014 and early-2015. None recalled being aware, at the time it was provided to GGC, of the 2015 DMA Canyon L8 Risk Assessment. Where Glasgow II witnesses were aware of the existence of the DMA Canyon L8 Risk Assessment, that knowledge was gained at a much later stage than 2015. Professor Gibson thought it might have been referred to in the 2018 IMTs but had no clear understanding of who within GGC saw it and when.[740]

86. Mr Redfern did not recall being told "formally" about the existence of the DMA Report at any point between 2015 and the present day. His awareness of its existence had been gleaned from the media and the Inquiry[741]. Despite the senior roles he held in relation to the RHC and the patient cohort most affected by concerns about the water system from 2018 onwards, he was not, on his evidence, made aware of concerns connected to the "discovery" of the DMA report that year or of any concerns about the water system that the report may have highlighted. However, Ms Ferguson recalled a meeting at which Mr Redfern was in attendance in March 2018 during which she raised concerns about the water on Ward 2A. She further recalled being informed

[735] John Henderson, Witness Statement, at Para. 10.
[736] Colin Purdon, Transcript, Page 64,
[737] Colin Purdon, Transcript, Page 64,
[738] Colin Purdon, Transcript, Page 73
[739] Colin Purdon, Transcript, Page 89.
[740] Professor Brenda Gibson, Transcript, Page 60
[741] James Redfern, Transcript, Page 79; p.239.

that there was nothing wrong with the water and that it was tested often[742].

87. The Board Water Safety Group met on 4 August 2015. The minute[743] records a lightly attended meeting. Ms Joannadis explained that Legionella was discussed at this time but could not explain why the QEUH failing its L8 Risk Assessment did not make it onto the agenda. Ms Joannadis had been asked by Mr Walsh to attend the Board Water Safety Group to deal with the clinical aspects of Pseudomonas and just Pseudomonas. [744]

88. Mr Walsh explained in his statement that he sat on the Board Water Safety Group[745]. It was put to him that the Board Water Safety Plan[746] set out that he would co-chair the Board Water Safety Group, but that he attended very few meetings and that the successful working of the structure required all participants to be engaged in the project for it to work. He explained that he had agreed with Ms Kane that she would chair the Board Water Safety Group, as his primary responsibility was around Pseudomonas and it was fully delivered. Then he asserted that he sent the Lead ICDs to meetings as well. He accepted that he had delegated his responsibility to a series of other people, partly to the Lead ICD, partly to Ms Joannidis and partly to the other co-chair (Ms Kane). It was put to Mr Walsh that as ICM and unlike anyone else on the Board Water Safety Group he had direct access to the medical director. By stepping out and being replaced by delegated people he had weakened the group. Moreover, that was at the time it was covering a new flagship hospital where we subsequently discover that, as Mr Powrie put it, Estates 'dropped the ball' and didn't tell anyone about the L8 Risk Assessment. He appeared to accept that characterisation.[747]

89. Mr Gallacher thought he had been told about it in 2017 but accepted that neither he nor Mary Anne Kane had raised it at the IMT of 12th March 2018[748].

[742] Sharon Ferguson, Transcript, at p 37; Witness Statement at para. 113.
[743] Bundle 13, Document 15, Page 53
[744] Ms Joannidis, Transcript, Pages 107-112
[745] Mr Walsh, Statement, paragraph 49, page 239
[746] Bundle 27, Volume 2, Document 1, Page 5.
[747] Mr Walsh, Transcript, Pages 67-78
[748] Mr Gallacher, Transcript, Page 50

Both were members of the Board Water Safety Group; Ms Kane was formally its Co-Chair and Mr Gallacher had chaired it. He accepted he did not do anything himself to follow up on actions about it. It would have been helpful to enquire about it in 2015, but he did not do so.[749]

90. This might be an appropriate juncture to question the effectiveness or otherwise of the Board Water Safety Group. Water was a high-risk item but looking, for example, to Alan Gallacher's evidence[750] it did not appear that 'owning the risk' brought much action or change in behaviours. Looking towards Glasgow IV this material, combined with the unanswered question as to whether the AICC or BICC ever took any action - as opposed to receiving and noting reports -during the crisis periods will be a fruitful area for governance investigation.

Ventilation in the QEUH/RHC

91. On 25 June 2015 Dr Peters (South Sector ICD) and Dr Inkster (Regional Sector ICD) met Mr Powrie in order (as Dr Inkster put it) "for me to become familiar with the broader site, because at the time Christine worked part-time, and I would be covering her days off. So, I needed to have some knowledge of the hospital as a whole[751]". Dr Peters followed up the meeting with an email which contained a brief summary of what they were told. It seems that they learned that: none of the PPVL rooms had HEPA filtered air supply, there had been no IPC signoff of commissioning and validation data on ventilation for any part of the hospital and there was no "easy to read collection of relevant documents for the specialist ventilation areas including design spec, commissioning and validation data" [752]

92. Professor Steele gave evidence that there was some evidence of the validation required by SHTM-03-01. However, he stated that there were no validation records at all for the ventilation system. He noted that as-built

[749] Mr Gallacher, Transcript, Page 3
[750] Mr Gallacher, Transcript, Page 43
[751] Dr Inkster, Transcript, Day 1, Page 30
[752] Bundle 14, Volume 1, Document 15 at Page 337

drawings were not universally available.

Concern about the choice of PPVL Rooms for all isolation rooms

93. Dr Peters did a brief tour of the new building in late 2014 with Mary Macleod of the Project Team and ICN Jackie Barmanroy. That was the first time that she thought, 'I'm not sure this is right'.[753] She was shown what was said to be a negative pressure room which she knew clearly wasn't - it was a PPVL room - but was told Professor Williams had signed it off. She assumed he was dealing with ventilation but had no direct information.

94. In the course of a further walk-round shortly after patient migration (when she was checking how prepared they were for possible serious infected cases) she found there were no negative pressure rooms anywhere in the hospital, nor there were any pressure gauges in PPVL rooms, which are standard for such rooms.[754]. She was 'astonished'[755], especially since the Brownlee Infectious Diseases Unit had moved to the QEUH.

95. Dr Peters then explained that in June 2015 she had been in touch with Anne Harkness asking for the ventilation specifications so she could review them. Professor Williams has done that, she was told.[756] At the same time Professor Williams had said to Dr Peters that ventilation 'wasn't his thing' and she should speak to Ian Powrie. She was told by Tom Walsh[757] that the issue had been led by Professor Williams with some input from John Hood, but that design sign-off had been by the ICN Jackie Barmanroy. Dr Peters asked for waterborne infection risk assessments. She asked Ian Powrie and copied Mary Anne Kane and Professor Williams and Tom Walsh, but no-one seemed to know. Professor Jones explained that he was told by Professor Williams that if the original specification by Brookfield was provided then that would be a safe environment for a vulnerable group of patients[758].

[753] Dr Peters, Day 1 Transcript, Page 31
[754] Dr Christine Peters' Statement – Para 37.
[755] Transcript Dr Peters, Day 1 Page 46
[756] Transcript Dr Peters, Day 1 Page 53
[757] Bundle 14, Vol 1, Page 204
[758] Professor Brian Jones, Witness Statement, Page 22 (Witness Bundle page 588)

96. It was explained by Dr Inkster that the Brownlee Centre at Gartnavel Hospital was purpose built for infectious diseases patients and had four negative pressure rooms for isolation of airborne infection patients. She believed a factor in the move was so the unit would be next to a Critical Care facility. Importantly the infectious disease patients were located at the other end of the ward away from immunosuppressed patients such as HIV patients. However, in 2015, the Brownlee patients moved to Wards 5C and 5D of the QEUH. There were some isolation rooms available to patients in the Critical Care ward which were PPVL rooms. Dr Inkster recalled her concern about the suitability of PPVL rooms for patients, because there is always leakage in one direction, depending on whether the room is positive or negative. An infectious diseases patient (such as chickenpox, measles or respiratory virus) could put other patients and staff elsewhere in the ward at risk.

97. Dr Inkster[759] and Dr Peters[760] had both attended a meeting with Brookfield in June 2015, who were apparently surprised to learn that there was an Infectious Diseases unit at the QEUH. Dr Inkster further recalled that the Director of Facilities, Mr David Loudon, told her that GGC 'got what it asked for'. Her recollection was that she was challenged about the need for negative pressure rooms by Mr Loudon, who questioned whether MERS or MDRTB were known about when the design of the hospital was signed off. She acknowledged that MERS was a new thing but argued that there is always a new emerging threat, a good example being the COVID-19 pandemic. [761]

98. It should be noted that Currie & Brown submitted in their response to PPP 5 that an Infectious Disease Unit was not part of the QEUH project brief. The project brief was to provide isolation rooms as part of an acute hospital to deal with patients who may be infectious (until they can be transferred to a specialist unit) or patients who are susceptible to infection from others.

Absence of HEPA Filters in Ward 2A

99. During the course of 2015, concerns emerged about the safety of the

[759] Dr Teresa Inkster, Witness Statement, Para 193.
[760] Dr Christine Peters, Witness Statement, Para 34.
[761] Dr Inkster Transcript, Day 1, Pages 96-103 and Dr Peters, Transcript, Day 1, Page 63-64

ventilation system on Ward 2A and, in particular, whether it provided a safe environment for BMT patients[762].

100. It may be useful at this juncture to consider some of the efforts to obtain ventilation information and the responses to these. Professor Craig Williams was pressed on this matter at some length[763]. He maintained that they were repeatedly assured by the Project Team that there was no problem with the validation. He could not explain[764] how one part of the Board effectively ignored another. As he did explain, they were repeatedly reassured orally and in emails and even by one individual attending an AICC meeting[765] and providing reassurance there. That was the top of their escalation. How the Project Team responded will be a matter for Glasgow IV.

101. If there were no HEPA filters then immunocompromised patients would not have the benefit of protection.[766] This was all odd, Professor Williams thought, because something like the absence of an HEPA filter was a bit like going to pick up a new car and discovering it had no wheels[767]. Curiously, Professor Jones did not consider HEPA filters to play a crucial role, since in his view Aspergillus spores are ubiquitous and invasive infection is due to reactivation in many patients amongst other factors[768]. Dr Peters maintained that she pointed out to Prof Jones that, according to JACIE Standard B2.1, if non-HEPA filtered rooms are used for lower-risk patients or due to a shortage of HEPA-filtered rooms, SOPs must outline how room allocation is prioritised.[769] Clare Mitchell commented that if there were no HEPA filters then immunocompromised patients would not have the benefit of cleaner HEPA filtered air and may be exposed to the risk of airborne infection[770]. Professor Stephanie Dancer considered filtering the air to be extremely important for immunocompromised patients since anything coming through the air would be

[762] See, primarily, Professor Brenda Gibson, Transcript, Dr Anna Maria Ewins, Witness Statement
[763] Professor Craig Williams, Transcript, Page 2
[764] Prof Craig Williams, Transcript, pages 3,4.
[765] Prof Craig Williams, Transcript, page 109.
[766] Prof Craig Williams, Transcript, page 90.
[767] Prof Craig Williams, Transcript, Page 8.
[768] Professor Brian Jones, Witness Statement, Page 26 (Witness Bundle page 592)
[769] Dr Christine Peters Witness Statement – Para 96.
[770] Clare Mitchell, Witness Statement, Page 5 (Witness Bundle page 532)

an enormous risk to those patients[771].

102. Professor Gibson explained that quite apart from national technical guidelines, transplant units must also adhere to the standards set by the Joint Accreditation Committee ISCT-Europe ("JACIE") and be accredited by JACIE[772]. All of Europe adheres to the JACIE standards; the USA operates a similar accreditation system. The standards set by JACIE are not overly prescriptive to enable compliance by low- and middle-income countries. The standard set by JACIE is that transplant units should be designed to "minimise microbial contamination" [773]. Professor Gibson recalled that when the Schiehallion Unit moved to the RHC, clinicians were told that the HEPA filtration that had been installed in the BMT rooms met the JACIE standards of protection against microbial infection[774].

103. In Glasgow II Schiehallion Unit clinical witnesses were aware of the existence of technical guidelines for ventilation in hospital buildings but were uncertain if they applied to patients outwith the BMT-cohort. Clinicians were, however, consistent in their understanding that BMT patients should be cared for in rooms which provided specialist ventilation in at least two respects: (i) High Efficiency Particulate Air (HEPA) filtration; and (ii) positive pressure.

104. Ward 2A had no specialist ventilation arrangements aside from in the BMT rooms. Clinicians had to think carefully about which patients would benefit from the protective environment in those rooms (as it was then thought to be) depending on the stage of their treatment. However, as Dr Ewins also explained, fundamental problems with ventilation systems in the BMT rooms meant that even more fraught decisions had to be made about access to those rooms and the ability to carry out transplants[775].

105. In 2015 Mr Powrie noticed the lack of HEPA filters and had concerns about how the PPVL rooms had been designed with the main extract in the

[771] Prof Stephanie Dancer, Transcript, Page 29
[772] Professor Brenda Gibson, Witness Statement, Paras. 39; 62-64.
[773] Professor Brenda Gibson, Witness Statement, Para. 62.
[774] Professor Brenda Gibson, Witness Statement, Paras. 63.
[775] Dr Anna Maria Ewins, Supplementary Witness Statement, para. 26.

bedroom. This was not in accordance with guidance.[776] Alan Gallacher accepted that it might have been helpful for him to find out about validation of the systems when he was appointed to his role in August 2015. However, he did not do so.[777]

106. Professor Gibson recalled being informed that Ward 2A as a whole was built to the standards required for a haemato-oncology unit, such that the rooms for treating BMT patients would have positive pressure and HEPA filtration[778]. Both Professor Gibson and Dr Ewins considered these to be vital elements of a protective environment suitable for treating BMT patients. Dr Mathers – among many others – spoke very highly of Professor Gibson – 'her knowledge and her dedication is unparalleled in my experience'[779]. He described her as 'a restless individual in trying to make sure everything is as good as it can be …….that's the kind of people you need in medicine …… they are restless about improvement and that is why……. children with leukaemia, etc., survive now when they wouldn't have 40 years ago, because of people like that.[780]'

107. Prior to the migration of paediatric patients to the RHC, Professor Gibson sought, and was given, assurance from the then Lead IPC doctor that it would be safe to begin transplant procedures on moving to the new ward[781].

108. However, Professor Gibson[782] recalled that at a visit to Ward 2A shortly before the move, it was discovered that HEPA filters were not in fact installed in the BMT rooms on Ward 2A; casings were present but the filters themselves were not. Discovery of the omission of filters at such a late stage was a matter of concern to Professor Gibson. She was surprised that the omission of filters had not been detected during the commissioning process. She had been told the specification of the ward was to the required standard and trusted what she had been told. Professor Gibson expected Management, Estates and IPC to

[776] Ian Powrie, Transcript, page 145
[777] Alan Gallacher, Transcript, page 11.
[778] Professor Brenda Gibson, Transcript, Page 48.
[779] Dr Alan Mathers, Transcript, Page 42
[780] Dr Alan Mathers, Transcript, Page 42
[781] Professor Brenda Gibson, Transcript, Page 48.
[782] Who is herself an inspector for JACIE and has inspected most transplant Units in the UK (statement, para. 101).

provide a safe environment in which to treat children; prior to this discovery she had no reason to doubt that that would be provided[783].

109. On 3 June 2015 Dr Inkster became aware that ward 2A had no HEPA filters in the eight isolation rooms when she received an email from Sandra Devine[784]. Dr Armstrong became aware on 5 June 2015 that HEPA filters had not been fitted in Ward 2A. [785] Dr Armstrong explained that before the paediatric BMT moved over on 1 June 2015, Mary Anne Kane found out that HEPA filters had not been fitted on 29 May 2015. They were faced with maybe stopping the RHC opening. HEPA filters were sourced from Northern Ireland, fitted, and it opened.[786]

110. It was acknowledged by Dr David Stewart that Professor Williams was contacting him on 19 June 2015 about isolation rooms in ITU and HDU not having HEPA filters, but in his view Professor Williams was writing to him for his information but not asking him to action anything[787]. We note that Dr Stewart did raise the policy for isolation rooms in the QEUH at the AICC of 2 November 2015.[788] It is notable that this is the only mention of isolation rooms in the Minutes of the AICC or BICC before Dr Inkster explains that the isolation rooms in the QEUH are below specification at the AICC on 6 March 2017.[789]

111. It was conceded by then Deputy Medical Director, Dr Stewart, that questions should have been asked about whether there were more issues with the building following the issues with the isolation rooms and Ward 4B[790]. He explained that he didn't ask questions because the great majority of his time was spent in his role dealing with acute medical services and the day-to-day operational challenges of running the hospital. He considered himself to have had barely any involvement in the Estates and BMT decisions, which was in

[783] Professor Brenda Gibson, Witness Statement, Para. 98.
[784] Bundle 14, Volume 1, Document 10, Page 263
[785] Transcript, Dr Armstrong, page 22
[786] Transcript, Dr Armstrong, page 24 to 26
[787] Dr David Stewart, Transcript, Page 17
[788] Bundle 13, Document 2, Page 20 and page 22
[789] Bundle 13, Documents 1 to 9 and 28 to 30
[790] Dr David Stewart, Transcript, Page 24

his view largely the remit of the medical director, Dr Jennifer Armstrong, Estates and the Infection Control team[791]. He told the Inquiry it was outside his remit[792].

112. Pamela Joannidis, a nurse consultant setting up the IPC team within the RHC, recollected that her understanding in 2013 and 2014 was that the Schiehallion unit was to have a lobby and be HEPA filtered. In July 2015, when she became acting lead infection control nurse for the RHC, she noticed on a walk around that there was no airlock and asked Professor Williams why. In July 2015 she did not know what the specification was for the Schiehallion unit.[793] Subsequently Dr Inkster told her that the ACH was only 3 ACH, not 6 ACH albeit that may not be until 2016.[794]As Mr Leiper pointed out, if the decision was “We're going to have a chilled beam unit," you have, by making that decision, made a decision as to what the rate of air changes are delivered by your mechanical system was.[795]‘

113. Ms Ioannidis’s general understanding throughout the whole new build project process was that the Schiehallion unit would be a sealed ward, with HEPA filtration, positive to the rest of the hospital with a lobby on the entrance to the ward, as the understanding was that was the description of the existing Schiehallion unit at Yorkhill.[796] . As she put it:

> “You would hope so, given technological advances, latest research and where you have the benefit of expertise learned. I think Yorkhill was built in 1965, I think, so you would very much expect a new building in 2014 to have fewer risks.”[797]

114. Dr Inkster recalled that the old Schiehallion ward at Yorkhill Hospital had eight isolation rooms which were HEPA filtered, but that the rest of the ward was not filtered. She did not know the air change rate for the old ward.[798]

[791] Dr David Stewart, Transcript, Page 23
[792] Dr David Stewart, Transcript, Page 29
[793] See email of 6 July 2015, Bundle 14, Volume 1, Document 10, Page 280
[794] Pamela Joannidis, Transcript, Pages 80
[795] Transcript of evidence of Jim Leiper p 59
[796] Pamela Joannidis, Transcript, Page 67
[797] Pamela Joannidis, Transcript, Pages 130-131
[798] Dr Inkster, Transcript, Day 1, Pages 43-44

115. On 5 June 2015 in an email to the Medical Director, Dr Armstrong, concerns were raised by Professor Williams about the absence of HEPA filtration in Ward 2A and that the absence of this would be “potentially unsafe” as regards children presently cared for in facilities with HEPA filtration.[799] Apart from the lack of HEPA filters, Dr Peters also recalled noting no air sampling being undertaken in the ward that was to house BMT patients.[800] In their response to PPP 5 Currie & Brown insist that HEPA filters were part of the design for Isolation Rooms in Ward 2A[801]. This will require to be investigated in Glasgow IV.

116. To assist, perhaps, in placing some of the later events in context, particularly the attitude to those raising problems, an exchange is noted between Dr Peters and Professor Leanord. In August 2015 she had been suggesting that they needed to do more about the building[802]. In reply he had said words along the lines of,’ why put your head above the parapet’. That was taken by Dr Peters to mean that,’ If you keep raising concerns, that could be a difficult road.” If the meaning was explained on that basis, Professor Leanord did not dispute Dr Peters’ recollection[803]. While this was friendly advice, Dr Peters did not understand it. She explained, ‘it's really a core foundational principle of any interaction with patients that you've got a responsibility to act in their best interests. And …., a bit of discomfort for you or just not being terribly popular, that doesn't come into any equation that I know of for patients. So, you have to act in the patients’ best interest. ……-- That is a foundational part of your job. If you're not doing that, you're not doing your job.’

117. Professor Leanord subsequently described Dr Peters and Dr Inkster as two of the most experienced and well-versed colleagues[804].

118. In the absence of HEPA filters, transplants would not have been able to take place. Professor Gibson’s evidence was that had the issue not been resolved,

[799] Bundle 14, Volume 1, Document 8 at page 200
[800] Bundle 12, Page 227 (A46157901)
[801] Provisional Position Paper 5 – Core Participants’ Responses, Page 10 (A43700817)
[802] Christine Peters, Day 1 Transcript, page 152
[803] Prof Leanord, Transcript, page 26; Dr Christine Peters, Witness Statement, para 56
[804] Alistair Leanord, Transcript, Page 28

migration to the RHC would have been delayed[805]. In an email dated 5 June 2015 to the then Clinical Service Manager[806], Professor Gibson noted the likelihood that a transplant planned for 20 June would have to be delayed as a result of the missing HEPA filters. Professor Gibson wrote:

> "It is inconceivable that a transplant unit was built without HEPA filtration. Truly shows the priorities all show and no substance."

119. Reference might also be made to the evidence of Dr Murphy as regards the missing HEPA filters[807]:

> "… the day before we were due to move into Ward 2A when the hospital was opening, there were no HEPA filters in place, and we had to fly them over from Ireland. It was only because Prof Gibson walked around with Alanna McVeigh, one of the Transplant Department's Administrators, on the day before that that was recognized. I mention this because I think it highlights the level of knowledge of the builders who were fitting out the hospital and the approach to detail that was being taken when it was built.
>
> When my colleagues from the UK or from Europe come to me and say, "We're just refurbishing our ward, we're moving on to a new ward, we know you've got a new children's hospital, what were the lessons you learnt?", I say to them, "Well, one of the lessons I learnt was, make sure you've got HEPA filters in your HEPA filtration suites." They look at you as if you are joking. I would have had the same reaction, but that was the level of build quality."

120. On 6 July 2015, the Board Infection Control Committee (BICC) minutes record discussion "around HEPA filters and the need to ensure air pressures are correct as Dr Peters had reported there were some issues around slightly positive air pressures". One Microbiologist advised "there are issues with ventilation in QEUH in a couple of areas and one room in particular". Dr Peters noted that at this meeting, attended by Professor Williams and chaired by David Stewart, that Professor Williams stated there were no issues with the ventilation. Dr Peters also recalled intervening to outline her concerns, but

[805] Professor Brenda Gibson, Transcript, Page 50
[806] Bundle 8, Page 125
[807] Dr Murphy, Witness Statement, paras. 150-151

later found out that the draft minutes did not fully reflect these concerns.[808] There appears to be a dispute about the accuracy of the minute of the AICC meeting of 6 July 2015, and some dispute about the nature and extent of the issues which were raised. [809]

121. It may be useful to record an exchange with Professor Williams about information received about ventilation. Having covered the clinical decision that on balance it was best to move into ward 2A, he was asked about information from the Project Team. He had realised that what he was finding might suggest problems in a number of areas. This question was put - "Would the answer to that, Professor Williams, have been to say that the information you'd been getting from the Project Team was clearly untrue; that validation had not happened because it couldn't have happened; and no patients were moving in anywhere until validation was carried out properly and evidenced?' He did not answer the question directly, merely referring to the decision on balance to move into 2A. However, he did say, that he,' specifically asked David Loudon if he was aware of any problems with the adult Bone Marrow Transplant Unit, because obviously I drew the same conclusion that there may have been risks across the rest of the site. I was told in absolute terms that he was not aware of any concerns with the adult Bone Marrow Transplant Unit.' He did not think it right to ask for any paperwork to support that. [810]

122. Swift action was taken to source and install the missing HEPA filters. Migration to the RHC was not delayed.[811] However, further concerns about the safety of the BMT rooms emerged following migration.

Air Quality on Ward 2A

123. Professor Gibson recalled that although the first two transplants proceeded without incident, concerns about air quality on Ward 2A emerged in around July 2015 and continued into August and September.[812] Air sampling on Ward 2A

[808] Dr Christine Peters, Witness Statement, Para 47.
[809] Bundle 13, Document 32, Page 250 at Page 254.
[810] Professor Williams, Transcript, Page 101
[811] Professor Brenda Gibson, Transcript, page 27
[812] Professor Brenda Gibson, Transcript, page 29

indicated high particle counts in the ward corridor. On raising this with the then Lead IPC Doctor[813], Dr Ewins recalled being informed that some 'noise' in the air sampling results was to be expected; the corridor was not pressurised and the unit not sealed from the rest of the hospital[814].

124. Of more immediate concern was the discovery of raised particle counts in the BMT isolation rooms in Ward 2A themselves[815]. Further investigation using smoke tests revealed that the BMT rooms were not properly sealed; air could enter the room through unsealed areas (for example, light fittings). Professor Gibson and Dr Inkster recall that at a point likely before 10 June 2015, Aspergillus was found in the air sampling in BMT rooms, but not in patients[816]. Despite these air sampling results, Professor Gibson recalled some debate about whether the rooms were in fact safe[817]. There was doubt about interpreting the air sampling results. Professor Gibson recalled that the new Lead Infection Control Doctor ("ICD")[818] was not satisfied that transplants could proceed safely[819]. Dr Ewins recalled a similar view being expressed[820].

125. These concerns arose at a time when the unit had an extremely vulnerable patient awaiting transplant. For the reasons identified above, transplant patients do not have the luxury of time; there is a narrow window in which a transplant can proceed. Clinicians were in the unenviable position of potentially having to balance the risks of treating and not treating a desperately sick child.

126. An exchange of emails between 6 August and 4 September 2015, captured the clinicians' growing sense of frustration about the unanswered questions about the safety of the BMT rooms and the fact that the unit had been allowed to move when the safety of the environment may not have been assured[821]. In her email dated 4 September 2015, Professor Gibson escalated her concerns to the

[813] Professor Craig Williams.
[814] Dr Anna Maria Ewins, Supplementary Witness Statement, paras. 15-16.
[815] Bundle 14, Volume 1, Document 269, Supplementary Witness statement of Dr Anna Maria Ewins, paras. 18-20.
[816] Transcript of evidence of Professor Brenda Gibson, p.54 and Dr Inkster, Statement, Para 263 and Bundle 14, Volume 1 and page 273
[817] Professor Brenda Gibson, Transcript page 57; see also the emails at Bundle 8, pp.128 - 129.
[818] Specifically, Dr Theresa Inkster.
[819] Professor Brenda Gibson, Transcript, page 54.
[820] Dr Anna Maria Ewins, Supplementary Witness Statement, para. 19.
[821] Bundle 8, pp.128-133. See, p.132.

board's Medical Director, Dr Jennifer Armstrong[822]. She explained that the concerns about the BMT rooms had been unresolved for two months. Deadlines for resolution had been breached. Families in the anxious position of knowing their child needed a transplant, were in an uncertain position. Clinicians had lost faith. She said:

> "We have no feeling that the appropriate sense of urgency is in place…the transplant programme has been severely compromised".

127. Professor Gibson recalled that Dr Armstrong attended a meeting three days after the email was sent. Dr Armstrong gave the instruction that transplants could move forward. Professor Gibson did not recall receiving an explanation for why the problem arose in the first place.[823] The Minute of that meeting of 7 September 2015 records that those present were: Dr Armstrong, Dr Mathers, Mr Hunter, Mr Redfern, Mr Archibald (by telephone), Professor Gibson and Professor Williams.[824]

128. Dr Ewins recalled remedial work being done to seal the BMT rooms. There came a point where air sampling showed that two of the BMT rooms had air sampling results of a tolerable level so that transplants could proceed[825].

129. It might again be useful to note the perception of one of the less involved participants, Dr Mathers, when discussing events in respect of Ward 2A in September 2015. He said,' "There was an appreciation that fungal infections were a risk to anyone whose immune system was severely compromised, and the risks and the benefits were debated at length in a constructive and collegiate manner."[826]

130. Although there was clearly a period of frustration on the part of clinicians in 2015, Professor Gibson was satisfied at the time that the response to the known issues was adequate. The problems with filters were resolved quickly enough to allow migration as planned. "Snagging" problems with the BMT

[822] Bundle 8, p.133.
[823] Professor Brenda Gibson, Transcript, pp.31-32.
[824] Bundle 13, Document 117, Page 843
[825] Dr Anna Maria Ewins, Supplementary Witness Statement, para. 19
[826] Dr Mathers, Transcript, Page 18

cubicles were not entirely unexpected. Remedial works were carried out. More generally, Professor Gibson understood that plans were put in place in 2015 to begin a programme of upgrading the Ward 2A BMT rooms to a higher specification. Although frustrated that there were problems, there appeared to be a plan to address these problems[827].At some point in late 2015, prompted by queries raised by Dr Peters, Ian Powrie enquired of the Project Team about ACH. It took several enquiries [828] before he was given the M&E Clarification Log and ZVP Ventilation strategy. He had not been aware of these documents previously.

131. Dr Peters was not involved directly in Ward 2A but was asked if she could assist the Inquiry as to why, when issues were found as early as 2015, it took until 2018 to be fully resolved. It was, she thought, 'a lack of a joined-up approach where we really needed to say, "Let's start again from scratch. We don't actually know what we have and take it from there."[829]

Ventilation system in Ward 4B (adult BMT ward)

132. Since the initial move into the hospital in 2015, adult haemato-oncology patients (as opposed to BMT patients) have been housed between Ward 4B and 4C in single patient rooms with en-suites. Ward 4B is now the adult BMT Unit and is located within the QEUH building. [830] In light of what came afterwards, the evidence of Professor Williams that as he understood it either SHTM 03-01 or the HBN states "This guidance does not describe how you would build for an Infectious Diseases Unit or a Bone Marrow Transplant Unit" seems important given the decisions that appear to have been made about what ventilation would be suitable for Ward 4B. [831]

133. Sandra Devine claimed to know, that although those in the Beatson were expecting something as good as they had previously or better it was never going to be as good as if it had been designed from scratch.[832], Craig Williams

[827] Professor Gibson, Transcript, page 62
[828] Ian Powrie, Witness Statement, pages 25 to 26
[829] Dr Peters, Transcript, Day 1 page 105
[830] Dr Alastair Hart, Witness statement, para 88
[831] Professor Williams, Transcript, Page 65
[832] Sandra Devine, Witness Statement, page 462

gave some evidence[833] about whether PPVL rooms could be used for specialist patients coming from the move of infectious diseases patients end immunocompromised patients. There was, he said a whole pile of correspondence with David Loudon, Currie and Brown and other specialist engineers which concluded with those specialists saying they were OK. That went through the BICC. The advantage was that they could be used for either or for someone who fits both categories. The guidance had said that these rooms were not suitable but did not go on to say what was. He did not read the guidance as a prohibition.

134. Professor Williams felt that the original specification for the move of adult BMT patients should have made it clear that what was provided at the Beatson was what was required. He maintained that position notwithstanding that there was no mention of 10 ACH[834]. The team at the Beatson was expecting an equivalent to what they had and that was also the expectation of the Infection Control Team; something better than the one they had left[835].

135. Dr Inkster produced emails in [836] that showed that in February 2015 she had been raising concerns about the isolation rooms (also referred to as PPVL rooms) in Ward 4B in February 2015 which were forwarded to the SMT.[837] This may have been in response to Professor Williams stating in an email on 5 February 2015 that there is no definitive guidance about the use of PPVL rooms by immunocompromised patients[838]. That email was in a thread that included a rather detailed email from Professor Williams on 29 January 2015[839] which states that “the planning team have been unable to locate further definitive guidance” and email from an Infectious Diseases Consultant on 27 January 2015 who had just been told that what he thought negative pressure rooms in HDU for the use of infectious diseases patients were in fact

[833] Professor Williams, Transcript, page 67
[834] Professor Williams, Transcript, pages 80 and 81.
[835] Professor Williams, Transcript, page 82
[836] Bundle 14, Volume 1, Document 8 at pages 191,192
[837] Dr Inkster, Transcript Day 1, Page 16,
[838] Email to Mr Loudon, 5 February 2015, Bundle 14, Volume 1 at page 182
[839] Bundle 14, Volume 1 at page 184

PPVL rooms[840].

136. Dr Inkster acknowledged that in February 2015 she was unfamiliar with the design of PPVL rooms. Dr Inkster noted that the BMT rooms in the Beatson were traditional positive pressure rooms and were HEPA filtered with a high air change rate.[841] On 26 February 2015 Dr Inkster sent United States Center for Disease Control ("CDC") guidance to Peter Moir and Derek Loudon in Estates copying in the Infection Control Manager.[842] She explained that CDC guidance was sent because it is more detailed than SHTM guidance and went beyond basic specification. In addition, there was a lot of detail on what U.S. clinicians call protective environment rooms for immunosuppressed patients. She received no response to her email. She sent it again and felt people were not listening to her at the time.[843]

137. It was Dr Inkster's opinion that given specification of the PPVL rooms the BMT patients should not have been moved across to the QEUH and a fairly significant refurbishment would have been required.[844]

138. In June 2015 the adult BMT had 'high particle counts'. Adult BMT patients moved from the Beatson Oncology Centre (the "Beatson") to Ward 4B in on 6 June 2015.[845] Shortly after they migrated, significant concerns were raised about the whether the Ward 4B ventilation system provided a safe environment for BMT patients[846]. Dr Peters noted that air sampling on 30th June 2015 in wards 4B and 2A had revealed particle counts in the tens of thousands, far exceeding the safe limit of 100 and posing significant risks to BMT patients. Aspergillus was also detected, indicating, in her words, 'a complete failure in air quality management'.[847] Further tests were carried out with the ventilation system "increased to maximum capacity" from 1 July to 3

[840] Bundle 14, Volume 1 at page 185
[841] Dr Inkster, Transcript, Day 1, Page 18
[842] Bundle 14, Volume 1, Document 8 at pages 191,192
[843] Dr Inkster, Transcript, Day 1, Page 16
[844] Dr Inkster, Transcript, Day 1, Page 20
[845] Briefing note Bundle 27, Volume 3, Document 2.1, Page 293
[846] See, for example, the witness statement of Dr Alistair Hart, paras. 88-90; the SBAR at Bundle 4, p.11; the email of 6 July 2019 at Bundle 5, Document 1, Page 18 and its attachment at Bundle 5, Document 2, Page 19.
[847] Dr Christine Peters, Witness Statement, para 44.

July 2015 and all that could be achieved was around 6 ACH with a differential from the rooms to corridor of around 6Pa.[848] On 1 July 2015, she became aware that the adult BMT in Ward 4B had not been built as it should have been.[849]

139. Dr Hart recalled that things needed to be fixed in Ward 4B including the ventilation system, to see if it could be improved. There were discussions and a briefing note[850] was produced. The note records the problems that then existed around air sampling results and lack of required air pressure differentials (including in the pentamidine treatment room). It records an aspiration to reach 12 ACH in Ward 4B. Remedial work could not be done with transplant patients there, as it would create risk for them with dust etc. There was nowhere else to accommodate them in the QEUH, so they were moved back to the Beatson on Wednesday 8 July 2015[851]. Non-transplant patients remained at the Beatson for several weeks, but then returned to occupy Ward 4B.[852] BMT patients remained at the Beatson for over 2 years before returning in June 2018 when the adult BMT service moved back into Ward 4B, and the adult haemato-oncology patients moved to Ward 4C.[853].

140. Dr Armstrong's evidence about her understanding at the time was powerful:

> I thought we were getting, as I've said before, a fantastic hospital because we'd been working so long for this, but we didn't get what we expected,[854]

141. Dr Peters had been shown a piece of paper with a suggestion for a specification for a haemato-oncology ward (not a BMT Ward). She had expected to see references to 10 pascals, 10 ACH, HEPA filtration and pressure monitoring and what she was shown did not have that material.[855] She visited the ward on 20th June 2015. She carried out a quick test with

[848] Bundle 27, Volume 3, Document 2.1, Page 293
[849] Transcript, Dr Armstrong, page 22
[850] Bundle 27, Volume 3, Document 2.1, Page 293
[851] Dr Alastair Hart, Witness Statement, para. 90 and email from Gary Jenkins, Director Regional Services, 6 July 2015, Bundle 27, Volume 3, Document 12, Page 291
[852] IR para 8.9.11
[853] Dr Hart, Witness Statement, Para 88
[854] Dr Armstrong, Transcript, Page 21
[855] Dr Christine Peters, Transcript, Day 1, Page 81

tissue paper to see whether air was coming in or out of the rooms. It was going in the wrong direction[856]. It turned out there were also issues with HEPA filtration and the sealing of rooms.

142. In July 2015, upgrade works were undertaken in Ward 4B which resulted in some changes to certain ventilation issues. The room pressure of 3-4 Pa was increased to approximately 5+ Pa. Bedrooms which had suspended ceilings of the patient bedrooms were sealed by the use of plasterboard although the ensuites remained with suspended ceiling tiles. A pressure monitoring system was also installed during the 2015 upgrade works.[857]

143. In response to PPP5 Currie & Brown state that due to late change in Board requirements the design / construction was limited by constraints of already installed plant and equipment. The derogated scheme was known and accepted by NHS GGC.

144. In Dr Inkster's view, the reason for the return to the Beatson was not only about air quality issues but a suboptimal specification. She explained that the suboptimal specification was not achieving higher ACH, not maintaining high pressure, or having solid ceilings in the bathrooms. [858] Dr Peters' views aligned with those of Dr Inkster, and she added that the issues were pre-empted by a design inspection, rather than first being identified through air sampling.[859].

145. On 27 July 2015, the Board Infection Control Committee (BICC) minutes record that BMT patients were transferred to the Beatson as the unit was not built to the correct specification. The main contractor had agreed to fund the rebuild for this area (Ward 4B). At the same meeting, concerns were again expressed about the continued treatment of immunocompromised patients due to the scheduled demolition of the surgical block in September 2015.[860]

146. Professor Williams was responsible for pulling together material about the

[856] Dr Christine Peters, Transcript, Say 1, Page 87
[857] Bundle 26, Document 2 at page 154
[858] Dr Inkster Transcript, Day 1, Page 76
[859] Dr Christine Peters, Witness Statement, para 46.
[860] Bundle 13, Document 33 at page 258

original specification for a meeting with the contractors, The object was to show that the Board 'had provided a clinical output specification …. which clearly outlined the fact that this would be for immunocompromised patients and that it should have been built to a similar standard' to the Beatson[861]. In July 2015[862] Mr Hoffman appears to have been consulted about what was necessary. He had no direct recollection. He commented on the need for firmly established positive pressure, fully sealed rooms and a monitoring system. He also made the point that it was not for him to approve a specification for a hospital in Scotland. Elsewhere, [863]he maintained his view that PPVL rooms were not suitable for highly immuno-compromised patients. In August 2015, having seen an e-mail[864] about a PPVL room meeting specification, he described the specification as irrelevant because it was not suitable for that cohort.

147. Mr Leiper helpfully explained the problem with the PPVL rooms at the QEUH.[865] The normal configuration was for the extract to be within the ensuite so that the air flowed from the lobby through the patient space and out through the ensuite. In the QEUH the extract was in the patient room which might not create the intended air flow. He had seen it demonstrated at a conference where the air had simply flowed straight across the ceiling and out the extract[866].

148. In July 2015, GGC issued a Project Manager Instruction, PMI 424, to Multiplex, which required Multiplex to implement an air change rate of 10-12 changes per hour and achieve a pressure differential of +5 to +10 pascals in Ward 4B[867]. The pressure differential is not in line with SHTM 03-01, which requires a pressure differential of +10 pascals[868].

149. The Inquiry was told by Ms Rankin that GGC contacted HPS on 31 July 2015

[861] Professor Williams, Transcript, page 107
[862] Bundle 25 Volume 3, page 299
[863] Bundle 14, vol 1 425
[864] Bundle 12 page 294
[865] Jim Leiper, Transcript, page 60
[866] Jim Leiper, Transcript, pages 60 and 61
[867] Project Manager Instruction 424, (A36372656)
[868] Bundle 21, Volume 1, page 507

requesting information on acceptable Aspergillus limits.[869]

150. On 10 August 2015 a meeting took place chaired by Mr Archibald to discuss concerns regarding the adult BMT facility that had briefly been in the QEUH Ward 4B. Finding out what the specification was, what the appropriate guidelines were, whether the facility had been properly commissioned and what actions could be taken to improve the performance of the existing facility were agreed.[870]

151. Dr Peters escalated her concerns to Tom Walsh who told her[871] that it would be escalated to the CEO and Medical Director. Ultimately patients returned to the Beatson, and major works were undertaken. This followed a SBAR[872] by Anne Parker (Clinical lead for the Beatson BMT) There were, said Dr Peters, a lot of very unhappy clinicians. The QEUH had been, as it were, 'the promised land'[873].

152. On 10-12 August 2015, Dr Peters did participate in an email exchange over whether the original specification, if delivered, would have been adequate [874] but that did not reach a clear conclusion. Thereafter Dr Peters was not involved in the remedial works.

153. Dr Peters explained the need for a SOP for patient placement – you needed to know easily where patient A with Condition B would best be placed. Accordingly, you needed all the details of all the different rooms. There was nothing in place.[875]

154. She was aggrieved, however by the Press Release and Q&A on the Ward 4B move[876]. The suggestion in the Q&A that BMT services at the RHC were separate and unaffected seemed inaccurate given what had been found elsewhere.

[869] Mr Rankin, Witness Statement, Hearing Bundle Page 12
[870] Bundle 13, Document 117, Page 842
[871] Dr Peters, Transcript Day 1, Page 98
[872] Bundle 12 Page 234
[873] Dr Peters, Transcript Day 1, Page 114
[874] Bundle 14, Vol 1 p 225
[875] Dr Peters, Transcript, Day 1 page 148
[876] Bundle 14, Vol 1 p 412

155. Ms Pritchard, then lead ICN in the adult hospital, described a leaking pipe and fungal grown in a ceiling space in Ward 4B[877] but she explained that there were various such incidents and IPC would not always be aware of them because sometimes staff would not always notify IPC as their first line would be to notify Estates if they had noticed a damp patch in the ceiling.[878]

156. On 5 October 2015, the BICC meeting minutes record that the rooms in the 'Adult Tower' had been completed, with the exception of two rooms. Alternative routes into the QEUH for immunocompromised patients were being found during the period of demolition of the surgical block. A significant flood had occurred in the neuro theatre, which was closed for approximately 6 weeks, but was now in use following satisfactory air monitoring results.[879]

157. As discussed in the context below Dr Peters recalled that on 9 November 2015, she and Dr Inkster outlined their concerns in a letter to Dr David Stewart[880], including Dr Inkster being asked to sign off on remedial work she had not been involved in, unresolved issues with 4B, the discovery of Mucor in the paediatric BMT despite ongoing transplants, and doubts about the functionality of the PPVL rooms.[881]

158. On 30 November 2015, the BICC meeting minutes record that adult BMT patients were due to transfer to the QEUH on 19 December 2015. Professor Williams advised that there was no national standard for testing BMT rooms[882].

159. On 29 November 2015 Dr Inkster was asked by Professor Williams to sign off Ward 4B to allow the return of the adult BMT patients from the Beatson back to the QEUH.[883] Professor Williams had contacted her and informed her that she would be leading on the move back. She explained that she asked for the original specification, the validation, the air sampling and nothing was

[877] Lynn Pritchard, Witness Statement, Question 13, Bundle page 264.
[878] Lynn Pritchard, Transcript, Pages 147-148
[879] Bundle 13, Document 34, Page 263
[880] Bundle 23, Document 15, Page 195.
[881] Dr Peters, Witness Statement, para 61.
[882] Bundle 13, Document 35, Page 268 at page 271
[883] Bundle 14, Volume 1, Page 495

forthcoming. At the time of the initial meeting, they had the keys to the ward and were moving in three weeks. At a meeting on 12 November 2015 with colleagues she took the view that she had none of this information and was not comfortable signing off the ward because nobody at that point could tell her what had actually been done.[884]

160. Dr Inkster sought assistance from HPS and a SBAR was received on 4 December 2015.[885] She felt that there was resistance to involving HPS from the ICM (Mr Walsh) and LICD (Prof Williams), and they referred to previous input from Health Facility Scotland.[886] She accepted that at this point a lot of people including her were "flailing around in the dark and slightly unaware of what's happened and going on".[887] Dr Mathers described her concerns as clearly articulated.[888]

161. On 14 December 2015 the "BMT Unit Transfer to QEUH Meeting" took place and the decision was made to postpone the move of the BMT unit back to the QEUH.[889] The reason given in the minutes is "to enable feasibility study into HPS requirements to be undertaken" and those recommendations are noted at the foot of the minute.

162. Eddie McLaughlan gave limited evidence about the discussions. He did not know how or why the board tried to move bone marrow transplant patients into a unit that was designed as a general ward. This was' not appropriate, not safe'. As had turned out to be the case in the work done on water, the as built drawings did not turn out to represent what had been built. There were significant gaps in the information.[890]

163. Ms Rankin noted that in November 2015, Dr Inkster contacted HPS by telephone requesting support[891]. It was recalled by Ms Rankin that she was contacted by Dr Inkster seeking advice and support on the specification refit

[884] Dr Inkster, Transcript, Day 1, Page 66 and Bundle 14, Volume 1, Page 497
[885] Bundle 3, Document 4, Page 36 and Bundle 14, Volume 1, Page 496
[886] Dr Inkster, Transcript, Day 1, Page 67
[887] Dr Inkster, Transcript, Day 1, Page 68
[888] Dr Mathers, Transcript, Page 18
[889] Bundle 13, Document 122, Page 850 and Dr Inkster, Statement, Para 241
[890] Eddie McLaughlan, Transcript, Page 23
[891] Annette Rankin, Witness Statement, page 10 (Witness Bundle page 12)

proposal for Ward 4B because patients in that ward had moved back to the Beatson due to high fungal counts. Her recollection was meeting with Dr Inkster and then she spoke with colleagues in HFS and may have spoken to Peter Hoffman[892].

164. Ms Rankin rejected any suggestion that her awareness in November 2015 of the ACH in Ward 4B being 2.5-3 ACH when she had been expecting 10 ACH, ought to have triggered her to check the ACH in the Paediatric BMT Unit in the RHC because it was not highlighted as an issue or flagged up to her[893]. She explained that HPS is a national organisation, and it is entitled to presume that the IPCT team are dealing with issues that are not flagged to HPS and support requested[894]. She refuted the suggestion that HPS had a scrutiny function; she argued that HPS are only there at the invite of the NHS GGC board[895]. She conceded, when pressed, that perhaps she and her HPS colleagues ought to have had a conversation with the NHS GGC team to ask about any concerns or what the ACH was. She clarified that no such conversations took place[896]. It was accepted by Ms Rankin that HPS can only react to what they have been told. They can only go to meetings when invited and health boards do not need to disclose certain information to HPS if they do not wish to do so, HPS does not have an awful lot of power and is mainly an advice and support function[897].

165. The SBAR of December 2015 was discussed with Ms Rankin during the course of her evidence. She conceded that when she made various ventilation recommendations, she did not know that the ventilation system could not achieve 10 ACH[898]. She could not recall when she became aware that the ventilation system could only reach 6 ACH but accepted that it was likely before the 2017 SBAR. She accepted that she and her colleagues reluctantly

[892] Annette Rankin, Transcript, pages 32 and 33
[893] Annette Rankin, Transcript, pages 40 and 41.
[894] Annette Rankin, Transcript, pages 43 and 44
[895] Annette Rankin, Transcript, page 44
[896] Annette Rankin, Transcript, pages 44 and 45
[897] Annette Rankin, Transcript, pages 169 and 170
[898] Annette Rankin, Transcript, page 45

accepted the 6 ACH as there was HEPA filtration[899].

166. The Independent Review reported that work was done to the mechanical ventilation system to Ward 4B of the adult hospital which was upgraded in December 2015. They described the works as including: installing metal frame plasterboard ceilings (MF ceilings) to reduce air permeability; applying sealant to various areas and replacing sealed lighting units. The measures were designed to improve the pressure differential between the rooms and the corridors on the ward. HEPA filtration was also installed. [900] Reading this part of the Independent Review report suggests that they were unaware of Dr Inkster's experience.

167. Mr Brattey gave evidence that in December 2015 he had become aware that isolation rooms were the wrong pressure level after staff in the affected ward alerted him. He recalled that he subsequently sent an email to David Wilson of Brookfield asserting that the isolation rooms were presenting an unacceptable risk to vulnerable patients within those protective environments.

168. On 25 January 2016, the BICC meeting minutes rather optimistically record Professor Williams reporting that discussions about the specifications for the adult BMT Unit were ongoing, but 'all ventilation issues' were now complete. The key issue was said to be the HEPA filtration of corridors, and the compliance of what was in place with the 'guidance'.[901]

169. On 23 March 2016 Mr Loudon issued a PMI (PMI 471[902]) to Multiplex to carry out further work on the ventilation systems in Ward 4B. The PMI required Multiplex to achieve 6 air changes per hour; room pressures of +2.5 to +8 pascals; the corridor to be HEPA filtered, and the entrance to the ward to be air locked using double door at the front entrance. It should be noted that these specifications differ from the December 2015 HPS SBAR.

170. Despite the parallel concerns arising in 2015 about the provision of safe

[899] Annette Rankin, Transcript, pages 49 and 50
[900] IR para 7.5.24
[901] Bundle 13, Document 36 at page 278
[902] Bundle 23, Document 19, Page 213 and Bundle 14, Volume 1, Document 53, Page 504

environments for adult and paediatric BMT patients, Professor Gibson did not recall being provided with information about the Ward 4B events; she recalls only being peripherally aware of a concern. There were "rumours" that problems with the ventilation system rendered Ward 4B unsafe for transplanting.[903]

171. It is concerning to note that in the March 2017 options appraisal document for the NHS GGC Acute Service Committee[904], the works not signed off by Dr Inkster were described as "remedial works to be undertaken to improve air quality in the ward"[905]. This was put to Dr Inkster, and she was clear that the works she was asked to sign off did not appear be designed to improve air quality in the ward.[906]

Issues around the Management and Culture of the IPC Team

172. Between 19 June and 7 July 2019, Dr Inkster and Dr Peters stood in for Professor Williams to cover ventilation issues in the QEUH/RHC whilst he was on leave. What they discovered is recorded in a document by Dr Inkster.[907]

173. Thereafter, on 8 July 2015, Dr Peters resigned from her ICD role (demitted her sessions in the words of Mr Walsh)[908] and Dr Inkster resigned from her sessions on the following day.[909] Dr Peters and Dr Inkster had a meeting with Professor Jones, head of service for Microbiology, and Dr Cruickshank, the clinical director. Dr Wright also wanted to give up her sessions and was permitted to do so.[910] Neither Dr Inkster nor Dr Peters were permitted to resign or "demit" their sessions.[911]

174. It may be best to put Dr Peter's reasons for resigning her ICD sessions in her

[903] Professor Brenda Gibson, Transcript, pages 32-33
[904] Bundle 27, Volume 7, Document 6, Page 158
[905] Bundle 27, Volume 7, Document 6, at page 160
[906] Dr Inkster, Transcript, Day 1, Pages 75-78
[907] Bundle 14, Volume 1, Pages 416 to 419
[908] Bundle 14, Volume 1, Document 26, Page 414
[909] Bundle 14, Volume 1, Document 27, Page 416-420
[910] Dr Inkster, Witness Statement, Para 449
[911] Dr Inkster, Transcript, Day 1, Page 6-

own words[912]. She said that; “The real big deal breaker for me was that there didn't seem to be the correct levers to try and do your job and at least find a way through the problems in a way that was controlled, good governance, collaborative, good practice. Just normal, functional working.”[913] A key reason for Dr Inkster was a lack of clarity on the IC role and she felt that she did not have the ability to request and receive information.[914] Her email explained that she had “major concerns regarding the specialised ventilated areas within QEUH and RHC and the impact on patient safety”.[915]

175. However, it is important to note that in both letters of resignation and subsequently they were clear that deficiencies in the ventilation systems of both the adult and paediatric BMT and in respect of water quality and testing results (with specific reference to Legionella) formed a significant part of their reasons for resignation.[916]

176. Dr Cruickshank stated that she attended at a meeting on 7 July 2015 with Dr Inkster, Dr Peters and Isobel Neil. The meeting came after Professor Jones told Dr Cruickshank that Dr Inkster and Dr Peters wanted to relinquish their infection control roles. Dr Cruickshank met with them and Isobel Neil. They told Dr Cruickshank what their concerns were. They both put their concerns in writing. Dr Cruickshank did not see what they had written until she was made interim director for ICDs. Dr Cruickshank noted that the concerns were about patient safety. Her impression from the meeting was that it was primarily to do with the ventilation and patient safety as they felt the procedures they thought should have been followed were not being followed, and the systems in place might compromise safety. Dr Inkster’s letter outlined her specific clinical concerns.[917]

177. Following this, Dr Cruickshank noted that Dr Peters and Dr Inkster did not resign as consultants. They wanted to relinquish their infection control

[912] Dr Peters, Transcript, Day 1 p 139
[913] Dr Peters, Witness Statement, para 54
[914] Dr Inkster, Transcript, Day 1, Pages 59-61
[915] Bundle 14, Volume 1, Document 27, Page 420
[916] Specifically in their resignation letters Bundle 14, Volume 1, Documents 26 and 28
[917] Transcript, Dr Cruickshank, page 131 to 133

responsibilities. Dr Cruikshank was not aware of what was done to investigate the patient safety aspects of their concerns. She only knew that Dr Stewart initiated a review after Dr Cruickshank and Professor Jones raised the concerns with him.[918]

178. Dr Cruickshank met with Dr Stewart a few days after she was appointed Interim Clinical Director for Infection Control Doctors by Dr Armstrong. She was appointed for six months to improve the relationships in the IPC team. Dr Cruickshank explained that she principally dealt with the lack of clarity of the roles and responsibilities of ICDs. She was trying to get the system to work better. Her main concern was that the management structure and working relationships between infection control and microbiology were not working properly. At her meeting with Dr Stewart, he produced his report. Dr Stewart took the issues raised to the Medical Director and said there was a review of cultural issues, but not patient safety. Dr Cruickshank noted that she and Professor Jones met with Dr Peters and Dr Inkster. Dr Cruickshank was sure that at that stage most of what they said was regarding their concerns, such as ventilation. She noted that, at that meeting, she had not seen Dr Peters' submission and had not seen Dr Inkster's either. Their concern was primarily regarding ventilation, and not management culture. That was not what drove them to resign. Dr Cruickshank noted that Dr Inkster was unhappy at not having been kept abreast of the changes made to the Adult BMT unit.[919]

179. It was put to Dr Armstrong that the Inquiry had heard evidence that on 7 July 2015 there was a meeting between Dr Cruikshank, Dr Peters and Dr Inkster where they said that they want to demit their ICD roles. Dr Armstrong knew about it probably around 9 July 2015. She had an e-mail between herself and the CEO where she made him aware that three ICDs wanted to demit their sessions.[920] Dr Armstrong asked Dr Stewart to investigate the reasons that they demitted. A report was sent to Dr Cruikshank on 30 October 2015. She only saw the reasons for the demits in the evidence bundles for the Inquiry.[921]

[918] Transcript, Dr Cruickshank, page 133 and 134
[919] Dr Cruikshank, Transcript, Page 134 to 136
[920] Dr Armstrong, Transcript, Page 36 and 37
[921] Dr Armstrong, Transcript, Page 38 and 39

180. Two of the ICDs provided letters to Professor Jones. It was put to Dr Armstrong that she asked Dr Stewart to do a review of how the IPC team worked. She explained that she got a call from Tom Walsh about the demits. They needed to stabilise the service. Dr Armstrong spoke to Professor Jones. All consultants have job plans. If they want to change that, they must get the local management team's view on it.[922]

181. Dr Armstrong was asked if the two doctors were not permitted to demit their sessions. She said that she thought Professor Jones said he would keep them in their sessions because there was nobody to back fill.[923]

182. Dr Stewart's review '*Summary of Infection Control Issues*'[924] requires some consideration. Dr Stewart could remember little about it, but the final paragraph on the first page curiously describes "a lack of appreciation by some ICDs of the need to risk assess decisions from an organisational political perspective". In Dr Inkster's view, read short, this meant organisational reputation was the priority.[925] The terms of that paragraph ("On the one hand there are reports from ICDs of having their professional authority undermined by the over-turning of their decisions by the IC management Team") rather confirms the evidence of Dr Inkster that she and Dr Peters had informed Dr Stewart that their professional authority was being undermined by IC management team overturning her decisions. She further acknowledged that Dr Stewart's next comments about ICDs not taking decisions when given authority to do so was directed at her.[926]

183. In respect of Dr Stewart's report, Dr Cruickshank considered that there needed to be greater clarity around the levels of accountability in the decision-making process.[927]

184. It was put to Dr Armstrong that the way the report was described by those involved, is that Dr Stewart sent an e-mail to the IPC team noting that he had

[922] Dr Armstrong, Transcript, Page 37 and 38
[923] Dr Armstrong, Transcript, Page 38 and 39
[924] Bundle 14, Volume 1, Document 41, Page 464
[925] Dr Inkster, Transcript, Day 1, Page 72
[926] Dr Inkster, Transcript, Day 1, Pages 72-74
[927] Dr Cruikshank, Transcript, Page 136

done some investigations and was going to do certain things like a development day. Dr Inkster and Dr Peters asked what Dr Stewart was doing concerning patient safety. Dr Armstrong explained that she thought there were two separate processes. She thought there was a process about demitting their sessions because of dignity at work issues, and the separate issue of patient safety came to her attention November 2015 in an e-mail from Dr Cruikshank. Dr Armstrong then got involved in getting Dr Cruikshank into the clinical director role.[928]

185. Dr Armstrong was referred to Dr Stewart's report[929]. Regarding paragraph 6 of the report, it was put to her that there was a statement about the need for greater accountability in decision making. Dr Armstrong agreed with Dr Stewart around the notion of conflicting views and opinions and the decision-making process. She agreed that there needed to be greater clarity.[930]

186. It was put to Dr Armstrong that there were then two statements of things raised with Dr Stewart. First, ICDs having their decision making undermined by the IPC Management team. Regarding whether the ICDs felt undermined by the management team, Dr Armstrong explained that Dr Stewart interviewed several people. He did that with a HR person. Therefore, when he was writing his report, she took that as part of his findings.[931]

187. It was put to Dr Armstrong that Dr Stewart also reported that ICDs were not taking decisions when they had the authority to do so. Dr Armstrong thought that one of the things Dr Stewart had suggested was bringing the parties together for a meeting. She would have known about the two issues and would have wanted to explore that more to try and understand what that meant.[932]

188. Regarding the final sentence of his report, it was put to Dr Armstrong that Dr Stewart did not remember what it meant, but that the word political did not

[928] Dr Armstrong, Transcript, Page 39 and 40
[929] See Bundle 15, Volume 1, Page 464.
[930] Dr Armstrong, Transcript, Page 41
[931] Dr Armstrong, Transcript, Page 41 and 42
[932] Dr Armstrong, Transcript, Page 42 and 43

need to be there. Dr Armstrong explained that it was not about politics. She thought that with infection control it was one part of the decision-making process. One always tries to balance risks. There has to be a risk-based assessment by infection control on the basis of what the circumstances actually are. That will vary depending on the time of year, but it was always about patient safety[933] The report was about how they managed infection control, not the reputation of the board.[934]

189. It was put to Dr Armstrong that one possible perspective is that sentence was thinking about the reputation of the board. She did not read that into it at all. The report was about how they managed infection control.[935]

190. The report was not made available to Dr Inkster or Dr Peters, but a letter was sent to a range of microbiologists and members of the IPCT on 30 October 2015.[936] In Dr Inkster's view, the letter labelled her and Dr Peters as being difficult and risk averse. In essence, there were personality issues and little if any genuine concern for the patient safety issues that both her and Dr Peters had raised.[937]

191. It was clear from this letter (and Dr Stewart accepted)[938] that his review only focused on the working relationships within the IPCT and not the specific patient safety issues raised by Dr Inkster and Dr Peters in their resignation letters. Over the next two months there was an exchange of correspondence[939] between Dr Inkster, Dr Peters and Dr Stewart where the microbiologists raised their concerns and Dr Stewart offered reassurance he had received from Dr Armstrong.[940] Dr Inkster explained that she kept going back to Dr Stewart because she could see no evidence that anything had changed and she was informed that the BMT would be moving back to the

[933] Dr Armstrong, Transcript, Page 44 to 46
[934] Dr Armstrong, Transcript, Page 44 to 46
[935] Dr Armstrong, Transcript, Page 46
[936] Bundle 14, Volume 1, Document 45, Page 472
[937] Dr Inkster, Transcript, Day 1, Page 63
[938] Dr Stewart, Transcript, pages 34 and 35
[939] Bundle 14, Volume 1, Documents 46,47 and 48
[940] Dr Stewart, Transcript, page 38

QEUH from the Beatson.[941]

192. Dr Peters concerns were not allayed by attendance at an Organisational Development Day where comment was made by the chair, Dr Stewart, about 'some ICD's lack of political awareness'[942]. As she put it, you would not reject a return to the Beatson out of embarrassment. [943] Dr Cruickshank was appointed into a new additional role as the clinical director for infection control doctors it seems to address cultural issues between Professor Williams and the ICDs who were supposed to report to him. [944] This change did not address the substantive concerns that Dr Peters and Dr Inkster had raised in July 2015.

193. Dr Peters also picked up more issues with incorrectly designed PPVL rooms. An incident on 30th August 2015 led to infectious patients having to be sent to Monklands.[945] Dr Peters was wondering if the emphasis had been on these critical rooms, what else might be wrong? She continued to raise her concerns. She had one reply from Dr Stewart who asked if everything was now OK. She felt that was disingenuous. It was, she thought, a technique to try to get you into a position to please those higher up.[946]

194. Professor Williams, as lead ICD, was asked why three ICDs all wanted to resign.[947]He claimed to have no idea. He also maintained that he left NHS GGC of his own accord.

195. It was accepted by Dr Stewart that Dr Armstrong asked him to investigate certain issues, mainly cultural stuff, because he was external and not involved in managing the Infection Control team[948]. He clarified that safety issues raised by Dr Peters were not within the scope of his remit for the report[949]. He understood it was made clear to the participants in related interviews for the

[941] Dr Inkster, Transcript, Day 1, Pages 61-66
[942] Bundle 14, Vol 1 p 464
[943] Dr Peters, Transcript, Day 1 page 161
[944] Dr Inkster, Transcript, Day 1, Page 62
[945] Dr Peters, Witness Statement, para 58.
[946] Dr Peters, Transcript, Day 1 page 189
[947] Transcript infra at p 146
[948] Dr David Stewart, Transcript, page 28
[949] Dr David Stewart, Transcript, page 34

report that it was about cultural issues[950].

196. On 30 October 2015, Dr Stewart produced his report and Dr Peters replied to him by email enquiring if he would provide an individualised response to other concerns, particularly patient safety issues[951]. On 2 November 2015, Dr Stewart acknowledged in evidence that he responded to Dr Peters that the issues to be addressed were communication and behaviours, clarity of roles and transparency of decision-making[952]. He went on to say in the email that he understood that significant progress had been made with the building issues and explained in evidence that this knowledge of significant progress had come from Dr Armstrong[953]. He recounted that Dr Armstrong had told him the concerns were known. The Infection Control team were aware of all the issues and that they were dealing with them. Moreover, he recalled that Dr Armstrong told him that progress was being made[954].

197. In Dr Stewart's view, the reference in his report to some ICDs needing to risk-assess from an organisational perspective, was that healthcare is a series of interconnected moving parts and a decision cannot be made in isolation. He gave an example of how shutting a ward might have an effect on A&E waiting times, ambulances outside the hospital and patients being nursed in corridors. In his opinion, the bigger picture must be looked at rather than taking a "purist" infection control view and shutting a ward and stopping further admissions until the situation was dealt with. This involved looking at ways to mitigate the risk. He used the analogy of a cog being taken out and trying to keep a machine running[955].

198. Dr Stewart gave evidence that he was surprised that he used the word 'political' in the context of ICD's needing to risk-assess situations and he could not explain why the word was there. He clarified that reputational damage was not in his thinking at all when he wrote the report. He suggested that the word

[950] Dr David Stewart, Transcript, page 29
[951] Dr David Stewart, Transcript, page 34
[952] Dr David Stewart, Transcript, page 35
[953] Dr David Stewart, Transcript, page 36
[954] Dr David Stewart, Transcript, page 25
[955] Dr David Stewart, Transcript, Pages 49 and 50

'political' may have been inserted by another colleague although acknowledged that he was responsible for the report[956].

199. A letter prepared by Dr Inkster and Dr Peters dated 9 November 2015 was discussed by Dr Stewart.[957] The concerns they raised included: (i) lack of involvement on the part of the ICT in relation to the design of the hospital; (ii) in relation to the adult BMT unit, the absence of environmental monitoring prior to patients moving in and the non-availability of information regarding specification and validation reports; (iii) a concern that despite monitoring of the air in the children's BMT unit disclosing evidence of fungal spores and there being holes in the ceilings of rooms, children were moved in and transplants proceeded. The two clinicians said they did not consider that their concerns were being addressed.

200. Dr Stewart explained that on receipt of the letter which listed an expanded list of issues with the building, he escalated that to Dr Armstrong, the medical director. He could not recall if he received a response from Dr Armstrong but commented that the general response from Dr Armstrong was that these were known issues, and the relevant team were dealing with them[958]. It was accepted by Dr Stewart that his role involved making important decisions like waiting times, but to some extent he was a bit of a gopher for Dr Armstrong. He observed that he was very much a go-between in the middle of the issues raised and Dr Armstrong. He accepted that he was merely a provider of information – rather than an actor[959].

201. Dr Stewart accepted that there was a great deal of unhappiness in the Infection Control team around the time of his report. He described his report as highlighting a need for action and listing things that needed to be done. His report was given to Dr Armstrong[960]. It was acknowledged by Dr Stewart that senior clinicians attending IMTs could inhibit discussion, but he argued that was not his experience and, in his view, it sends out a message that things

[956] Dr David Stewart, Transcript, Page 52
[957] Bundle 14, Volume 1, Document 47 at Page 478
[958] Dr David Stewart, Transcript, Pages 39 to 41
[959] Dr David Stewart, Transcript, page 41
[960] Dr David Stewart, Transcript, page 47

are being taken seriously[961].

202. The suggestion that Dr Stewart's email to Dr Inkster and Dr Peters on 22 December 2015 was disingenuous was refuted by Dr Stewart. He argued that he would never knowingly do anything dishonest, and he understood that he would have received information from Dr Armstrong before writing the email[962]. He argued that he was an advocate for Dr Peters and Dr Inkster but conceded that he was not able to hold Dr Armstrong to account. He refuted a suggestion that he could have done more to highlight the hospital build issues that had been brought to his attention than just send his email on 22 December 2015 to Dr Inkster and Dr Peters. He was up to his eyes in managing other aspects of the service and he did what he could[963].

203. It seems that Dr Armstrong is denying that Dr Stewart told her about the patient safety issues in July 2015, that she had not seen the letters of resignation from Dr Peters and Dr Inkster until recently[964] and that she only asked him to carry out a dignity at work investigation[965] that became his '*Summary of Infection Control Issues*'.[966] It is difficult to reconcile Dr Armstrong's evidence on this issue with that of Dr Stewart and Dr Cruickshank. Dr Stewart was particularly clear that the reason he felt able to go back to Dr Peters and Dr Inkster with reassurance that their concerns had been addressed was because he was being told that by Dr Armstrong. She knew what was going on with the ventilation in Ward 2A and Ward 4B. He did not. It is submitted that Dr Armstrong's evidence in this area is simply not reliable.

RSV Virus Facemask Incident

204. This is set out in an email exchange[967] and was spoken to by Ms Pritchard[968],

[961] Dr David Stewart, Transcript, page 72
[962] Dr David Stewart, Transcript, pages 57 and 58
[963] Dr David Stewart, Transcript, pages 64 and 65
[964] Dr Armstrong, Transcript, Pages 39 and 40
[965] Dr Armstrong, Transcript, Pages 40 and 41
[966] Bundle 14, Volume 1, Document 41, Page 464
[967] Bundle 27, Volume 11, Document 11, Page 70
[968] Lynn Pritchard, Transcript, Pages 127-134 and Statement Question 4(b)

Ms Devine (then Ms McNamee)[969]. The facts of what took place appear clear from the emails. On 15 December 2015, Dr Peters advised an ICN in the QEUH to advise staff in ITU to wear surgical masks and/or FFP3 masks due to a risk from a particular virus. Within 30 minutes, Ms McNamee had challenged the advice on the basis that it might amount to a change of policy that required management consideration, and a debate escalated between those in the email thread and offline in the IPC team. Whatever the merits of the advice (it is [970]notable that after an intervention from Dr Inkster for whom she had 'the greatest respect' Ms McNamee agreed that masks should be worn) this event appears to have acquired totemic status in some circles. Ms Urquhart described it as a source of tension between her and Dr Peters. Ms McNamee clearly thought it was a significant issue to the extent that four ICNs sought advice from the Royal College of Nursing. Nevertheless, Ms Devine accepted the request had been made in the interests of patients, that Dr Peters was a very good ICD, and that not following the request could at least have been perceived as nurse resistance.[971](Ms Devine was asked specifically if, 'when Dr Peters asked for something to be done or suggested something should be done, she would be doing that because she felt that was appropriate for the patients?' Her answer was 'Absolutely'.[972])

205. A similar point can be made about a complaint by Ms Devine about Dr Peters raising various matters. This was difficult to deal with. Nevertheless, the recipients did so in case they had missed something She then accepted[973] that the same was true from Dr Peter's perspective, as she didn't know if something had been missed. It was clear from her evidence that Ms Devine was a supporter of systems and process – notably she would not accept that adherence to process restricted flexibility to deal with the unusual.

206. It is not for the Inquiry to determine whether the ICNs in the face-mask incident were not entitled to react as they did (albeit it is difficult to understand what could be problematic in a pair of microbiologists giving advice on use of

[969] Sandra Devine, Transcript, Pages 52-60 and Statement from paragraph 159
[970] Dr Peters, Transcript, Day 1 page 78
[971] Sandra Devine, Transcript, page 54
[972] Sandra Devine, Transcript, page 59
[973] Sandra Devine, Transcript, page 65

personal protective equipment when dealing with an unusual virus). It is, however, remarkable that these events have subsequently been taken entirely out of proportion and repeated years after the event, in what can only realistically be seen as a disproportionate and repeated attack on Dr Peters. They were raised long after in Dr de Caestecker's report into Dr Redding's Stage 2 Whistleblow in May 2018,[974] in Jane Grant's letter to Professor Stevens in response to the draft CNR Overview Report on 1 March 2018 (albeit Ms Grant appears to have the wrong year)[975] and now in evidence to the Inquiry. Given the nature of what actually took place, it is difficult to avoid the conclusion that this incident has, since 2018, not be raised in good faith as a concern about professional practice, but as a means to imply professional failure on the part of Dr Peters.

Pseudomonas aeruginosa (PsA) in PICU

207. On 24 December 2015, an IMT meeting took place following the isolation of Pseudomonas aeruginosa (PsA) in the respiratory specimens of two patients in Ward 1D, the Paediatric Intensive Care Unit (PICU)[976]. The samples tested positive on 17 December 2015. A member of the IPCN attended the ward and undertook the Water Safety Critical Control Checklist which noted that expressed breastmilk was still in the fridge when it should have been discarded[977].

<u>Year: 2016</u>

Introduction to 2016

208. Evidence of events in 2016 from patients and relatives at Glasgow 1 was not plentiful. The majority of evidence relating to events in 2016 therefore came from the clinical, nursing and managerial staff witnesses who gave evidence in Glasgow II together with further evidence in Glasgow III.

209. In early 2016 Professor Williams resigned as lead ICD. The post was

[974] Bundle 27, Volume 4, Document 6, Page 81
[975] Bundle 25, Document 3, Page 151 at page 153
[976] Bundle 1, pages 20-21
[977] Bundle 4, page 18

advertised with a closing date of 4 March 2016 and (notwithstanding that, according to Dr Peters, Professor Jones wanted Professor Leanord to get the job) Dr Inkster was appointed. Just as with Professor Williams, Dr Inkster worked five sessions as lead ICD and five sessions as a Consultant Microbiologist. Before he left, Dr Peters wrote to Dr Cruickshank requesting her to ensure that Professor Williams left a handover of relevant information: however, she understands that this was not done.

Cupriavidus infection in the Aseptic Pharmacy

210. In early January 2016, a paediatric patient experienced an infection; the blood culture tested positive for Cupriavidus pauculus. This is another case where NHS GGC location records do not stand up to scrutiny. The CNR Overview Report explains in a footnote that there is doubt about the location of the patient and whether or not they were in ward 2A.[978] Given that similar issues have been identified with location data for BSI results by Mr Mookerjee, Dr Mumford and the CNR and the fact that Dr Inkster clearly thinks this was a Ward 2A patient, it is not proposed to investigate this further.

211. An investigation linked the infection to a sink within the Aseptic Pharmacy Unit[979]. Cupriavidus had been identified in routine testing. A sample taken from a tap on a wash hand basin in the aseptic pharmacy also isolated Cupriavidus. Typing of both isolates were found to be the same. A "little used outlet" sink in the staff changing area was subsequently removed.[980] A PAG meeting took place on 17 June 2016[981]. The minute of the PAG appears to record a decision to hold an IMT. It is understood that no IMT took place.

212. At the time, Dr Inkster considered this to be a localised issue rather than systemic water contamination.[982] However, if she had seen the 2015 DMA Canyon L8 Risk Assessment at the time she would assumed it was a systemic

[978] Bundle 6, Document 38 at page 994
[979] Dr Jairam Sastry, Witness Statement, para. 145. See also T Inkster et al, Journal of Hospital Infection, 111 (2021) 53-64, at Bundle 6, Document 40, Page 1236; PAG meeting minute dated 17.6.16, Bundle 2, p.10. Indicates Cupriavidus infection within RHC.
[980] Pamela Joannidis, Transcript, Pages 123-124, Dr Inkster, Transcript, Day 1, Pages 85-88
[981] Bundle 2, page 10
[982] Dr Inkster, Transcript, Day 1, Page 88

contamination issue and carried out water testing and considered a whole range of other control measures such as chlorine dioxide dosing and other infection control measures.[983] As she put it "…if I'd had access to DMA reports then absolutely [I would have worked it out] but I didn't."[984] Mr Walsh accepted that he would have expected to have been informed about the DMA Canyon report in 2015 and it would have been useful for him, Dr Peters and the infection control nurses to have known about the existence of the report in 2015[985]. This appears to highlight the deficient communication between various teams such as Estates and Infection Control. The lack of a system to ensure that all relevant stakeholders are aware of key issues was evidently lacking.

213. In their response to PPP 5, NHS GGC have accepted that this infection was linked to the hospital environment, following typing which demonstrated a positive link between water and patient samples. Evidence from the Glasgow II witnesses indicated that Cupriavidus is a very rare gram-negative organism associated with the environment[986]. In her long career, Professor Gibson had not come across a Cupriavidus infection before[987].There was evidence from Glasgow I to the effect that patients and families were warned against drinking tap water in Ward 2A in 2016[988]. One witness recalled seeing filters on the taps and showers in Ward 2A during 2016[989.]

Increase in line infections on Ward 2A.

214. Witnesses were aware of a general increase in positive central line infections in paediatric haemato-oncology patients from around mid-2016 [990]. Professor Gibson recalled that clinicians began to suspect an unusual pattern of

[983] Dr Inkster, Transcript, Day 1, Page 92-93
[984] Dr Inkster, Transcript, Day 1, Page 88
[985] Thomas Walsh, Transcript, page 79
[986] See, for example, Professor Gibson, Transcript, p.81; Emma Sommerville, Transcript, page 35; Dr Alistair Hart, Witness Statement, para. 61; Dr Milind Ronghe, Witness Statement, para. 55; Dr Dermot Murphy, Witness Statement, para. 130.
[987] Professor Brenda Gibson, Transcript, page 81
[988] Statement of Witness 6.para 33
[989] Statement of Witness 6.para 32
[990] Dr Shahzya Chaudhury, Transcript, page 77; Melanie Hutton, Transcript, page 19

infections.[991] Ms Rodgers recalled that the Lead Nurse for Infection Control brought to her attention a spike in line infections. At that time, IPC believed the increase in infections might be linked to the type of line being used[992].

215. Professor Gibson recalled that later, in 2018, when concerns about gram-negative infections with a possible gram-negative source arose, she had a concern that in fact that pattern of infection had begun in 2016/2017. She instructed a look back at gram-negative infections which occurred in 2016/2017[993]. However, as at 2016/17 there was no suggestion of an environmental cause.

216. In addition to concerns about line infections, Professor Gibson recalled an increase in Aspergillus cases. This concern was discussed at an IMT meeting on 5 August 2016 and in redaction within that minute can see that one of the patients with Aspergillus also had Pseudomonas 'from fluid' and that one of the patients had Candida[994]. As indicated, the hypothesis in 2016 was that a change in type of central line from Bard to Vygon accounted for the increase in line infections. Additional education was implemented, and witness evidence indicates that the issue was thought to resolve[995]

Flow straighteners and Pseudomonas.

217. On 2 February 2016, the Board Water Safety Group (BWSG) meeting minutes record a discussion between the Dr Inkster and Mr Powrie of 'water and environmental issues' and discussion between Mr Gallacher and Professor Williams regarding water sampling. The meeting discussed the risk of Pseudomonas with the use of flow regulators. HPS advice was recorded as being to remove, sanitise, and return the flow straightener to the tap and to replace the plastic components every three months, or alternatively to keep the flow straighteners in place with sampling to be undertaken in high-risk

[991] Professor Brenda Gibson, Witness Statement, pp. 34-35.
[992] Jennifer Rodgers, Transcript, page 23 and 26
[993] Dr Shahzya Chaudhury, Witness Statement, paras. 53-56
[994] Bundle 1, p.22.
[995] Jennifer Rodgers, Witness Statement, para. 90.

areas. [996]

218. In April 2016, Dr Peters noted that there was a water leak in ARH2; this had been caused by corrosion of mild steel, which had been used instead of stainless steel[997].

An Increase in Aspergillus Cases in Ward 2A

219. In December 2015, there was a large amount of water ingress into ITU2 due to an incorrectly positioned vent on the outside wall. The inner wall space was not inspected when remediation works carried out to check if any water damaged material remained. ICNET alert system noted that from January 2016 there had been increased numbers of Aspergillus isolates in the Critical Care Unit[998].

220. Dr Peters notes that there were reports of fungal growth in Ward 2A and three rooms (20, 23 and 24) had been taken out of use[999]. In July 2016 there was a leak in room 25 from the ducting caused by a tear, which allowed unfiltered air to pass from the ceiling void into the room. [1000]

221. In August 2016, two patients tested positive for Aspergillus in Ward 2A[1001]. Neither patient was in a BMT room. A Problem Assessment Group (PAG) meeting took place on 4 August 2016[1002], followed by an IMT meeting on 5 August 2016[1003]. The infections were reported externally to HPS on 5 August 2016. Dr Inkster explained that this information is sent to HPS and the Scottish Government. She also noted that Aspergillus is not transmissible between patients and isolation rooms would be for immunocompromised patients[1004].

[996] Bundle 11, Document 16, Page 53
[997] Dr Peters, Witness Statement, Paragraph 71
[998] Bundle 2, Document 2, Page 8
[999] Dr Peters witness statement para 76
[1000] Dr Peters, Witness Statement, Para 78
[1001] Bundle 2, Document 4, Page 11
[1002] Bundle 2, Document 6, Page 22
[1003] Bundle 1, Document 6, Page 22
[1004] Bundle 1, Document 6, Page 25

222. The potentially contributing factors to the infection were identified as: (i) tears in the ventilation ductwork; (ii) the construction/demolition work on site, which was creating dust, and (iii) condensation forming on the chilled beams, this issue having been raised with the main contractor as abnormal. There was also a suggestion of a water leak. According to Dr Peters there was also a water leak in 2A caused by a tear in the flexible duct. Dr Inkster considered that these control measures had been effective.[1005]

223. Mr Brattey observed in his evidence that HEPA filters had a five-year lifespan but were having to be replaced after only one year. He recalled looking at a dirty HEPA filter in the hospital and comparing it with a clean HEPA filter. The visual difference between the two filters was like night and day[1006]. Dr Lee noted that dust and debris released during demolition is recognised as a source of fungal spores[1007].

224. Pamela Joannidis described how drips brought dirt from the dust down onto the environment, down onto the patient bed, onto the floor and, at some point, the beams were sampled and there were organisms, environmental organisms, there. So that would mean those organisms in that dust coming down having a vehicle to come down into the patient area.[1008] It was recollected by David Brattey that water was leaking from a chilled beam in the general area of Ward 2A about late 2015 or early 2016. The water was not condensation, but a leak from a broken coupling that linked the pipework to the chilled beam unit. He understood that Infection Control had investigated the leak[1009].

225. As a response to these issues Dr Peters contacted Peter Hoffman, Consultant Clinical scientist at Public Health England. His view was that chilled beams should not be used in hospitals because of infection risk. [1010]On 5 September 2016, Dr Inkster updated her GGC colleagues that the Adult BMT unit fell

[1005] Dr Peters, Witness Statement, Paragraph 78 and Dr Inkster Statement, Paragraphs 323-325 and 507
[1006] David Brattey, Transcript, page 49
[1007] Dr Susanne Lee, Witness Statement, page 15 (Witness Bundle page 44)
[1008] Pamela Joannidis, Transcript, Pages 120-122
[1009] David Brattey, Transcript, Page 67
[1010] Peter Hoffman, Witness Statement, Paragraph 71

below the standards of other units in the UK. She also informed her colleagues that work was ongoing in the paediatric BMT unit to achieve the required specification[1011].

226. In September 2016, 4 patients were reported to have Serratia Marcescens in PICU. One patient with a positive result had transferred from Neonatal Intensive Care Unit (NICU). An IMT was held on 27 September, which recommended the implementation of Standard Infection Control Precautions (SICPs)[1012].

227. Between September 2016 and February 2017, there were three positive blood cultures of Elizabethkingia miricola from patients in Wards 2A and 2B. The background to these infections was that Ward 2A had leaked condensation water from the wall panels[1013]. An environmental source was suspected but not confirmed and the condensation on wall panels was a concern[1014].

Other Unusual Infections

228. Following the infection of a patient within Ward 2A with Aspergillus, consideration was given to the use of portable EPA filtration units in the unit. Although the air in Ward 2A was filtered, it was not HEPA filtered with the exception of the lobby air in the 8 PPVL rooms[1015].

229. An increased programme of cleaning of Ward 2A, and cleaning of the chilled beams was proposed in response to the Aspergillus infection. High risk patients were prescribed prophylaxis, AmBisome[1016]. Portable HEPA filtration units were placed in the ward in August 2016 but were discontinued due to the high dust levels they were generating and that they were found to be dirty[1017].

230. The IMT indicates that no air sampling programme was in place. The continued absence of HEPA filtration due to the separate air handling unit and

[1011] Bundle 13, Document 6, Page 45
[1012] Bundle 1, Document 7, Page 29
[1013] Bundle 2, Document 8, Page 16
[1014] Bundle 21, Document 4, Page 139
[1015] Bundle 4, Document 23, Pages 113 to 115
[1016] Bundle 1, Document 6, page 25
[1017] Bundle 1, Document 9, Page 37

chilled beams was noted[1018].

231. Following the Serratia Marcescens outbreak, the environment was screened as negative for Serratia Marcescens and Pseudomonas. Preliminary water sampling results were undertaken which indicated no Serratia Marcescens or Pseudomonas, but other environmental gram-negative bacteria were found pre-flush indicating taps are colonised by micro-organisms. The practice of washing equipment in sinks was thought to be a potential source of contamination in the environment[1019].

232. Without being specific as to dates, Dr Redding recalled two or three children at the RHC being on prophylactic intravenous antibiotics, noting that the side effects are much greater than for oral antibiotics and saw this as a red flag that something was not right in the environment. She was surprised there were not more concerns being raised at a very senior management level.[1020]

Ventilation Developments

Options development process for Ward 4B

233. The process of working out what to do with Ward 4B began in January 2016 with an email from Mr Archibald to a large team including Dr Inkster, Mr Moir, Mr Powrie, Dr Jones, Professor Williams, Mr Walsh and Ms Rankin.[1021] The process is discussed in some detail in Dr Inkster's statement.[1022] Dr Inkster provided three options.[1023] It appear that the then Chief Executive Mr Calderwood was to be briefed in March 2016[1024]. The process of developing options did not conclude in 2016.

The Infections Diseases Ward

234. On 6 May 2016 nine Infectious Diseases consultants wrote to Dr Inkster

[1018] Bundle 1, Document 6, page 24
[1019] Bundle 1, Document 8, page 32
[1020] Dr Redding, Transcript, Pages 98-100
[1021] Bundle 14, Volume 1, Page 492
[1022] Dr Inkster, Statement, Paras 243 to 246
[1023] Bundle 14, Volume 1 at page 493
[1024] Bundle 14, Volume 1 at page 494

raising concerns about the PPVL rooms int Ward 5C.[1025] As consequence she wrote an SBAR.[1026] On 18 May 2016 she had a response from Anne Harkness and David Loudon which correctly identified that there were no negative pressure rooms available in the QEUH, and perhaps less accurately suggested that MERS and Multi Drug Resistant TB were unknown when the design of the hospital was signed off. [1027] Dr Inkster pointed out that:

> "MERS would have been a new thing, but the thing is there's always the risk of an emerging threat. I mean, we've learned that from the pandemic. That's always a risk, and my point was that, in a busy acute hospital like the Queen Elizabeth, anyone can turn up at the front door in A&E with a new and emerging threat or MDRTB, and we didn't have anywhere to put them."[1028]

235. To her knowledge there were no isolation rooms for the infectious diseases unit when she left the QEUH. Infectious diseases patients were using the negative pressure rooms in the Critical Care unit.[1029]

Realisation of the Ventilation Derogation

236. The email from Mr Powrie to Dr Inkster copied to Mr Loudon, Anne Harkness and Mr Walsh of 26 May 2016 is a striking document, as it appears to be the first point that a member of the IPCT, and certainly Dr Inkster, becomes aware of the Ventilation Derogation from December 2009 which dropped the air change rate for most of the hospital from 6 Air Changes per Hour (ACH) to 3 ACH or less.[1030] Dr Inkster recalled being very surprised as she expected them to be 6 ACH. She did not feel there was sufficient justification for delivering less than 6 ACH because no patient risk assessment had been undertaken for this derogation from the SHTM 03-01.[1031] No one had ever given Dr Inkster a justification for the maximum temperature requirement of 26 degrees in the Ventilation Design Strategy.[1032] Mr Walsh was adamant that

[1025] Bundle 14, Volume 1, Page 88 and Dr Inkster, Statement, Paragraph 337 (Hearing Bundle page 115)
[1026] Bundle 4, Document 10, Page 49
[1027] Bundle 14, Volume 1, Document 4 at page 101
[1028] Dr Inkster, Transcript, Day 1, Page 101
[1029] Dr Inkster, Transcript, Day 1, Page 102
[1030] Bundle 20, Document 68, Page 1495
[1031] Dr Inkster, Transcript, Day 1, Pages 105-106
[1032] Dr Inkster, Transcript, Day 1, Pages 107-108

the infection control team had no involvement with the derogation from 6 ACH to 3 ACH except a specific derogation relating to the Renal Dialysis Outpatient Unit[1033]. He expressed surprise that infection control was not told about the change from 6 ACH to 3 ACH until years later after the derogation[1034].

237. Dr Armstrong learned that the general ventilation was not 6 ACH on 20 June 2016. There had been an outbreak in level 7 of Mycobacterium abscesses. Dr Armstrong spoke to the CEO and said she thought there should be a review.[1035] Dr Armstrong felt that she may have over-reacted. They were not seeing any infections in the hospital.[1036]

238. Dr Armstrong was asked if she got any detailed response from Mr Loudon to explain the reason for the air change rate derogation at the time. She explained that Mr Loudon had already shared that, and she expected him to deal with it.[1037]

239. It was put to Dr Armstrong that Professor Steele was asked if there was any formal risk assessment of the derogation. He said there was nothing. Dr Armstrong has seen Dr Inkster's SBAR. She was asked if she was aware of any other document that could be described as a risk assessment. She was not.[1038]

240. The email and its impact were discussed Professor Steele who stated that he had never been provided with a more detailed explanation as to why ventilation derogation had been agreed.

241. Professor Jones considered air quality to be less important than other strategies such as prophylaxis, which he considered were more effective. Moreover, in his view, compliance with SHTM 03-01 was not essential to safe effective care of transplant patients. He opined that air quality was only one mitigating factor in the prevention of infection in transplant patients. He placed

[1033] Thomas Walsh, Transcript, pages 28 and 29
[1034] Thomas Walsh, Transcript, page 31
[1035] Dr Armstrong, Transcript, Page
[1036] Dr Armstrong, Transcript, Pages 56 to 58
[1037] Dr Armstrong, Transcript, Pages 61 and 62
[1038] Dr Armstrong, Transcript, Page 63

considerable emphasis on JACIE guidance over SHTM 03-01 and highlighted the fact that QEUH/RHC was accredited by JACIE[1039].

242. Ms Pritchard, then lead ICN for the adult hospital, explained that her response was “It's a brand-new building. Why have they not met the specification? Why is it so low compared to what it should be?”[1040]

243. Dr Peters was asked when she found out about the ventilation derogation? It appears she started asking in late 2015. Ian Powrie chivvied the Project Team until he had the documents [1041]. He sent them to Dr Inkster who sent them on to Dr Peters on 26th May 2016. Dr Peters’ response, perhaps understandably, was to say, ‘Questions for DL [presumably David Loudon]: what was the IC input into the decision to deviate from the recommendations and on what evidence base?” This should have been picked up on validation, but there was none done.’ It was news. It was absolutely news at this stage’[1042]

244. In June 2016, Dr Inkster produced an SBAR that was part of her response to the news about the Air Change Rate in patient rooms. The SBAR only addresses patients with airborne infections and the risks they pose of cross contamination to patients and staff. [1043] Dr Inkster did accept that a rate of 3 ACH would expose even non neutropenic patients to a greater risk of infection from respiratory viruses due to the lack of ventilation.[1044]

245. Dr Inkster explained that trying to retrofit air changes would be extremely challenging and disruptive in a hospital that size. The duct work was not sized appropriately to enable that. So, instead of advising retrofits, she decided to put in place risk mitigation focused around aerosol generating procedures where you would want to have higher air changes, and on protecting staff. In respect of the specific recommendations, she explained SOPs for influenza, and respiratory RSV, should now have a two-hour fallow time to enable dilution of airborne contaminants. The two-hour period came from the CDC

[1039] Professor Brian Jones, Witness Statement, page 22 (Witness Bundle page 588)
[1040] Lynn Pritchard, Transcript, Page 145
[1041] See Bundle 20, page 1495.
[1042] Dr Peters, Transcript, Day 1 page 204
[1043] Bundle 4, Document 11, Page 52
[1044] Dr Inkster, Transcript, Day 1, Page 117

guidance that the room should not be in use for 45-60 minutes following an aerosol generating procedure ("AGP") for 6 ACH. Dr Inkster conceded that she had not addressed in her SBAR the issue of immunosuppressed patients in wards 2A and 4B going elsewhere in the hospital for procedures. She was challenged over the first recommendation that room doors were to remain closed, and accepted that it would be necessary tell people there was a problem with air change rates in order to get them to mitigate the risk by closing doors.[1045] She explained that in respect of the children's hospital she did not do an SBAR, but did give the same instructions about aerosol generating procedures.[1046]

246. After Dr Inkster gave evidence[1047] an email thread about how Dr de Caestecker had sourced the section on ventilation at the top of the third page of her report on Dr Redding's Stage 2 Whistleblow[1048] in the summer of 2018 came to light[1049]. This is discussed in a later section of this narrative.

247. This June 2016 SBAR is notable because it appears to be the only attempt that the Inquiry has found by anyone at NHS GGC to consider the risk that might be posed (outside specialist ventilation wards[1050]) from the reduction in air change rates from those set in SHTM 03-01. Professor Steele confirmed that there was no site wide risk assessment.[1051]

248. In their evidence Dr Mumford and Ms Dempster expressed their concern that the assessment is incomplete, focuses on the risk from who might have an infection themselves and that there needed to be supplementary work on vulnerable patients and the implications for them.[1052]

249. Professor Steele stated that he was asked to carry out an in-depth review soon after he was appointed in October 2018. He met with Professor Brown and Jane Grant and discussed what an in-depth report would look like. His

[1045] Dr Inkster, Transcript, Day 1, Page 109-114
[1046] Dr Inkster, Transcript, Day 1, Page 116
[1047] Dr Inkster, Transcript, Day 1, Pahe 154
[1048] Bundle 27, Volume 4, Document 6, Page 81
[1049] Bundle 27, Volume 14, Document 6, Page 37
[1050] Wards 2A/2B in the RCH and 4B, 4C and the infectious diseases wards on the 5th floor
[1051] Professor Steele, Transcript, Pages 35-37
[1052] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 132-135

mandate was to undertake a root and branch review of the contract, specification, what was delivered, and who could be held accountable. He confirmed that his review was to be in respect of domestic hot and cold water, the ventilation systems in Wards 2A and 4B, the general air systems, cladding, the failure of glazing panels, and chilled water. Professor Steele was not aware of the chilled beams at the time. He with Professor Brown and Jane Grant and discussed what an in-depth report would look like. He was to investigate the extent of defects and why things were happening. His mandate was to get some support to undertake a root and branch review of the contract, specification, what they got, and who could be held accountable.[1053]

250. Professor Steele confirmed his review was to be in respect of domestic hot and cold water, the ventilation systems in Wards 2A and 4B, the general air systems, cladding, failure of glazing panels, and chilled water. Professor Steele was not aware of the chilled beams at the time.[1054]

251. Professor Steele confirmed that, in effect, the derogation had been agreed by the board before the contract was signed. That is why it did not form part of the board's litigation against the contractors. Professor Steele was not aware of any documentation which explained why the derogation was agreed. [1055]

252. Dr Armstrong was asked when the board started to try to work out how it was that the hospital was delivered to it with flaws. Dr Armstrong did not know the full answer to that. She did know that when Professor Steele came in, and Jane Grant came in, they asked for a report. That report looked at the totality of everything in 2018.[1056]

253. Dr Armstrong was asked, as the board member responsible for ensuring patient safety, if she could have done more to learn lessons from the procurement. Dr Armstrong explained that for patient safety, she wanted to fix the hospital whilst keeping patients safe. She was a fish out of water regarding procurement. They were raising issues with the hospital and trying

[1053] Professor Steele, Transcript, Page 19 and 20
[1054] Professor Steele, Transcript, Page 21
[1055] Professor Steele, Transcript, Page 22 and 23
[1056] Dr Armstrong, Transcript, Page 222

to address them. They were trying to keep things like bone marrow transplants going whilst they fixed the hospital. She thought they did that reasonably well.[1057]

254. It was put to Dr Armstrong that the point being made is Professor Steele arrived, and he was the first person to think they needed to work out what happened. Before he arrived, nobody else thought of that. Everyone else in the management team was not a doctor. Was it not her responsibility to ask the question. Dr Armstrong thought that they were, but not in a systematic way.[1058]

Ventilation in Ward 2A

255. In 2016, the eight isolation rooms in Ward 2A had HEPA filters, were sealed, 10 ACH, but without a positive differential between the anteroom and the corridor as they remained PPVL rooms.[1059]

256. When dealing with the Aspergillus incident, the IPCT looked at the pressure in the non-isolation rooms and corridor in Ward 2A. They had slightly less than 3 Pa+, a degree of positive pressure and no HEPA filters. Dr Inkster told the Inquiry she took some reassurance from that. The ward's filtration was upgraded but not to HEPA level.[1060]

257. Dr Inkster recalled that in 2016 she was given two options for improving the specification for the eight rooms in ward 2A. The first option was to continue with the PPVL concept and make sure the rooms were adequately sealed. The second option was to upgrade them according to SHTM 03-01. It was explained by Dr Inkster that she chose the second option. She asked that the lobby be 10 Pa and the bedroom be 20 Pa for an extra layer of protection. Unfortunately, she was told this option was not available and the children could not be sent anywhere else while upgrade works were carried out. (The

[1057] Dr Armstrong, Transcript, Page 222 and 223
[1058] Dr Armstrong, Transcript, Page 223 and 224
[1059] Dr Inkster, Transcript, Day 1, Page 118
[1060] Dr Inkster, Transcript, Day 1, Page 119

Beatson had no paediatric services or paediatric critical care.[1061])

Water System Management in 2016

258. Dr Inkster explained that, in early 2016, she was asking for water risk assessments for the hospital, and they were not being produced. Both she and Doctor Peters had been asking if there were risk assessments. [1062] They asked Ms Kane, Mr Walsh and Mr Powrie. Mr Powrie does not appear to have told Dr Inkster about the 2015 DMA Canyon L8 Risk Assessment, Mr Walsh did not know about it before at least June 2018, but then he had not been attending the Board Water Safety Group despite being its co-chair. Dr Inkster reported the non-existence of water risk assessments to the IPC SMT on 25 February 2018[1063]. At the meeting were most of the senior people in the IPCT. It may be significant that at the previous meeting of the Board Water Safety Group on 2 February 2016, the non-attendance of "Infection Control Colleagues" other than Ms Joannidis, had been noted.[1064] The fact remains that the existence and conclusions of the 2015 DMA Canyon L8 Risk Assessment did not reach the IPCT at this point. For it to do so clearly needed those in Estates who knew about it to tell the IPCT, but had the issue been on the agenda of the Board Water Safety Group then questions might have been asked.

259. In 2016, DMA carried out some decontamination work in ward 4A by isolating the water supply to ward 4A, disinfecting it (possibly with hydrogen peroxide), and then flushing it all back out. Mr Watson described this work as having been authorised by Jim Guthrie.[1065]

260. Only 47 water samples were taken in Wards 2A and 2B in 2016.[1066]

261. In April 2016 Ian Powrie found a corroded section of mild steel piping so there was concern about how many more there were. It was a good breeding

[1061] Dr Inkster, Transcript, Day1, Pages 81-83
[1062] Dr Inkster, Transcript, Day 1, Pages 88-90
[1063] Bundle 13, Document 70, Page 533 at page 536
[1064] Bundle 11, Document 18 at page 54
[1065] David Watson, Transcript, Page 91 and 92
[1066] NHS GGC data analysed by Mr Mookerjee: Bundle 21, Document 1, Page 33

ground for bacteria.[1067]

262. In early November 2016 David Watson of DMA was asked by Colin Purdon (then NHS GGC Senior Estates Manager) to carry out an updated L8 Risk Assessment for the QEUH. The quote is dated 8 November 2016 and was copied to Mr Powrie.[1068] It seems impossible to think that Mr Powrie and Mr Purdon could have been ignorant of the contents of the 2015 DMA Canyon L8 Risk Assessment and yet seek an updated L8 Risk Assessment in November 2016. The new assessment was not in fact carried out until the autumn and winter of 2017/2018.

263. NHS GGC provided the Inquiry with a "Written Scheme for Legionella Control" which is described on its face as "December 2016 update".[1069] It is remarkable as the first document yet discovered which contains a populated appointment table.[1070] It identifies the following significant appointments:

- The Duty Holder Robert Calderwood
- Duty Holders: Grant Archibald and David Louden
- Designated Persons (Water): Mary Ann Kane and Alan Gallacher
- Authorising Engineer (Water): Dennis Kelly
- Authorised Person (Water): Jim Guthrie

264. The status of this document was unclear. Although clearly based on or similar to the DMA template written scheme supplied to Mr Powrie by Mr Watson in January 2015, Mr Watson did not recognise it. It may well be the Written Scheme that Kerr Clarkson was aware that Colin Purdon was working on or around August 2018.[1071]

[1067] Dr Peters, Transcript, Day 1 page 196
[1068] Bundle 25, Document 34, Page 678 and David Watson, Transcript, Page 92-94
[1069] Bundle 6, Document 111, Page 872 (A44311640)
[1070] Bundle 6, Document 111, Page 877
[1071] Kerr Clarkson, Transcript, Page 9-11

Year: 2017

Introduction to 2017

265. In February 2017 Dr Redding raised her ongoing concerns about the ventilation system and the IPC service with the then CEO Robert Calderwood, who was due to retire at the end of March 2017. In her statement she said he told her that she could not expect to reach a "gold standard" with everything and "that Peters woman is creating problems". Dr Redding decided to wait and speak with the new Chief Executive, Jane Grant, who was taking over in April.[1072] Thereafter, in April 2017, Dr Redding contacted Ms Grant, and they eventually spoke on the phone. Dr Redding recalled that she raised recurrent problems with the ventilation that had been ongoing since the hospital opened and issues with water leaks which she thought should not be happening in such a new facility. She also recalled raising the concerns about patients being placed inappropriately into rooms, as the microbiologists did not know which rooms reached the standard required for particular patients and that she felt there was a fundamental problem with the IPC team.[1073]

266. In April 2017 Dr Peters took on the role of Clinical Lead for Microbiology from Professor Leanord.[1074] No handover was provided. [1075]

267. In June 2017 Dr Inkster went on sick leave in respect of a serious medical condition.[1076] She did not return. This caused problems for the IPCT and board level management of IPC.

268. Notwithstanding the criticisms of Dr Peters, when Dr Inkster became ill, Dr Peters was asked to step up by Prof Jones. She declined.[1077] However Professor Jones' position was that Dr Peters wanted the position but was considered unacceptable by senior management due to her disruptive behaviour. He specifically highlighted a failure to follow procedures and

[1072] Dr Redding, Statement, Para. 94, Hearing Bundle, Page 93
[1073] Dr Redding, Statement, Para. 98, Hearing Bundle, Page 94
[1074] Dr Peters, Day 2 transcript page 1
[1075] Dr Peters witness statement para 85
[1076] Dr Inkster Statement, Para 242
[1077] Dr Peters, Day 2 transcript p20-22

bombarding colleagues with emails questioning their actions. In his view, Dr Peters' actions were hugely disruptive to the IPC service[1078]. Mr Walsh described Dr Peters as having an inappropriate and unnecessary interest in infection control. He explained that she would ask infection control nurses for details of patients on wards and demand updates on information that she did not need in her role as a microbiologist[1079]. Moreover, he claimed that she would say that organism X had been found on ward Y when there were systems and processes in place to pick that up[1080]. However, in the course of his oral evidence, he did accept there was an obligation on a doctor such as Dr Peters to raise issues about patient safety[1081].

269. A further criticism of Dr Peters was not using appropriate structures for escalating issues. Mr Walsh claimed that rather than escalating issues to Mr Walsh or Professor Williams, she was contacting other colleagues[1082]. He asserted that the volume of interference impacted on the day to day running of the infection control service[1083]. He agreed that Dr Peters arranging for samples to be taken from the chilled beams was not a bad example of what he called her "operational interference"[1084]. However, he did tentatively suggest that, at times, Dr Peters sought to undermine the infection control service. He suggested her motivation for undermining the infection control service was to prove she was right and that other hypotheses were wrong.

270. Dr Valyraki recollected raising concerns about staffing levels when Dr Inkster was on sick leave, as the number of Infection Control staff was not sufficient to meet the unpredictable increase in workload[1085]. She also recalled tension and a lack of clarity of roles during Dr Inkster's period of sick leave and resignation[1086]. Dr Balfour mentioned her concern about staffing levels when she resigned from the ICPT, which specifically was the absence of a deputy

[1078] Professor Brian Jones, Witness Statement, page 13 (Witness Bundle page 579)
[1079] Thomas Walsh, Transcript, pages 13 and 14
[1080] Thomas Walsh, Transcript, page 95
[1081] Thomas Walsh, Transcript, page 88
[1082] Thomas Walsh, Transcript, page 15
[1083] Thomas Walsh, Transcript, page 95
[1084] Thomas Walsh, Transcript, page 37
[1085] Dr Kalliopi Valyraki, Witness Statement, page 564 (Witness Bundle)
[1086] Dr Kalliopi Valyraki Witness Statement, page 565 (Witness Bundle)

for the lead ICD and the specialist areas like the water safety group that they covered[1087].

Options Appraisal process for Ward 4B and Implications for Ward 2A in 2017

271. The Inquiry heard evidence about the options appraisal process for the Adult BMT ward. An options appraisal document from the NHS GGC Acute Service Committee from March 2017[1088] was put to both Dr Inkster[1089] and Dr Armstrong. Whilst the slow and convoluted evolution of the options of where (in a sense) to put the Adult BMT ward is of interest, the more important points are the acknowledgements by Mr Jenkins who prepared the paper that:

> "OPTION 2: QEUH, LEVEL 48
>
> Infection Control/Environmental As noted, the facility in 4B QEUH does not meet the standards set out by SHTM 03-01 (Appendix six) for neutropenic rooms or HPS guidance and therefore, the main concern is that of airborne infection particularly invasive fungal infection (IFI) due to organisms such as aspergillus and zygomycosis due to air quality. Based on published literature, mortality rates in outbreaks related to construction or demolition in patients with Haematological malignancies are quoted at 57.6%. Concentrations of aspergillus species below 1 colony forming unit/m^3 are sufficient to cause infection in high-risk patients.
>
> Currently, the BMT Unit in NHS GGC's Royal Hospital for Children does not meet the standard either however, the rooms do have a positive pressure of 10 PA HEPA filtration and have anterooms. It has been agreed to upgrade four of these rooms to meet the full standards."[1090]

272. If there was any doubt that Ward 2A did meet SHTM 03-01 when the ward opened, or even when remedial work was done in the summer of 2015, that doubt was removed by March 2017 when this paper was prepared for the Acute Service Committee confirming that the unit that was then in use did not meet standards.

[1087] Dr Alison Balfour, Witness Statement, page 506 (Witness Bundle)
[1088] Bundle 27, Volume 7, Document 6, Page 158
[1089] Dr Inkster, Transcript, Day 1, Pages 74-??
[1090] Bundle 27, Volume 7, Document 6 at Page 172

273. Dr Armstrong was asked about this version of the Options Appraisal and explained that this did not go to the Acute Services Committee. The options appraisal considered the clinical and infection control impact of moving the unit back from the Beatson. The last paragraph of the report said the service should go back to QEUH. On 16 March 2017, Dr Armstrong got a group of people together and they agreed to do up the bathrooms and start monitoring the air. Only if the air was of a decent quality would they move patients.

274. The paper was changed, and Dr Armstrong then took it to the Acute Services Committee. She was looking for money from the committee. The HAI-SCRIBE got delayed. It went back to HPS in October 2017. The work and monitoring are then started. Once the monitoring took place, in March 2018, HPS, clinicians and infection control said the monitoring was sufficient. In May 2018, HPS sees the monitoring looked good. Dr Armstrong stated it was not just about the air changes. It was about a whole risk assessment. They were trying to provide decent service for patients. She thought they had done that[1091] Dr Armstrong accepted that if they had got what they thought they would be getting, it would have been so much better and easier. They had to do a lot whilst treating patients.[1092]

275. When pressed on this Dr Inkster accepted that it would have been a good idea in March 2017 to have given Ward 2A a similar upgrade to Ward 4B (for example HEPA filters etc). However, she explained there was a lack of contingency with Ward 2A, because the children had no alternative, unlike the BMT unit which could go to the Beatson while Ward 4B was being upgraded. Dr Inkster told the Inquiry if there had not been the barriers to upgrade, she would have asked for Ward 2A to have HEPA filtered rooms, the same HPS spec as the adult BMT rooms, a HEPA filtered corridor and a protected double-door entry.[1093]

276. Dr Armstrong was referred to the final options appraisal for Ward 4B[1094]. Dr Armstrong was a member of the Acute Services Committee. Dr Armstrong

[1091] Dr Armstrong, Transcript, Pages 63 to 70
[1092] Dr Armstrong, Transcript, Pages 70 to 73
[1093] Dr Inkster, Transcript, Day 1, Pages 83-85
[1094] Bundle 27, Volume 7, Page 158.

explained that this paper did not go to the Acute Services Committee. In 2016, the clinicians wrote to her to say that they wished to go back to QEUH. The unit was at the Beatson, and the environment was optimal. Patients were being taken out of isolation room as they were getting sick after chemotherapy. They were being put in an ambulance and taken to QEUH. The clinical team to look after them was not at QEUH. In 2016, an appraisal was carried out ruled out moving the service to maternity or neurology. They did an options appraisal, which asked about the clinical and infection control impact. The clinicians said that patients may come to harm if they don't get back. Infection control and HPS did not agree. The very last paragraph of the report states that the service should go back to QEUH and overrides the advice of HPS and infection control.

277. On 16 March 2017, Dr Armstrong got a group of people together and they agreed to do up the bathrooms and start monitoring the air. Only if the air was of a decent quality would they move the patients. The paper was changed, and Dr Armstrong took it to the Acute Services Committee. She was looking for money from the committee. The SCRIBE was delayed. It went back to HPS in October 2017. The work and monitoring were then started. Once the monitoring took place in March 2018, HPS, clinicians and infection control said the monitoring was sufficient.[1095]

278. It was put to Dr Armstrong that the author of the report accepts that Ward 4B didn't meet the standard, and neither did Ward 2A. She agreed. Dr Armstrong was asked if she accepted that if the hospital had been built to standard, then they would not have had to do any of this. Dr Armstrong accepted that if they had received what they thought they would be getting, it would have been much better and easier as they had to do a lot of this whilst treating patients.[1096]

Increase in line infections on Ward 2A.

279. A number of witnesses reported that their children experienced line infections

[1095] Dr Armstrong, Transcript, Page 63 to 70
[1096] Dr Armstrong, Transcript, Page 70 to 73

during 2017[1097]. Consistent with this, a letter issued by Mr Kevin Hill, Director of Women's and Children's Services, GGC, in November 2019[1098] confirms that concerns were raised by staff about the number of line infections occurring on Ward 2A in 2017. The evidence included reports of individual infections in the early part of 2017[1099].

280. In her statement, and as amplified in oral evidence, Jennifer Rodgers provided detailed evidence regarding an increase in line infections in 2017 and the associated response, in which, as Chief Nurse, she was heavily involved. Although the concern about increased line infections on Ward 2A had appeared to resolve in late 2016, the rate appeared to increase again in early 2017[1100].

281. In March 2017, concern began to emerge within NHS GGC about increased bacteraemia rates in paediatric haemato-oncology patients. The first Problem Assessment Group (PAG) for a Gram-Negative environmental bacterium (GNB) was convened on 3 March 2017 to discuss a general upward trend in positive blood cultures in paediatric haemato-oncology patients in the RHC[1101]. It was recorded that there had been 13 positive cases in January 2017 and 11 cases in February 2017.

282. Dr Inkster explained how the three cases of Elizabethkingia miricola in March 2017 were identified in condensation that had formed on a chilled beam.[1102] Three reports we made to HPS/ARHAI from paediatric haemato-oncology in the first week of March 2017 including for Elizabethkingia miricola and Aspergillus fumingatas.

283. In July 2017, Kimberly Darroch's daughter suffered a line infection and a septic shower event. Her condition deteriorated and she died in August 2017. The death certificate is reported to record the presence of Stenotrophomonas Maltophillia. Lynndah Allison and Rachel Noon Crossan also reported line

[1097] See, for example, the evidence of Suzanne Brown and Louise Cunningham; see also Appendix 3 of Glasgow 1 submission.
[1098] See letter from Kevin Hill to parents dated 12.11.19 attached to the witness statement of Mark Bisset at p 55.
[1099] Suzanne Brown, Witness Statement, at Para. 30.
[1100] Jennifer Rodgers, Witness Statement, Para. 91.
[1101] Bundle 2, Document 10, Page 22.
[1102] Dr Inkster, Statement, Para 520; Dr Inkster, Transcript, Day 1, Page 125

infections in in August 2017[1103]. According to Dr Peters no water samples were taken around this time and therefore while water cannot be positively identified as a source of infection, neither can it be ruled out[1104]

284. In November 2017, Louise Cunningham's daughter contracted a line infection which she later discovered showed the presence of two different bacteria, Enterobacter Cloacae and Raoultella Planticola[1105]. By this stage, Ms Cunningham's daughter had experienced eight Hickman line replacements.

285. It was accepted by Ms Rankin that, on reflection, she and her colleagues ought to have joined the dots of the Aspergillus infection HIIAT reports and the sub-optimal ventilation system to then widen their interest. However, she explained that HPS got involved in November 2017, the SBAR was given to NHS GGC in January 2018 and then the water incident took over from March 2018 resulting in their resources being focused on that and the Aspergillus infections were no longer being reported. She accepted that HPS' attention was diverted in 2018 due to the water incident. However, she argued that once the SBAR was handed over, there is no follow up and HPS had no remit to follow up an SBAR[1106].

286. Ms Rodgers described the response to the increase in line infections as a "quality improvement approach". This project is described variably in evidence as the quality improvement project, QI Group and CLABSI (central line associated blood stream infection)[1107] Improvement Project. It is referred to hereinafter as the "QI Group". It appears that the group was formed in response to concerns about the increasing rate of unusual bacteraemias in Ward 2A between July 2016-early 2017. Together with Mr Bradnock, a surgeon, Ms Rodgers led the QI Group which comprised a multi-disciplinary team. Ms Rodgers explained that a quality improvement approach does not target one specific problem. The aim is to achieve an objective; in this

[1103] Rachel Noon, Witness Statement, Crossan at para. 48; Lynndah Allison, Witness Statement, at paras. 54 and 58.
[1104] Dr Peters witness statement paragraph 100
[1105] Louise Cunningham, Witness Statement, at Para. 60.
[1106] Annette Rankin, Transcript, Pages 69 and 70
[1107] Definition of "CLABSI" contained in Jennifer Rodgers, Witness Statement, Para. 97

instance, reduced CLABSI rates by improving overall quality. It is not a hypothesis-based approach; there is no specific hypothesis and response[1108].

287. The QI Group's work began in earnest in May 2017[1109] when it met for the first time to develop measures to attempt to reduce the rate of infection.[1110]. It included all paediatric haemato-oncology patients with central lines in the RHC. The first challenge facing the QI Group was the lack of available and reliable data from other centres against which the RHC's line infection rates could be benchmarked[1111]. In an approach which might be thought redolent of the co-operative, evidence- based approach to paediatric cancer care described by Dr Murphy, the QI Group engaged with Cincinnati Children's Hospital. Ms Rodgers described Cincinnati as being recognised as the safest children's hospital in the world. The QI Group modelled its approach on a similar project undertaken in Cincinnati.

288. The QI Group's aim was to reduce the CLABSI rate to Cincinnati's "best in class" rate of less than 1 per thousand line days. Reference should be made to Ms Rodgers' statement for details of the various improvement steps put in place. In summary, work included: training in aseptic non-touch technique for line care, training about reduced line contact, staff education, patient and family engagement sessions and daily Actichlor cleaning. Changes also included the introduction of alcohol impregnated port protector caps in August 2017 (also referred to as "Curos caps"). Ms Rodgers confirmed that these caps are the "green caps" referred to in the Glasgow I evidence, in which the Inquiry heard Mrs Kirkpatrick's recollection of the introduction of green caps for Hickman lines in late 2017. Mrs Kirkpatrick recalled that green caps were not a feature of Hickman lines at Yorkhill, nor were they used at Dumfries and Galloway Royal Infirmary[1112]. The evidence about green caps on Hickman lines and the suggestion of their unique use within the RHC was spoken to by a number of witnesses. They were introduced as a line care improvement

[1108] Jennifer Rodgers, Transcript, p.43.
[1109] Witness statement of Jennifer Rodgers, Para. 94
[1110] Bundle 13, Document 14, Page 104
[1111] Jennifer Rodgers, Witness Statement, Para 36
[1112] Annemarie Kirkpatrick, Witness Statement, at Para. 35

measure; not in response to concerns about the water supply[1113]. They had been introduced due to the high incidence of line infections and the Infection Control Team's ("ICT") belief that nurses were not cleaning the lines properly[1114]. Witnesses also reported that the ICT team were on Ward 2A with increasing frequency in the later part of 2017.

289. It was at this time that enhanced supervision was introduced; a practice which continued in the years following (although it may have been stepped up and down at times). As the name suggests, enhanced supervision is a means of monitoring and improving infection control practices on a ward. A team including the lead nurse from IPC, lead nurse from paediatrics, and Estates and Facilities visit the ward and apply a "magnifying glass" on the unit and its practices[1115]. In Professor Gibson's view, line care on the Schiehallion Unit was to an extremely high standard; she had no reason to think that nurses were not applying best line care practice[1116].

290. Ms Rodgers explained that in old RHC in Yorkhill, the median CLABSI rate had been 3.25 cases per thousand line days. In May 2017, the rate in the RHC was above that level. The concern about the rate was such that Ms Rodgers described a desire to put in place actions rapidly to improve it[1117].

291. Ms Cunningham gave evidence that around the time of her daughter contracting a line infection in November 2017, she recalled further deep cleaning of rooms and room moves [1118]. Deep cleaning also took place on the adult wards[1119].

292. As mentioned already, during the period under discussion, witnesses perceived an increased ICT presence on Ward 2A[1120]; and a heightened awareness of infection and prevention control measures coupled with increasing pressure on

[1113] Jennifer Rodgers, Transcript, Page 41
[1114] Annemarie Kirkpatrick, Witness Statement, Paras. 31–35.
[1115] Jennifer Rodgers, Transcript, Page 34
[1116] Professor Gibson, Transcript, Page 68
[1117] Jennifer Rodgers, Transcript, Page 37
[1118] Louise Cunningham, Transcript, Page 24
[1119] Dr Alastair Hart, Witness Statement, Para. 74
[1120] Louise Cunningham, Transcript, at Page 22

nursing and domestic staff.

293. Nursing staff understood the need for these measures, but they had a significant impact on morale. At times nurses (and domestic staff) felt under scrutiny, or worse, that they were being blamed for infections[1121]. This perception, that ward staff felt they were being blamed, was also shared by some of the Glasgow 1 witnesses. There was a perceived deterioration in the relationship between the ICT and ward staff who were becoming increasingly frustrated at the situation. Concerns about the impact of these measures on staff are seen throughout the IMT minutes. In fact, audits demonstrated exemplary practice[1122].

294. Blame was also directed at parents who were instructed not to pour left-over drinks down sinks in the patient bedrooms[1123], and were reprimanded for not immediately disposing of the packaging from a new toy[1124].

295. Witnesses recounted a change in infection control protocols. Parents were no longer allowed to assist with certain day to day tasks like obtaining fresh bed linen for their child or in taking samples to the sluice room. This led to a perceived increased workload on staff. Some witnesses recounted multiple stool and urine samples gathering in bathrooms awaiting collection[1125].

296. One witness described an overall drop in the mood of the ward as protocols became stricter. Even patients felt that they had done something wrong[1126]. Ms Cunningham recalled one particularly distressing event where she was instructed that almost all of her daughter's possessions had to be removed because they were viewed as contaminated. Ms Cunningham's daughter had to give up almost all of her toys, teddies, cards and artwork. Even after the room was deep cleaned, only minimal possessions were allowed back in the

[1121] See, for example, Witness Statements of: Angela Howatt, para. 61; Kathleen Thomson, para. 210; Sarah-Jane McMillan, para. 141
[1122] Kathleen Thomson, Witness Statement, Para. 210
[1123] Aneeka Sohrab, Transcript, at Page 80
[1124] Alfie Rawson, Transcript, at Page 10
[1125] Leann Young, Transcript, at Page 32
[1126] Louise Cunningham, Transcript, at Page 54

room. Toys were replaced with the assistance from a charity[1127].

297. By the end of 2017, the CLABSI rate had started to drop. The CLABSI working group had caused infection rates to decrease through a series of changes including staff practice; new equipment (including the Curos port protector tip), and ensuring staff adhered to decontamination/line care. From December 2017, every CLABSI was to be subject to 'rigorous review' utilising what is described as Event Cause Analysis methodology within 72 hours of a reported case.[1128] Ms Rodgers recalled that the rates had come down to around 4 per thousand line days; whilst this was a reduction, it was not to the level hoped for, despite all of the measures put in place[1129]. The measures were ultimately successful: the median rate of line acquired infection reduced from 6.33 in June 2017 to 1.34 in December 2019. Since the end of 2019, the median rate has been less than 1 per 1000 line days (meeting the aim of the QI Group).[1130]

Increase in fungal infections.

298. On 3 March 2017, a PAG was convened in response to a concern about an increase in fungal infections within the RHC[1131]. High fungal counts were recorded in cubicles within Ward 2A, and the TCT area. Following the cleaning of the affected areas, re-sampling confirmed acceptable results.[1132] Jennifer Rodgers confirmed that the concern about an increase in fungal infections was distinct from concerns about the CLABSI rate[1133]. Professor Gibson explained[1134] that the fungal infection in question – Candida spp. – tends to be endogenous (whereas Aspergillus "comes from the atmosphere"). She also indicated that, on further investigation, there had not been an increase of Candida cases. When the issue was escalated to an IMT which met on 7 March 2017 positive test results for Aspergillus had returned. At the

[1127] The John O'Byrne Foundation.
[1128] Bundle 13, Document 47, Page 344
[1129] Jennifer Rodgers, Transcript, Page 45
[1130] Bundle 27, Volume 13, Document 13 at page 78
[1131] Bundle 2, p.19.
[1132] Bundle 13, Document 45, Page 331
[1133] Transcript of evidence of Jennifer Rodgers, p.30.
[1134] Transcript of evidence of Brenda Gibson, p.66.

IMT Dr Inkster expressed concern that there had been three Aspergillus cases in Ward 2A since July 2016. [1135]

299. The action plan from the PAG on 3 March 2017 prompted a focus on the environment.[1136] There was a suspicion of a connection to the water supply or to condensation from chilled beams[1137]. The Estates Team undertook a review of vent cleaning and maintenance, as well as sampling of vents, chilled beams and water outlets[1138]. All samples were negative. The IPC Nurse carried out a visual inspection of the environment. The incident was closed on 27 March 2017.[1139]

300. The PAG records that prophylaxis may have been instigated in response to this concern. Around Autumn 2017, Ms Ferguson recalled being told that her son was being placed on Posaconazole to protect his lungs although he went on to develop a fungal infection in his chest in October[1140].

301. Professor Gibson indicated that colleagues in Edinburgh may have been asked about their own experiences of Aspergillus infections[1141].

302. Following the HIIAT red report, the Aspergillus infections were reported to HPS.[1142] IMTs took place between 7 March[1143] and 28 April 2017, when the incident was closed.

303. A number of investigations into the outbreak took place, some of which considered the environment as a potential source of infection: the IPC team reviewed the level of dust from ongoing works on site; a leak into the ceiling void was identified and found to be causing mouldy ceiling tiles; an inspection of CBUs (which leaked periodically) took place; air and water sampling was carried out (results were negative), and hand hygiene audits (85% score) were carried out. The control measures which were put in place included the

[1135] Bundle 1, p.35.
[1136] HPS Initial Report (May 2018), page 11, PAG Minute, Bundle 2, Document 9, Page 19
[1137] Bundle 1, Document 9, Pages 36-37
[1138] Bundle 1, Document 8, Page 16
[1139] Bundle 27, Volume 9, Document 15, Page 391
[1140] Transcript of evidence of Sharon Ferguson, at p.54.
[1141] Professor Brenda Gibson, Transcript, Page 66
[1142] Bundle 27, Volume 3, Document, 25, Page 482
[1143] Bundle 1, Document 9, Page 35

removal of mouldy tiles and ceiling void repair; a full terminal clean of the ward; anti-fungal prophylaxis being given to all patients; ongoing surveillance by clinical teams "to alert IPCT as lab testing unreliable", and the development of a water damage policy by ICD and Facilities & Estates (F&E).[1144]

304. In the summer of 2017 Dr Inkster had carried out a 'look back' for Ward 2A in relation to Aspergillus, and there were three cases with one dating back from 2016. In Ms Dodd's view, this number of Aspergillus cases was excessive.[1145]

305. A single patient identified with an Aspergillus infection following a Bronchoscope procedure on 23 October 2017.[1146] A PAG was held on 27 October 2017[1147]. This was not escalated to an IMT. However, an ongoing risk of airborne infection to neutropenic patients was recognised due to the lack of functioning protective isolation, low number of air changes per hour and dust collecting on chilled beam units with poor air quality on 2A. At this time there were demolition projects ongoing on the QEUH site, increasing the risk of invasive fungal disease and as a result all neutropenic patients in the Schiehallion unit were given anti-fungal prophylaxis[1148]

306. The control measures which were put in place following the October 2017 Aspergillus infection included the risk assessment of all Ward 2A patients by the clinical team before anti-fungal prophylaxis was prescribed; twice weekly IPCN visits to the ward to monitor the environment, cleaning and practice, and ongoing cleaning of the ward with chlorine-based detergent.[1149]

307. Dr Inkster was of the view that is possible that the ventilation arrangements in Ward 2A (before it was rebuilt) is relevant to existence or otherwise of Aspergillus infections in that ward. She explained that there are various sources of Aspergillus, that construction and demolition is one, and that you need your protective environment for immunosuppressed patients. Another issue that might have an effect is water damage above ceiling tiles where

[1144] Bundle 27, Volume 7, Document 7, Pages 239-240
[1145] Susan Dodd, Transcript, Page 24
[1146] Bundle 2, Document 25, Page 66
[1147] Bundle 2, Document 25, Page 66; Bundle 13, Document 13 at page 100
[1148] SBAR 30/10/17 Bundle, 4, Document 23, Page 113
[1149] Bundle 2, Document 25, Page 66

inspection is less frequent.[1150] In the context of the acceptance that ventilation in Ward 2A was did not meet the standards set in guidance in the options appraisal for the adult BMT service, prepared for the NHS GGC Acute Service Committee from March 2017[1151], Dr Inkster's view as lead ICD that colleagues were not being open and transparent with her at the time of these Aspergillus infections is particularly troubling.[1152]

Unusual infections in 2017

308. The Serratia Marcescens incident in PICU, which began in February 2017, continued into March 2017[1153]. At least 3 cases occurred in March 2017.[1154] The focus of the response to the February 2017 Serratia Marcescens infections was on domestic cleaning. Chlorine cleaning of the bed spaces took place. The isolates were typed, and timelines were created.[1155]

309. Water sampling was undertaken in Ward 2A from March 2017.[1156] Between 7 March 2017 and 17 November 2017, 151 water samples were collected. All tested negative for Elizabethkingia; coliforms; Pseudomonas spp; Legionella, and Stenotrophomonas maltophilia within the water system.[1157]

310. Aside from the evidence heard about the work being done by the QI Group to address the CLABSI rate, Glasgow II witnesses did not indicate knowledge of other investigations or steps taken in response to the unusual infections in 2017. However, according to certain evidence heard during Glasgow I, in April 2017 Ward 2A was placed in lockdown for a period of two to three weeks, ostensibly due to an outbreak of Rhinovirus[1158]. Rooms required to be deep cleaned, and patients were moved between rooms.

311. There were two identified cases of Stenotrophomonas Maltophilia in July 2017. Some MB/ICDs noted that the SPC charts showed a marked increase

[1150] Dr Inkster, Transcript, Day 1, Page 53
[1151] Bundle 27, Volume 7, Document 6, Page 158
[1152] Dr Inkster, Transcript, Day 2, Page 149
[1153] Bundle 2, Document 10, Page 22
[1154] Bundle 2, Document 11, Page 25
[1155] Bundle 2, Document 7, Page 15
[1156] Bundle 1, Document 9, Page 37
[1157] Bundle 21, Document 1 at Page 33
[1158] Louise Cunningham, Transcript, at Page 13

in cases beyond these two[1159]. It has been suggested that there were two cases in the early part of 2017. It has also been suggested that inquiry by MB/ICD staff at the time of the two July cases showed either a further 5 cases having occurred in recent months or showed a total of 5 cases (as having occurred after a long period of none) [1160]. Moreover, there were six cases in 2017 among the cohort of patients that they were considering[1161]. According to Dr Peters, 2 recent cases in the PICU and NICU (from 2020) closely matched one of the April 2017 cases, suggesting a common source.[1162] She also notes that there is still no comprehensive collation of typing results despite this being recommended by the CNR, and, in fact, the typing of Stenotrophomonas is discouraged by the Board IPCT[1163] Water sampling was completed over a month after infections occurred and was negative for Stenotrophomonas.[1164] Stenotrophomonas maltophilia was added to the National Infection Prevention and Control Manual alert organism list in June 2017, but it was clearly an concerning infection even before it had been added.

312. Control measures put in place as a result of the Stenotrophomonas maltophilia infections included: terminal clean of the 2 rooms occupied by the affected patients; ongoing review of line care (CLABSI group); additional staff and parent education, and a 'review of the environment' led by the Lead Nurse for IPC, Senior Charge Nurse and Domestic Manager. A PAG was convened on 26 July 2017[1165]. The microbiologist dealing with this incident sought information on recent cases. That produced the information that there had been a further 5 cases (or a total of 5 cases). That microbiologist requested water testing in July 2017. This was eventually carried out in September 2017. NHS GGC is understood to consider that this testing demonstrates there is no link between cases of Stenotrophomonas maltophilia and the built hospital environment. The CNR concluded, without indicating which years in particular

[1159] Bundle 6, Document 37, at Page 938
[1160] Bundle 2, Document 17, Page 44
[1161] Bundle 6, Document 38 at page 1029, Table 4.2
[1162] Dr Peters, Witness Statement, Para 85
[1163] Dr Peters, Witness Statement, Para 87
[1164] Bundle 21, Page 140
[1165] Bundle 2, Document 17, Page 44 g

their finding covered, that the frequency of Stenotrophomonas maltophilia was "higher than would be expected". They appeared also to consider that there was a clustering in time and of place as regards Stenotrophomonas maltophilia cases. They considered that the chances of this having occurred by chance was small[1166].

313. On 20 July an IMT took place to discuss cases of Mycobacterium Abscessus within the Cystic Fibrosis patient population[1167]. A meeting of the BICC took place on 31 July 2017, and the minutes record a number of cases of Mycobacterium Abscessus.[1168] Whole genome sequencing results confirmed these were linked. IPC were unclear of route of transmission and HPS were involved.[1169]

314. Between July and December 2017, there were 9 episodes of Klebsiella infection, affecting 7 patients. An IMT (which appears to be wrongly dated 13.2.17) indicates some consideration of 11 Klebsiella infections between August and December 2017 in relation to infections in the Philipshill ward, which is part of the adult hospital, but is in a building separate to the main QEUH building[1170]. The CNR OR states that "there was no investigation into an increasing number of Klebsiella bacteraemias encountered between 2016 and 2018".[1171] None of the IMTs or PAGs bundled by the Inquiry for Glasgow II discuss this infection and the Philipshill ward falls out with the remit of the Inquiry.

315. A second Cupriavidus infection was discovered in September 2017[1172], 17 months after a patient had tested positive for Cupriavidus matched to an isolate in a water sample taken from a sink in the aseptic pharmacy (i.e., a confirmed environmental link between the environment and patient infection). This was the second instance of patient infection with Cupriavidus. This case

[1166] CNR OR §4.3.5
[1167] Bundle 1, Document 11, Page 43
[1168] Bundle 13, Document 45, Page 330
[1169] Bundle 1, Document 11, Page 47
[1170] IMT meeting minutes dated 13 February 2017 – Philipshill ward – Klebsiella pneumonaie (A41890116) – held by the Inquiry but not included in a hearing bundle as relates to the Retained Estate
[1171] Bundle 6, Document 38, Page 1062, Example 8.2
[1172] Dr Jairam Sastry, Witness Statement, Para. 145; IMT dated 6 March 2018; Bundle 1, p.56.

was similarly linked to the isolation of Cupriavidus bacteria in a clinical handwash basin within Ward 2A, which could not be removed but which was disinfected at the time,[1173] although it is unknown whether typing of the isolates confirmed a match.

316. Susan Dodd explained in her statement that, in September 2017, Dr Peters was providing ICD cover for Dr Inkster and was investigating a case of Cupriavidus in Ward 2A.[1174] This was another unfamiliar micro-organism. Dr Peters briefed Ms Dodd about a similar case in Ward 2A in 2016, and as consequence investigations were made into practice in the aseptic pharmacy and storage of dirty waste was relocated.[1175] A PAG Minute from 5 February 2018 /IMT discussions would indicate later investigations do appear to have confirmed that the September 2017 patient had received chemotherapy medication which had been prepared there[1176].

317. In contrast with the 2016 case this second case was not reported to or investigated by HPS in 2017.[1177] HPS became aware of it in 2018, when there was a third case reported. This occurred at a time when Dr Inkster was on sick leave. This was thought by at least one clinician to be similarly linked to a sink on Ward 2A, albeit a hand hygiene sink[1178]. NHS GGC does not accept a link between the patient infection and the environment. In their response to Counsel to the Inquiry's Closing Submission in respect of Glasgow II, they declined to accept (at least at that stage and in the absence of further evidence) any of the infections identified in the history of concern as having been caused by an aspect of the built hospital environment.

318. Towards the beginning of Autumn 2017 witnesses from Glasgow I recalled being warned not to drink the water in Ward 2A or to use it for brushing their teeth[1179]. The same witnesses recalled the showers on Ward 2A being out of

[1173] Bundle 24, volume 3, Document 25, Page 482
[1174] Bundle 21, Document 4 at Page 141
[1175] Susan Dodd, Witness Statement, Para 57
[1176] Bundle 2, p.82.
[1177] Bundle 24, volume 3, Document 25, Page 482
[1178] Dr Jairam Sastry, Witness Statement, Para 145
[1179] See e.g. Witness statement of Annemarie Kirkpatrick at para. 169.

use for a number of weeks[1180].

319. An IMT took place on 22 September 2017 to consider cases of *Exophilia* among the CF population. Dishwashers were identified as the potential source in the infections and arrangements made to clean them.[1181] Ms Pritchard, then lead ICN in the adult hospital was adamant that it was not for ICNs to check that dishwashers were clean and were being cleaned.[1182] In the SBAR of 3 October 2017 the failure to create a system to check the dishwashers were being cleaned is raised as a specific issue.[1183]

320. A number of cases of Acinetobacter baumanii occurred in various locations of the RHC/QEUH in September/October and November 2017, PAGs were held[1184].

321. In October 2017, a new case of Acinetobacter baumanii was identified in Ward 3A. It was identified as being of the same strain as two previously colonised cases on the ward (identified in September) at that time. A fourth case, a patient colonised with Acinetobacter baumanii since 2016, who returned to the ward after the new HAI occurred, also had the same strain of Acinetobacter baumanii. Control measures put in place were SIPC measures and monitoring of Ward 3A for onward transmission (the theory appears to have been patient to patient transmission).[1185] Control measures put in place included: 'TBPs around bed spaces'; hand hygiene audit and environmental sampling undertaken (results unknown), and ongoing IPCT investigations and monitoring.[1186]

322. In October 2017, at least 4 patients were colonised with Serratia Marcescens in PICU. A PAG was held on 6 October 2017[1187]. The control measures put in included a terminal clean of the affected patient bay, and a hand hygiene

[1180] Annemarie Kirkpatrick, Transcript, at Page 40; and Stevie-Jo Kirkpatrick, Transcript, at Page 16
[1181] Bundle 1, Document 12, Page 50
[1182] Ms Pritchard, Transcript, Pages 165-167
[1183] Bundle 4, Document 20, Page 104 at page 106
[1184] Bundle 2, Document 20, Page 52; Bundle 2, Document 22, Page 58; Bundle 2, Document 28, Page 73
[1185] Bundle 1, Document 23, Page 60
[1186] Bundle 2, Document 20, Page 52; Bundle 2, Document 22, Page 58; Bundle 2, Document 28, Page 73
[1187] Bundle 2, Document 21, Page 55

audit. No further action was to be taken unless new cases were identified.[1188]

323. In November 2017, two new cases of Acinetobacter baumanii colonisation occurred, one in Ward 1E and the other in PICUA third patient with Acinetobacter baumanii colonisation was also in PICU (believed to be one of the cases from Ward 3A in October 2017). There was a time and place link for all three cases: the same bed bay (location unknown). Two of the cases from October 2017 were also associated with the same bed bay[1189].

324. On 3 November 2017, an IMT was held in relation to cases Pseudomonas on Ward 10D[1190].

325. Cultures taken in December 2017 showed the presence of *Enterobacter* in Ms Ferguson's son[1191].

326. When concerns about the safety of the water supply emerged in 2018, it caused Professor Gibson and Dr Ewins to query with IPC whether certain infections seen in the Ward 2A patient cohort in 2017 might have been linked to the water supply. Professor Gibson was concerned, in particular, about a number of Stenotrophomonas infections in 2017, but emphasised that, from her perspective, this was a concern which arose only with the benefit of hindsight[1192].

327. During 2017, there were a total of 51 episodes of infection amongst the haemato-oncology patients in Ward 2A considered by the CNR. This included: 6 instances of Stenotrophomonas (including the 2 instances identified above); 10 instances of Klebsiella (including the 9 cases identified above); and 8 instances of Enterobacter. It also included 6 instances of Acinetobacter; 3 instances of Pseudomonas, and 1 case of Serratia marcescens. Infections caused by these latter three bacilli were identified in patients in other areas of the RHC/QEUH during 2017, in respect of which PAG/IMTs took place. A total of 27 different species of organism caused bacteraemias in this group in 2017,

[1188] Bundle 2, Document 22, Pages 58-59
[1189] Bundle 2, Document 29, Page 76
[1190] Bundle 27, Volume 11, Document 6,
[1191] Sharon Ferguson, Transcript, Page 14
[1192] Professor Brenda Gibson, Witness Statement, paras. 123-124.

more than in any other year between 2015 and 2019[1193]. With exception of the undernoted cases none of these cases were escalated to a PAG and therefore, to that extent, it can be said that they were not investigated by IPCT.

328. The exceptions are a PAG which took place following the identification of 2 cases of Elizabethkingia in February 2017[1194]; a PAG which took place in September 2017 following the identification of 2 cases of Stenotrophomonas (and the death of one of those patients)[1195]; and a PAG which took place in March 2017 to consider the increase in unusual Gram-negative bacteraemias in the Schiehallion Unit between mid-2017 and February 2017[1196]. No further action appears to have been taken to investigate the infections or to consider an environmental link.

329. Susan Dodd, then lead ICN for the RHC, gave evidence of how, shortly after arrival at the RHC in March 2017, there were a cluster of unusual infections such as Elizabethkingia, Aspergillus and Stenotrophomonas maltophilia.[1197] In May 2017, Ms Dodd produced a summary document to flag concerns about these unusual infections in order to make senior management aware.[1198] It was sent specifically to Sandra Devine, Associate Nurse Director for IPC, and Tom Walsh, IC manager. She also discussed her summary document at the weekly lead nurse meeting for Greater Glasgow and Clyde and the monthly Senior Management Team ("SMT") meeting. She understood that the summary document would be discussed at the Acute Control of Infection Committee ("AICC") and the Board Infection Control Committee ("BICC").[1199] Ms Dodd explained that she had never heard of Elizabethkingia, and it was relatively new to Dr Inkster who was the lead ICD. They both considered the literature and noted it was associated with the ventilation system and condensation. This resulted in the air vents within patient rooms of the RHC

[1193] CNR Overview Report, Table 4.2 and 4.2 at Bundle 6, Document 38 at page 1028
[1194] Bundle 2, Document 8, Page 16
[1195] Bundle 13, Document 13, Page 99
[1196] Bundle 2, Document 10, Page 22
[1197] Susan Dodd, Statement, Para. 33
[1198] Bundle 27, Volume 3, Document 37, Page 626
[1199] Susan Dodd, Transcript, Pages 6-19

being looked at.

330. In early 2017, there were practical steps taken to reduce the number of infections in the Schiehallion unit by improved hand hygiene, PPE use, cleaning of equipment and cleaning of the environment.[1200]

331. Ms Dodd was asked to expand on part of her statement where she said that, in the context of Stenotrophomonas maltophilia infections, by August 2017 "*having seen improvements with the practice issues identified, it was at this point that I felt there may be some significance with the 2A environment causing these infections",* and responded that by that time a lot of interventions were at a place and yet infections of concern from organisms that like to grow in the environment were still arising. Her opinion was that despite some issues ongoing with the domestic cleaning, she took the view the fact that infections were occurring despite the actions taken indicated an environmental link.[1201]

332. On 13 October 2017 Dr Peters grew Mycobacterium chelonae from a showerhead in Ward 7C.[1202] She had been looking for another organism. She was not aware of Mycobacterium chelonae cases in the hospital at that time, but it was an organism of concern [1203] in high-risk areas so she escalated it to Professor Jones, who said he would take it on.

333. In November 2017 the Acute Infection Control Committee was informed that ward 2A was seeing a high number of outbreaks with central line associated blood stream infection (CLABSI)[1204]

334. On 1 March 2019[1205] an SBAR calling for a retrospective review of Stenotrophomonas maltophilia cases in 2017 was prepared by Dr Mathers. It is discussed in the part of this narrative that deals with the spring of 2019.

[1200] Susan Dodd, Transcript Pages 16-17
[1201] Susan Dodd, Transcript, Page 26
[1202] Dr Peters, Witness Statement, Para 137
[1203] Dr Peters, Transcript, Day 2, Page 56
[1204] Bundle 13, Document 13, Page 94
[1205] Bundle 4, Document 36, Page 151

Issues about the safety of the environment raised prior to October 2017 SBARs

335. The Independent Review described the infections occurring during 2017 as "an emerging picture of very unusual organisms causing blood stream infections".[1206] Dr Redding was aware of the MB's concerns about difficulty getting IPCT and Estates to agree to water testing and this was referenced in the 3 October 2017 SBAR.[1207] Clinicians described a growing unease about the pattern of gram-negative infections on Ward 2A in 2017. There was, however, no advice from IPC or microbiology at that time which indicated a possible link to the environment[1208].

336. On 6 March 2017, the AICC meeting minutes record that the QEUH isolation rooms had been found to be unsuitable for airborne infectious disease patients[1209]. A report on the facilities was provided by HFS. The rooms were out of use: any patients were to be transferred to GRI or Monklands.[1210] On 8 May 2017, the AICC meeting minutes record that work was underway in Ward 2A to change the pressure in two isolation rooms from 'negative' to 'positive' pressure (incorrectly described as positive to negative in minutes).[1211]

337. Dr Peters spoke to an e-mail chain on 24 October 2017[1212] which illustrated some of the issues around use of prophylaxis in Ward 2A. She was the microbiologist covering paediatrics. Professor Gibson told her they were introducing antifungal prophylaxis on a recommendation from Professor Jones. It turned out this was due to air quality and the growing of Aspergillus. That made her realise there were still ventilation issues. She asked how long the prophylaxis would last and was told, 'how long is a piece of string'. When Professor Jones then commented that having HEPA filtered rooms under positive pressure would help, Dr Peters pointed out she had been saying that for about 2 and a half years. She thought it was farcical that the ventilation

[1206] IR, para 8.37.18
[1207] Dr Redding, Witness Statement, Para 104
[1208] Professor Brenda Gibson, Transcript, Page 65
[1209] Bundle 13, Document 9, Page 69
[1210] Bundle 13, Document 9, Page 69
[1211] Bundle 13, Document 10, Page 76
[1212] Bundle 14, Vol 1 p746

specification for that ward was still not clear. [1213]

338. Dr Peters noted that on 11 May 2017 she received a copy of a draft tender document for remediation work to convert the PPVL rooms to positive pressure rooms. Dr Inkster asked for her comments, which she provided. [1214]

339. On 3 July 2017, the AICC meeting minutes recorded that no changes were required within GGC as IPCT already included the extra organisms as alerts within the system. Whilst no guidance was provided in the NIPCM on how to manage the organisms or implement surveillance, the ICD had developed triggers for these organisms based on 'available scientific literature'.[1215] An SBAR was issued by GGC to IPCTs advising of the update to the list in August 2017[1216].

340. Dr Peters noted that in August 2017 high risk patients were being moved into areas where building works were underway. She asked Mr Walsh for clarification but did not get a response. She subsequently attended a meeting chaired by Professor Jones at which these issues were raised. She attempted to ascertain who had made the decision but was unsuccessful. She felt there was "an inadequate understanding of the importance of appropriate accommodation for this patient cohort and that this was a risk for the safe management of patients going forward.[1217]

Issue around the signing of HAI-Scribes by ICDs

341. In August 2017 a microbiologist with ICD sessions was asked to sign a HAI Scribe relating to the replacement of the ceilings in 24 ensuite shower rooms in Ward 4B.[1218] There is no reason to think that the work that had been done brought Ward 4B to the standard required by NHS NSS in their December 2015 SBAR[1219] and it is remarkable that this HAI-Scribe predates the later

[1213] Dr Peters, Day 2 transcript, Pages 66-68
[1214] Dr Peters, Witness Statement, Para 87
[1215] Bundle 13, Document 11, Page 78
[1216] Bundle 4, Document 19 Page 100 GGC SBAR dated August 2017 – to be released in document bundles for June hearing
[1217] Dr Peters witness statement para 94-97
[1218] Bundle 20, Document 1, Page 13
[1219] Bundle 3, Document 4, Page 36

SBAR from NHS NSS of October 2017.[1220] There is evidence that this particular ICD was unwilling to sign the HAI Scribe on the basis that he did not have sufficient knowledge of the project or expertise to do so.[1221] In her evidence the ICN who prepared the HAI-Scribe, Ms Pritchard, took the view that one could complete a HAI-Scribe without knowing the background, but appeared to accept that you needed to know the background for a more complicated one.[1222] Dr Peters rejected the idea that she was 'sticking her nose in' – the individual was someone for whom she was a line manager. She raised the issue with Professor Jones and Dr Armstrong[1223]

342. A similar issue arose when she was asked to help another ICD colleague, Dr Valyraki, over a HAI Scribe for works on 4B. Dr Valyraki had no experience of these. She visited the ward and found a dusty environment with vulnerable patients nearby. Again, she failed to get 'traction.[1224] Dr Peters explained this situation. Dr Valyraki was being pressured to sign off works, this time to ward 4B. She was upset and came to see Dr Peters on 28 November 2017. Dr Peters became involved as her line manager, went to the ward with her, and found dusty conditions, although there were still patients in the vicinity. Doctor Valyraki had a coughing fit[1225]. Dr Valyraki did not address this incident in her statement. Dr Peters felt it was important to have a proper understanding of what works were being done, how it related to the bigger project and so on. She organised a meeting but found it difficult because it was hinted that she was causing works to be delayed and, after all 'it was only a bit of dust'.[1226] She agreed that the delay was unfortunate but, in her view, you did not weigh up one risk against the other. 'What you say is you do the SCRIBE properly and that will actually ensure that you get there faster.' According to Dr Peters, Sandra Devine said the work had been carried out with full discussions with HPS and HFS, and Dr Peters was asked not to contact them. However, it

[1220] Bundle 3, Document 7, Page 57
[1221] Dr Peters, Statement, Para 89. Dr Redding Statement, Para 105, Hearing Bundle Page 96
[1222] Lynn Pritchard, Transcript, Page 177 to 178
[1223] Bundle 14, Volume 1, Document 69, Page 696, Dr Peters, Day 2 transcript p20-28
[1224] Dr Peters, Day 2 transcript p20-28
[1225] Dr Peters, Day 2 transcript p72
[1226] Dr Peters, Day 2 transcript p 76

transpired that HPS were not aware the works. [1227]

343. Dr Armstrong confirmed that Dr Peters stopped the works going ahead. Dr Inkster was off sick at the time.[1228] Professor Jones stepped in to sign off the HAI SCRIBE so the work could take place.[1229] Dr Armstrong was asked if there was not a similarity between these events and those in late 2015 when Dr Inkster was asked to sign something off. Dr Armstrong's understanding of 2015 was that the work was carried out by the contractor and Professor Williams. Dr Inkster came into her role and looked at the work and thought it was not going to pass muster.[1230]

344. Dr Armstrong did not recognise that there was an issue with the management structure of the IPC team.[1231]

345. Dr Armstrong said that the Ward 4B was accredited by JACIE in May 2020.[1232] Dr Armstrong was asked if NHS Assure offered to review, assess or accredit the work done to Ward 2A. She said that she was not involved in that process.[1233] Dr Armstrong did not know if there were any outstanding issues with water leaks, mould or ventilation faults in any of the specialist wards.[1234]

346. In respect of these events around Ward 4B in 2017 the Inquiry does not unfortunately have the advantage of the evidence of the microbiologist who was initially asked to sign off the work in August 2017 and Dr Valyraki has been unable to provide evidence about the other event about which Dr Peters spoke. However, it notable that the fact that this microbiologist with ICD sessions was asked to approve this work in August 2017 and had these concerns is never disputed, but there is a real similarity between these events and the occasion when Dr Inkster was asked to sign a HAI-Scribe for work in Ward 4B in December 2015.[1235] It is submitted that it is more likely than not

[1227] Dr Peters, Witness Statement, Para 151
[1228] Dr Armstrong, Transcript, Page 74 to 79
[1229] Dr Armstrong, Transcript, Page 79 and 80
[1230] Dr Armstrong, Transcript, Page 83 and 84
[1231] Dr Armstrong, Transcript Page 85 and 86
[1232] Dr Armstrong, Transcript Page 86
[1233] Dr Armstrong, Transcript Page 86
[1234] Dr Armstrong, Transcript Pages 86 and 87
[1235] Described in some detail in paragraphs 226 - 241 of Dr Inkster's statement and in this narrative above.

that on at least two occasions ICDs without the necessary knowledge and/or experience was asked to sign off work to Ward 4B to enable the return of the adult BMT service to the QEUH.

ICDs Wishing to Demit their ICD Sessions

347. Doctor Peters went on to explain that a challenge at this time was that many ICDs seemed to want to stand down, but they realised they could not leave the hospital without infection control cover. At that point she organised a rota and a central e-mail box. She accepted that that was not ideal. It was 'a sticking plaster' but a genuine attempt to try to help. [1236]

348. Dr Peters reported that one microbiologist reported feeling" bullied" by Professor Jones, and felt they were under pressure to sign off the Adult BMT as safe when they lacked the information to do so. Dr Peters wrote to Dr Armstrong and advised her of the ongoing problems within Infection Control. On 23 August 2017 the same microbiologist requested an urgent job plan review with a view to relinquishing IC sessions, citing lack of leadership and conflicts within management [1237]

349. At this stage both Dr Inkster and Dr Valyraki were off sick, and Infection Control were overstretched. Dr Peters repeatedly asked for locum cover, but this was refused[1238].

The Stage 1 Whistleblow and SBAR of 3 October 2017

350. Issues about the safety of the environment were raised in October 2017 SBARs. On 3 October 2017, an SBAR was prepared by three consultant microbiologists. The matters of concern raised in the SBAR related to the facilities in the QEUH and RHC, as well as the structure of the IPCT service within NHS GGC. It raised concerns about the risk to patients arising from infection control issues[1239]. The SBAR was submitted to the NHS GGC

[1236] Dr Peters, Day 2 Transcript, Page 65
[1237] Dr Peters Witness Statement, Para 89-91
[1238] Dr Peters Witness Statement, Para 104
[1239] Bundle 4, Document 19, Page 104

Medical Director. Dr Peters[1240] and Dr Redding[1241] both gave evidence that they had raised these issues with Dr Armstrong (who asked them to set them out in an SBAR) because they did not consider that they were being listened to when they had raised matters with Tom Walsh, Sandra McNamee, Jane Grant, Grant Archibald, Dr Stewart, Dr Armstrong and Aileen McLellan.[1242]

351. The issues were raised in the SBAR under three main headings: Patient Placement, Cleaning and Estates. Within those categories there were concerns about: the adequacy of the ventilation provision for certain patient groups (including immunocompromised patients), cleaning, water quality and testing and the resourcing and structure of the IPC service. In particular six issues stand out. These are:

1. That the standard rooms in the hospital should have 6 ACH and only have 3 ACH in breach of the SHTM 03-01 standard
2. Positive Pressure Ventilated Lobby (PPVL) rooms are not suitable for patients with airborne infections and such patients should be housed in this new hospital.
3. There are insufficient rooms to for the isolation of immunocompromised/BMT patients in the RHC.
4. There is no cleaning and maintenance policy for TMV taps.
5. Issues around lack of water testing and ICD role in requesting and receiving the results in a timely manner in exceptional circumstances.
6. Where a water source of infection needed to be investigated.
7. The lack of experience of the Infection Control Team in the absence of Dr Inkster, who was then on sick leave.

352. The SBAR also identifies the dates on which each concern was raised and escalated. Many of the concerns were first raised in 2015, including those

[1240] Dr Peters, Day 2 Transcript, Pages 36-37 and Dr Peters, Witness Statement from Para 108
[1241] Dr Redding, Witness Statement, Paras 107 to 116
[1242] Dr Redding, Witness Statement, Para 1

about air quality on Ward 2A which was said to represent a continuing risk.

353. Dr Armstrong accepted that at in Stage 1 Whistle Blow the Whistleblowers were acting on the duties they hold under good medical practice, to advise people of problems that they think they can see, and she didn't mind them writing to her.[1243] It was put to her that many of the things might be being raised were because they are microbiologists and wouldn't know about it because they are not in the management structure. Dr Armstrong thought that was a good point.[1244]

354. A meeting to discuss the SBAR of 3 October 2017 took place on 4 October 2017 and was chaired by Dr Armstrong with the authors of the SBAR. The other attendees were Director of Facilities, Deputy Director of Nursing (Morag Gardner), Dr Rachel Green (Medical Director of Diagnostics), Professor Brian Jones (Head of Microbiology), Tom Walsh (IPC Manager), Sandra McNamee (Associate Nurse Director IPC), Jonathan Best (Chief Operating Officer), David Loudon (Director of Property and Procurement), Ian Powrie (Depute General Manager, Estates), Anne Harkness (Director, South Sector), and Gary Jenkins (Acting Director, North Sector). The Inquiry has the minute of the meeting.[1245]

355. Dr Redding[1246] and Dr Peters[1247] cover what took place at the meeting in great detail in their statements and in evidence.

356. Dr Peters said the meeting started badly when she introduced herself as Clinical Lead for Microbiology at the QEUH and Dr Armstrong responded that she was 'head of nothing'[1248]- Dr Armstrong denied saying that. Dr Armstrong wanted to walk out of the room having understood all of the issues and documented them. She had no concern about anyone's behaviour at the end of the meeting.[1249] A range of concerns were discussed. Of note, perhaps,

[1243] Dr Armstrong, Transcript, Pages 87 and 88
[1244] Dr Armstrong, Transcript, Pages 91 and 92
[1245] Bundle 14, Volume 1, Page 753
[1246] Dr Redding, Witness Statement, Paras 117 to 144
[1247] Dr Penelope Redding, Witness Statement, Pages 38-47; Dr Penelope Redding, Transcript, Pages 124-129; Dr Peters, Witness Statement, Pages 141-147; Dr Peters Day 2 Transcript, Pages 37-38
[1248] Dr Peters Day 2 Transcript, Page 37
[1249] Dr Armstrong, Transcript, Pages 89 and 90

was a discussion over PPVL rooms. The ID consultants were still not happy and by October 2017 patients were still being sent to other hospitals. One of the meeting attendees was David Loudon. According to Dr Peters he was angry, asserting that 'the rooms had been built to standard'.[1250] In response to questions from the Chair, Dr Peters confirmed that there were isolation rooms in a number of locations which were supposed to be in accord with HPN Supplement 1.

357. Dr Peters thought it was odd to be told at the meeting that only now were HPS being consulted about the specification (HPS maintaining that they had not been involved in any original decisions). Anne Harkness seemed to suggest building a new ID unit if the rooms could not be modified. There also continued to be a debate about air sampling standards. In Dr Peters' view it was no answer to say that there were no national standards. They were not getting answers. A point about ACH and chilled beams was met by David Loudon saying Dumfries had them. Rates of infection complaints were answered by Sandra Devine referring to a Point Prevalence Survey (which Dr Peters thought irrelevant). David Loudon thought they had no business asking about water sampling[1251]. In retrospect it was odd not to hear about the DMA Canyon Report.

358. There was discussion about line infection rates in 2A. Sandra Devine noted there was no benchmark in this area. Dr Peters replied that they needed to establish the actual rate however Ms Devine said there were insufficient resources for this.[1252]

359. Dr Peters noted that not all outbreaks and HAI cases were being investigated owing to an overreliance on definitions and national alert organisms[1253]

360. It was put to Dr Armstrong that Dr Redding described the meeting on 4 October 2017 as difficult and that she was intimidated by the number of people in attendance. Dr Armstrong explained that coming into a meeting like

[1250] Dr Peters, Day 2 Transcript, Page 39
[1251] Dr Peters, Day 2 Transcript, Page 50
[1252] Dr Peters, Witness Statement, Para 124
[1253] Dr Peters, Witness Statement, Para 126

that could be intimidating, but that the meeting on 4 October 2017 was not conducted in an intimidating fashion.[1254]. What she wanted to do was to get the directors to take it seriously. Dr Armstrong did not consider that the meeting had been conducted in that fashion. She walked out with Dr Redding at the end and said that they had a pretty decent exchange.[1255]

361. After the meeting of 4 October 2017 Dr Redding reported raising concerns about the accuracy of the minutes and that she and Dr Peters asked for amendments which were not made.[1256]

362. A number of statements recorded in the Minute[1257] are worth drawing attention to as they relate directly to major issues of interest to the Inquiry:

8. **Air change rates in standard rooms:** "Dr Redding asked if the air changes can be changed from 3 to 6 in some rooms but not in all areas and David Loudon advised this was not realistically possible."

9. **Positive Pressure Ventilated Lobby rooms**: Mr Loudon explained that the Positive PPVL rooms were "signed off by the board and clinical teams; he also confirmed that remedial work had been carried out due to issues raised at the snagging stage of the build." Ms Devine explained that "the inclusion of the Infectious Diseases service was a late amendment to the QEUH project and therefore not commissioned as an ID unit at the outset". Ms Harkness appears to be recorded as saying that, in response to the 3 October 2017 SBAR, "she met with Directors and ID Physicians, and they agreed a pathway for these patients to be transferred to other sites. She also commented that, based on the external advice, unless the existing rooms can be modified in some way the only alternative was to build a new Infectious Disease Unit, which would require a significant resource".

10. **Rooms for the isolation of immunocompromised/BMT patients in**

[1254] Dr Armstrong, Transcript, Pages 88 and 89
[1255] Dr Armstrong, Transcript, Pages 88 and 89
[1256] Dr Redding, Transcript, Pages 125-126 and Dr Peters Day 2 Transcript, Page 37-
[1257] Bundle 14, Volume 1, Page 753

the RHC: HEPA filters were installed in two of the rooms in adult ITU but there had been no request to add these to isolation rooms throughout the adult or children's hospital and significantly more than two years after the RHC "The group debated the definition and severity of immuno-compromised patients."

11. **Water testing:** The minute records that it was accepted that the reason testing result was not received by a certain microbiologist was possibly due "recent changes in staff in both estates and IPC". This appears to amount to acceptance that there had been a problem with ICDs getting water testing results.

12. **TMV Taps:** "David Loudon stated that we are not required to test all taps but a sample and that this was in accordance with guidance." It is notable that more than two years after the QEUH opened, and more three years after the 5 June 2014 meeting about the Horne Optitherm Taps,[1258] the minutes for this meeting on 4 October 2017 record "In relation to TMVs Ian Powrie advised that these are maintained in all high-risk areas, and they are working towards carrying this out in all areas. He said the end piece of the taps cannot be removed and an SBAR is in place for this. Estates are finalising the installation of a heat sanitation system and once complete this will be sent to the Board Water Safety Committee for approval.".

13. **Infection Control Structure:** The minute records Dr Armstrong proposing that consideration is given to having a further separate meeting to discuss this.

363. In light of the subsequent Stage 2 Whistleblow by Dr Redding, it seems important to note that in respect of these issues those attending the meeting (including Dr Armstrong, Mr Loudon, Mr Best, Ms Devine, Mr Powrie and Ms Harkness) all appear to accept that the problems identified in the SBAR of 3 October 2017 did exist, and it does seem as if the SBAR had prompted action

[1258] Bundle 15, Document 9, Page 692

beyond what had already been started.

364. Dr Armstrong was asked if she accepted at the time that the three Whistleblowers were acting on their duties to advise people of problems. Dr Armstrong didn't mind them writing to her. She considered that there were other ways it could have been dealt with before it reached her. She wanted to see it in writing to systematically address the issues.[1259]

365. Dr Redding gave evidence that during this meeting Ms Devine said that during a point prevalence survey QEUH was found to have levels of infection under the national average and that all Alert Organisms were monitored by the IPCT and that there were no indications that this site had a higher-than-average infection rate. Dr Redding pointed out that this would not pick up unusual organisms or the outbreaks that the authors of the SBAR were concerned about.[1260] The same analysis from Ms Devine is set out in her appendix[1261].The relevance of a PPS can be doubted.

366. In a meeting of the BICC on 9 October 2017, the minutes record the receipt of emails concerning "*the ventilation and negative pressure rooms in QEUH and RHC*" and a meeting held by the Medical Director (MD) a week previously to progress matters on those issues. This would seem to be a reference to the Stage 1 whistle blowing/SBAR of 3 and 4 October 2017.[1262]

367. A further SBAR dated 30 October 2017 considered the risk of invasive fungal disease within ward 2A[1263]. It said that a recent probable case of invasive fungal infection raised concern "*regarding the ongoing issues on the unit*." The SBAR drew attention among other things to the fact that the patient was understood not to have been housed in a HEPA filtered room.

368. By November 2017, 4 of the PPVL rooms in Ward 2A had been converted to positive pressure rooms. At a meeting of the AICC on 6 November 2017, the minutes record that significant expenditure would be required to convert the

[1259] Dr Armstrong, Transcript, Pages 87 and 88
[1260] Dr Redding, Witness Statement, para 130
[1261] Bundle 25, Document 10 from Page 364
[1262] Bundle 13, Document 46, Page 337
[1263] Bundle 4, Page 113

rest of the rooms to positive pressure rooms.[1264]

Access to Water Sampling Results

369. Dr Inkster created a notification of out of specification water testing results process with Mr Powrie in February 2016. At the time, the main focus of testing was Legionella and Pseudomonas and not much else. Dr Inkster explained that there had been a system in place beforehand, but she did not think there were water reports as she had been asking for them and not getting them.[1265]

370. A repeated theme in evidence in Glasgow III, particularly from Dr Inkster and Dr Peters, was that at times before the start of the Water Incident in 2018, there were issues around the provision of water sampling results to Microbiologists and ICDs. It is appropriate to discuss this issue at this point of the narrative as Dr Inkster was clear that, when she returned to work in early 2018, she had become aware that in her absence some Microbiologists and ICDs considered that they had had difficulties accessing water test results[1266] and this was discussed at a Board Water Safety Group meeting on 16 October 2017.[1267]

371. Mr Clarkson, the current Authorised Person (Water), explained that the current practice since 2021 is that sample results are put in the spreadsheets, they are analysed, and incident reports are created for any out of specification results. If any potential issues with temperature or chlorine dioxide are identified then he would inform his colleagues in IPC to review clinical practices like flushing.[1268] He further explained that the limits for water samples related to Legionella and Pseudomonas are defined by guidance but the agreed limits for other bacteria, mould etc were initially agreed by Dr Inkster and Ian Powrie in 2018.[1269] These limits are located within Appendix 2

[1264] Bundle 13, Document 13, Page 100
[1265] Dr Inkster, Transcript, Pages 26-28
[1266] Dr Inkster, Witness Statement, Paras., 431-432, Page 143
[1267] Bundle 11, Document 24, Page 77 (A38675838) at page 78
[1268] Kerr Clarkson, Transcript, Pages 45-49
[1269] Dr Inkster, Day 1 Transcript, Page 173

of the Water Safety Plan.[1270]

Ventilation Developments

372. Chilled Beams were new to Ms Dodd. She explained that condensation from them was a recurring problem, where condensation collected and dropped on the floor below, sometimes onto the patient beds or equipment in the room. Condensate was often visibly dirty[1271] and there was dust on the vents.[1272] Similar evidence was heard from Mr Brattey, who noted that the chilled beams were getting dirty quicker than anticipated and that ‘stoor’ could be seen sticking to the grill of the chilled beam[1273]. In respect of Aspergillus the summary document described the need for "inspection of cooling beams which are reported to leak periodically”, but Ms Dodd was unable to remember whether the leak was from the connectors to the beams or the water supply to the beams.[1274] There was an occasion when condensation was so bad it appeared to ‘rain’ inside the building, but Ms Dodd considered it was later than 2017.[1275]

373. Similar evidence was given by Lynn Pritchard in respect of the adult hospital. Ms Pritchard also described how complex a process it was to clean chilled beams, as it would require the patient to leave the room, a HAI-Scribe and it took some time.[1276] Evidence was given by Mr Brattey of the stages in the process of cleaning a chilled beam. He explained that the patient would require to leave the room, and technicians would then seal off the room. A technician would then stand on a ladder, remove the chilled beam unit cover, and then use a HEPA filtered hoover to clean between the fins of the chilled beam unit[1277]. Mr Brattey could only recall annual cleaning of the chilled beams via the PPM system on one occasion[1278].

[1270] Kerr Clarkson, Transcript, Pages 49-52 and Bundle 27, Volume 1, Document 19 at page 276 (A49516753) from pages 394 to 400
[1271] Susan Dodd, Witness Statement, Para. 99, Transcript, Page 13
[1272] Susan Dodd, Witness Statement, Para 100
[1273] David Brattey, Transcript, Page 42.
[1274] Susan Dodd, Transcript, Pages 15-16
[1275] Susan Dodd, Transcript, Page 14
[1276] Lynn Pritchard, Transcript, Page 148-150
[1277] David Brattey, Transcript, page 40
[1278] David Brattey, Transcript, page 64

374. In March 2017 the lead ICN in the RHC Ms Dodd was aware that Ward 2A had 3 ACH outside the isolation rooms. She was not aware of the ACH for the BMT isolation rooms, but did think there were digital pressure gauges outside the rooms. Strikingly she did not know whether ward 2A had HEPA filtration but found the absence of an air lock lobby ward entrance arrangement to Ward 2A to be unusual, as she had previously worked at the Beatson Cancer Centre where such lobby air locks were fitted.[1279]

375. On 30 October 2017 Dr Peters produced an SBAR titled "SBAR: 2A Patient Accommodation and Risk of Invasive Fungal Disease"[1280], she explained that she produced it for Professor Jones.[1281] In Glasgow II Dr Ewins confirmed that the building requirements listed in the SBAR for "Neutropenic/BMT patients" broadly accorded with her understanding of the specialist ventilation required by such patients: 10 air changes per hour, positive pressure at 10 Pa to the corridor, all air entering the room should be HEPA filtered and alarms should be present to monitor for failure[1282]. Dr Ewins noted an important caveat that not all neutropenic patients require this level of protection at all stages of their treatment.[1283] A highly specialised environment is required for BMT and SCIDS (severe combined immune deficiency) patients. Other high-risk patients may benefit from this protective environment at particular stages of their treatment but do not require it as a matter of course. It may be of assistance to consider this evidence alongside Dr Inkster's evidence about 'Neutropenic Wards' in the summary of her evidence in Chapter 3.

Water System Management in 2017

376. In March 2017 an issue arose with a dialysis point which is a wall mounted water point attached to the water system where a dialysis machine can be connected.[1284] Ms Pritchard described the problem as widespread and every one was checked.[1285] A meeting took place on 22 May 2017 and mould and

[1279] Susan Dodd, Transcript, Page 22-24
[1280] Bundle 4, Page 113
[1281] Dr Peters, Statement, Para 143
[1282] Dr Anna Maria Ewins, Supplementary Witness Statement, Para. 21-22.
[1283] Dr Anna Maria Ewins, Supplementary Witness Statement, Paras. 21 to 25.
[1284] Bundle 14, Volume 1, Document 60, Page 616; specifically at Page 619
[1285] Lynn Pritchard, Transcript, Pages 138-139

damp were found behind such points.[1286]

377. Dennis Kelly was in post as Authorising Engineer (Water) for the QEUH campus by May 2017.[1287] What appears to be the first Authorising Engineer Audit ("AE Audit") of the QEUH was carried out in May 2017 by Dennis Kelly.[1288]

378. Only 198 water samples were taken in Wards 2A and 2B in 2017.[1289]

379. Following a request for a quote to update the L8 Risk Assessment in November 2016 this finally got under way in the autumn of 2017. The 2017 DMA Canyon L8 Risk Assessment[1290] records that the site survey was completed on 8 September 2017, outlets were surveyed in October and the Management Meeting for Gap Analysis took place on 30 January 2018. Details of the Gap Analysis and who was involved from NHS GGC can be found in the assessment.[1291] It is bewildering that work on the Written Scheme for the QEUH was still being recorded as being incomplete in that Gap Analysis three years after the building as handed over to NHS GGC. The 2017 assessment was reported to Tommy Romeo (NHS GGC Estates Manager) on 25 April 2018[1292], though he did not read the report himself as he probably "didn't have the time", instead passing it on to Colin Purdon.[1293] It is remarkable that Mr Watson was clear by the time he had handed over the 2017 assessment to NHS GGC, the 'Water Incident' in Ward 2A of the RHC was underway[1294] and yet no NHS Estates staff member taking part in the IMT for that incident or the Water Technical Group that arose from the 'Water Incident' in 2018 thought it necessary to bring the conclusions of either the 2015 or 2017 L8 Risk Assessments to the attention of the then Lead ICD, Dr Inkster.

[1286] Bundle 14, Volume 1, Document 60, Page 621
[1287] Kerr Clarkson, Transcript, Page 12
[1288] Bundle 18, Volume 2, Document 112, Page 909 (A44312600)
[1289] NHS GGC data analysed by Mr Mookerjee: Bundle 21, Document 1, Page 33
[1290] Bundle 6, Document 30, Page 416 (A33870243)
[1291] Bundle 6, Page 597
[1292] Bundle 6, Document 30, Page 417 and David Watson, Transcript, Page 96-98
[1293] Thomas Romeo, Transcript, Page 144
[1294] David Watson, Transcript, Page 96

380. Full details can be found in the 2017 DMA Canyon L8 Risk Assessment[1295], but the key findings issued in April 2018 were such that DMA noted that a significant number of issues they had identified in 2015 had not been resolved. Notable issues were:

- Most dead legs in the water system in 2015 were still there.
- Isolated water tanks.
- Hot water expansion vessels not replaced.
- No flushing regime evident.
- Gaps in the PPM.

381. DMA were clear that at the time of their 2017 assessment the water system was not compliant with L8.[1296] Issues that were identified in the 2017 DMA Canyon L8 Risk Assessment were:

- Deadlegs to be removed.
- Limited flushing regime to be more extensive including all points on trades water system.
- Lower calorifier return temperatures than desired (but above SHTM 04-01).
- Expansion vessels should be 'flow through' and insulated.
- Fit caps to end of spare circulation pipes.
- Debris to be removed from Cold Water Storage Tanks ("CWSTs")
- Suitable backflow protection installed.
- Double check valves installed to prevent stagnant water.

[1295] Bundle 6, Document 30, Page 416 (A33870243)
[1296] David Watson, Transcript, Page

- EPDM flexible hoses to be replaced by WRAS approved hoses/hard-piped.

- Hot water and cold water temperatures at outlets not at required temperatures.

- Hot water and cold water supply strainers to be cleaned and disinfected.

382. Phyllis Urquhart in her evidence described, upon starting as Compliance Manager at the end of 2017, working from neither the 2015 nor the 2017 DMA risk assessments, but from a document drawn up to compare the action points identified in the two. Her reaction was concern at these outstanding matters, which amounted to a red flag for her, particularly as immunocompromised patients might be involved – *"Golly, let's get these closed as quickly as possible."*[1297]

383. Ms Urquhart was unimpressed at the management of the water system, when she encountered it. She accepted that it was "possibly" in an unsafe condition at the beginning of 2018.[1298] She considered the paucity of records relating to PPM Schedules, records of alterations, plans of sentinel testing points, and names of Authorised Persons to be sufficient to make the system non-compliant.[1299].

384. Mr Dennis Kelly, the Authorised Engineer, who carried out a water compliance audit of the QEUH/RHC's water system in 2017 was also not impressed with the management of the water system. He gave evidence that the expected risk reduction actions (such as flushing and inspection of water tanks) were not in place[1300]. He also observed that not all the evidence was in the Estates' record system to show risk reduction tasks had been completed and that there were significant gaps uncovered during his audit of the Estates' record system[1301]. Mr Kelly was concerned by these gaps and specifically gave the examples of the absence of a water safety plan and not all deadlegs having

[1297] Phyllis Urquhart, Transcript, Pages 74-78
[1298] Phyllis Urquhart, Transcript, Pages 98-100
[1299] Phyllis Urquhart, Transcript, Page 25
[1300] Dennis Kelly, Transcript, Page 129
[1301] Dennis Kelly, Transcript, Page 130

been identified as illustrations of failures[1302]. He described the record system in place as 'haphazard'[1303] and that in his opinion, the records were 'bitty at best'[1304]. He concluded that he was very concerned by the strong recommendations in the 2017 hospital audit and that the audit was not particularly satisfactory[1305].

385. Ms Urquhart's experience was initially a frustrating one. She introduced an electronic 'Smartsheet' system which in her view went on to improve matters, but she experienced reluctance and pushback at first from colleagues to move to a new system, and in her position did not feel empowered to push forward appropriately.[1306] Concerningly, she implied that QEUH was operating to lower expected standards than other hospitals she was familiar with such, as Gartnavel or the Western.[1307] A specific theme in her evidence was the number of outlets, which led to conflicts between access-for-flushing and the use of outlet-vicinities for storage.[1308] She found the preference for single rooms to have created greater challenges from a water safety perspective than would traditional wards.[1309]

386. A specific concern mentioned by Ms Urquhart related to Estates staffing. She was very disappointed to note that there were insufficient competent staff to deliver its functions properly – notably this was not just a matter of lack of appointments to designated roles such as Authorised Persons, but also related in general to rapid turnover of staff and to lack of concern about what that indicates.[1310]

387. Mr Kelly opined that in 2017 the water system was only partially compliant with SHTM 04-01 because the L8 risk assessment was out of date, lack of evidence of many risk reduction tasks having been completed, and the

[1302] Dennis Kelly, Transcript, Page 136
[1303] Dennis Kelly, Transcript Page 142
[1304] Dennis Kelly, Transcript, Page 145
[1305] Dennis Kelly, Transcript, Page 171
[1306] Phyllis Urquhart, Transcript, Pages 61-67
[1307] Phyllis Urquhart, Transcript, Page 79
[1308] Phyllis Urquhart, Transcript, Page 86
[1309] Phyllis Urquhart, Transcript, Page 90
[1310] Phyllis Urquhart, Transcript, Page 23

questionable competence of the Estates staff[1311].

The Response to the 3 October 2017 SBAR and the 27 Point Action Plan

388. The Glasgow II hearing heard evidence about the awareness of clinicians and managers of the first of the aforementioned SBARs and the concerns raised within it. Professor Gibson indicated that she was not aware of the existence of the SBAR prior to her preparation for giving evidence to the Inquiry. She was aware that microbiologists and IPC had concerns and that those concerns had been escalated in the hope of action on the part of senior management[1312]. Ms Rodgers, who was the Chief Nurse at that time, was also unaware of the existence of the 3 October SBAR in 2017[1313] although she too was aware of some of the issues identified, for example, the high rates of line related infections on Ward 2A and some concerns about patient placement[1314].

389. After the meeting of 4 October 2017[1315] a 27-point action plan was produced and reported the Board Clinical & Care Governance Committee on 5 December 2017[1316] and noted by the Board on 20 February 2018.[1317] Dr Armstrong thought that a lot of the actions in the 27-point action plan were already being carried out.[1318]

390. It was put to Dr Armstrong that Dr Redding said that she may have been re-assured if someone had sat down with them and told them what was being done about the action plan in the months after. If she had the information, she may not have needed to do stage 2 whistle blow. Dr Armstrong said she could have got the action plan to them sooner. Dr Inkster came back and shared with Dr Redding and Dr Peters on 13 March 2018. She accepted that they should have done it earlier.[1319]

[1311] Dennis Kelly, Transcript, Pages 148-149
[1312] Professor Gibson, Transcript, Page 79
[1313] Jennifer Rodgers, Transcript, Page 17
[1314] Jennifer Rodgers, Transcript, Page 18
[1315] Bundle 14, Volume 1, Page 753
[1316] Bundle 20, Document 48, Page 792 and Bundle 27, Volume 4, Document 7, Page 90
[1317] Bundle 20, Document 48, Page 792
[1318] Dr Armstrong, Transcript, Page 90
[1319] Dr Armstrong, Transcript, Pages 92 to 94

391. Dr Redding was asked about the Action Plan. She explained that that plan to address the issues raised by the Whistleblowers was never able to be fully signed off by them because it contained errors. She and Dr Peters provided comments, but what was reported to the Clinical & Care Governance Committee on 5 December 2017 was unchanged.[1320]

392. Dr Inkster was on sick leave when the 27 Point Action Plan was produced. She understood that Dr Armstrong was responsible for implementing the action plan. She also was concerned about the action plan missing items such as Aspergillus concerns in RHC. In March 2018 she commented on the version attached to the papers for the Clinical & Care Governance Committee on 5 December 2017[1321] and explained that her version went to the AICC, but that later it reverted back to the previous version at the Board Clinical & Care Governance Committee on 5 March 2019[1322] when issuing an update, and she was told that for governance reasons they had to stick to the original one even though it wasn't accurate.[1323]

393. Dr Peters regarded the Action Plan as wholly inadequate.[1324]

394. In March 2018 Dr Redding and Dr Peters drafted a response to the action plan together with the third Whistleblower; however, they did not submit it but instead moved on to step 2 of the Whistleblow [1325] She provided further comments on 30 August 2019 direct to Dr Armstrong as she maintained that her earlier comments were not taken on board.[1326]

395. Regarding the Action Plan, Dr Armstrong thought that a lot of the actions were already being carried out.[1327] Dr Armstrong was referred to the action plan[1328]. She was asked if there were things in the action plan to be acted on by the board that were not being acted on before the SBAR. Dr Armstrong

[1320] Dr Redding, Transcript, Pages 133-134
[1321] Bundle 20, Document 48, Page 792
[1322] Bundle 27, Volume 7, Page 484
[1323] Dr Inkster, Day 1 Transcript, Pages 145-148. Statement, Paras 476-489 and Bundle 27, Volume 4, Document 116, Page 353
[1324] Dr Peters, Witness Statement, Para 220
[1325] Dr Peters, Witness Statement, Para 162
[1326] Bundle 14, Volume 2, Page 678
[1327] Dr Armstrong, Transcript, Page 90
[1328] See Bundle 20, page 792.

considered that there would not have been many.[1329]

396. It was put to Dr Armstrong that many of the things were being raised because they are microbiologists and would not know about it because they were not in the management structure. Dr Armstrong thought that was a good point. They had a lead microbiology meeting. Dr Inkster attended some of them. Dr Armstrong wondered if they should have created a report, because for a committee to function it needed a product that routinely went to them rather than them having to ask for it. She wondered if it was a missed opportunity.[1330]

397. Dr Armstrong was asked if five sessions a week was enough for the LICD. She thought that the operational team was managing that. She thought that a lot of the work of the new build contributed to that. They could have possibly increased the sessions.[1331]

398. It was put to Dr Armstrong that Dr Redding said that she may have been re-assured if someone had sat down with them and told them what was being done in the action plan in the months after. If she had the information, she may not have needed to do stage 2 whistle blow. Dr Armstrong said she could have got the action plan to them sooner. However, she said there was a series of e-mails between late October 2017 to February 2018 providing updates. There was one in November. There was another in January 2018 where Ian Powrie provided a lot of information on the ventilation within the QEUH. There was one when Dr Inkster came back in February on the patient placement policy. There was a lot of e-mail traffic. However, they could have done better at producing a decent report. Dr Inkster came back and shared with Dr Redding and Dr Peters on 13 March 2018. She accepted that they should have done it earlier.[1332]

399. Professor Steele explained that he was aware of the Action Plan. Whilst Dr Armstrong coordinated with communications, many of the actions concerned

[1329] Dr Armstrong, Transcript, Page 91
[1330] Dr Armstrong, Transcript, Pages 91 and 92
[1331] Dr Armstrong, Transcript, Page 92
[1332] Dr Armstrong, Transcript, Pages 92 to 94

the built environment and were coordinated by him. Professor Steele ensured that actions were closed out. He stated that part of his responsibility as to ensure this was known to those who had raised the concerns.[1333]

400. Ms Devine said that while there had been things on the 27 Point Action Plan which were already in train there were certainly things which needed to be addressed[1334]. Around this time, NHS GGC was looking to recruit external advice in relation to its ventilation systems.

401. Dr Peters notes ongoing issues in October and November of 2017. On 13 October 2017 she grew Mycobacterium Chelonae from a shower head in a Cystic Fibrosis ward.[1335] There was an issue with air quality in the Teenage Cancer Trust ward. On 24 October 2017, mould samples including Aspergillus and Mucoraceous fungi were found in 2A. [1336]

402. Ms Rankin recalled her assistance being sought by Sandra Devine and Professor Jones in relation to eight PPVL rooms in Ward 2A[1337]. She understood they had been contacted by Dr Peters around non-compliance within Ward 2A. She conceded at this point it would have been appropriate to question the ACH due to her awareness of the reduced ACH in Ward 4B, but she argued that she was only asked to support with Ward 2A[1338].

403. The patients in the Schiehallion unit were not all viewed as neutropenic Ms Rankin asserted in her oral evidence, it was more complicated because some patients are not immunosuppressed from an oncology perspective[1339]. She accepted that she would rely on the clinical staff to advise on the immunosuppression levels of patients[1340].

404. It was argued by Ms Rankin that PPVL rooms offered some protection to immunosuppressed patients and that the HPN 04-01 from England had been

[1333] Professor Steele, Witness Statement, Para 83
[1334] Sandra Devine, Transcript, Page 81
[1335] Dr Peters, Witness Statement, Para 137
[1336] Dr Peters, Witness Statement, Para 142
[1337] Annette Rankin, Transcript, Page 52
[1338] Annette Rankin, Transcript, Pages 53 and 54
[1339] Annette Rankin, Transcript, Page 56
[1340] Annette Rankin, Transcript, Page 55

updated recently to remove the exclusion for severely immuno-compromised patients using PPVL rooms. However, she conceded the updated HPN 04-01 did not apply to Scotland and that she was at the time trying to make the maximum use of the facilities they already had[1341]. She acknowledged that a balancing of risks exercise must be undertaken to get it as safe as it can be to allow patients to return to the ward[1342].

Year: 2018

Introduction to 2018

405. Dr Inkster returned from sick leave in January 2018. In her absence significant changes to the status of the lead ICD within the reporting system for IPC had been developed. These would have involved her reporting as lead ICD to the Clinical Lead for Laboratories. Upon learning of them and consulting the BMA she offered her resignation.[1343] Ms Devine saw these proposed changes as amounting to the proposition that the Lead ICD should be managed by the microbiology management team[1344]

406. Dr Inkster was persuaded by Dr Armstrong to remain in post and the plans were withdrawn. She explained that at that time it was evident that there was no medical leadership and that gave her concerns.[1345]

407. Dr Inkster also discovered that Sandra Devine thought her triggers for a PAG were too sensitive resulting in unnecessary PAGs taking place. In Dr Inkster's view, there were issues with the building and the triggers needed to pick those things up.[1346] An ICD reported concerns they had had with asking for, but not receiving, water testing results.[1347]

408. Dr Armstrong was asked, in early 2018, when Dr Inkster could have explored the issue whilst on sick leave. They had hoped to meet Dr Inkster on 20

[1341] Annette Rankin, Transcript, Page 58
[1342] Annette Rankin, Transcript, Page 63
[1343] Bundle 14, Volume 2, Document 85, Page 10
[1344] Sandra Devine, Witness Statement, Para 108
[1345] Dr Inkster, Transcript, Day 1, Pages 139-143, Statement, Paras 490-403
[1346] Dr Inkster, Transcript, Day 1, Page 187
[1347] Dr Inkster, Witness Statement, Para 543

December 2017 to discuss the issue with her. Dr Armstrong did not realise that had not happened. She would have wanted the process to be gone through as opposed to going straight to a resignation. She wanted Dr Inkster to come back to work. She said that Dr Inkster made a lot of very good points and was very, very good at her work. The team were upset because they felt that they had been working very hard, and Dr Inkster was upset. Dr Armstrong could understand that.[1348]

409. According to Christine Peters, it was around this time that it was agreed that Drs Valyraki, Inkster and Balfour would be ICDs for the south, and the rest of the microbiology team at the QEUH would no longer have ICD sessions.[1349]

410. This proposed restructuring and proffered resignation of the Lead ICD a matter of months before what would turn out to be the Water Incident in Ward 2A is of interest to the Inquiry. In essence, it seems significant that leadership figures realised that things needed to change in the IPCT, but that the solution was to interpose a further stage in management between the lead ICD and the HAI Executive lead, the Medical Director and the executive board. When seen in the context of events in 2019, it does not seem unreasonable to conclude that at the end of 2018 NHS GGC was more interested in structures and control of its ICDs than in enabling their voices to be heard. One wonders what would have happened if the Water Incident in Ward 2A had occurred in a system where the management line for the lead ICD was further separated from the IPCT.

Stage 2 Whistleblow by Dr Redding

411. In her evidence, Dr Redding explained that in October/November 2017 as the Action Plan arising from the meeting of 4 October 2017 had yet to be sent to her she started warning Jane Grant, Dr Armstrong and Dr Stewart that they were considering a move to Stage 2 of the Whistleblowing policy.[1350] Then after receiving a copy of the 27 point action plan [1351] she took the issue to Dr

[1348] Dr Armstrong, Transcript, Pages 193 and 194
[1349] Dr Peters, Witness Statement, Para 154
[1350] Dr Redding, Witness Statement, Para 145
[1351] Dr Redding, Witness Statement, Para 150-155

de Caestecker by email on 8 February 2018 as a Stage 2 Whistleblow. [1352] She explained this did not raise any new issues but focused on the failure to address the existing concerns around patient safety.[1353] In her email to Dr de Caestecker, Dr Redding summarised her concerns as:

> "1. The standard rooms at the QE and RHC should have 6 air changes per hour (ACH/hr). No room meets this standard. There are only 3 ACH/hr. This is clearly a breach of the standard.
>
> 2. PPVL rooms are not suitable for the isolation of patients with air borne infections and they cannot be housed in this new hospital.
>
> 3. There are not sufficient rooms for the isolation of immunocompromised / BMT patients at RHC.
>
> 4. I am unclear where GG+C is with the management of immunocompromised adult patients at the moment.
>
> 5. Are the issues around ventilation on the GG+C Risk Register?"

412. Specifically, Dr Redding explained that her "aims in following this Whistleblowing process include: 1. Ensuring patient safety and patient confidence is maintained; 2. Ensuring the issues are addressed; 3. That lessons are learnt so similar mistakes in the future can be avoided."

413. Dr de Caestecker met with Dr Redding and Dr Peters. Dr Peters did not formally make a State 2 Whistleblow but accompanied Dr Redding to the meeting as the latter retired on the day of their meeting in March 2018. Dr de Caestecker treated Dr Peters as a Whistleblower.[1354]

414. Dr de Caestecker wrote to Dr Redding and Dr Peters in response to the Stage 2 Whistleblow on 4 May 2018[1355]. Dr Redding was concerned that the letter only mentioned the five points in her email, but that these were not all the issues she discussed with Dr de Caestecker and wrote back.[1356] Dr de

[1352] Bundle 14, Volume 2, Document 87, Page 72
[1353] Dr Redding, Transcript, Page 137 and Dr Redding, Witness Statement, Para 156-
[1354] Dr De Caestecker, Transcript, Page 33
[1355] Bundle 14, Volume 2, Page 223
[1356] Dr Redding, Statement, Para 172 and Bundle 14, Volume 2, Page 218 and 219

Caestecker responded on 21 September 2018.[1357] Dr Peters' response was by email on 15 May 2018[1358] and was positive and from her point of view drew matters to a close.[1359] Presumably, Dr Peters would have taken a rather different approach if she had seen the criticisms of her in the internal report[1360] into Dr Redding's stage 2 Whistleblow, but it is not NHS GGC policy to share such reports with Whistleblowers.

Dr de Caestecker Stage 2 Whistleblowing Report

415. Unlike Dr Peters and Dr Redding, the Inquiry had access to Dr de Caestecker's report into Dr Redding's Stage 2 Whistleblow.[1361] When they eventually saw it, Dr Redding was scathing about the report.[1362] Dr Peters was very critical as well and in respect of the criticisms directed at her personally she noted that the report criticised her for sending too many emails but (subject to a discussion with Dr Inkster on the topic which they resolved between them), she felt all of her communications were necessary. She also disagreed with conclusions that the issues raised in the Whistleblow had "already been dealt with in the main with action plans for the rest".[1363]

416. Dr de Caestecker was the NHS GGC Director who investigated the Whistleblow and wrote the report. She described the process in some detail in her statement. Dr de Caestecker reviewed SHTM 04-01, the minutes of the earlier meeting of 4 October 2017,[1364] the 27 Point Action Plan[1365], the Clinical and Care governance committee paper about these concerns[1366], emails and letters on the organisation of infection control, and risk registers. [1367] She also interviewed a small number of people: Dr Kennedy, Dr Jones, Mr Walsh, Ms Devine, Dr Green, Dr Inkster and Ms Kane. [1368] She summarised her

[1357] Bundle 14, Volume 2, Document 95, Page 220
[1358] Bundle 14, Volume 2, Page 222
[1359] Dr Peters, Statement, Para 208
[1360] Bundle 27, Volume 4, Document 6, Page 81
[1361] Bundle 27, Volume 4, Document 6, Page 81
[1362] Dr Redding Statement, paras 171-186
[1363] Dr Peters, Transcript, Day 2, Pages 81-83
[1364] Bundle 14, Volume 1, Page 753
[1365] Although in oral evidence she maintained that she did not receive the 27 Point Action Plan until later during Dr Redding's Stage 3 Whistleblow: Dr de Caestecker, Transcript, Page 5
[1366] Bundle 20, Document 48, Page 792 and Bundle 27, Volume 4, Document 7, Page 90
[1367] Dr De Caestecker, Statement, Questions 57 to 65
[1368] Bundle 27, Volume 4, Document 6, Page 81

conclusions in her statement as:

> "I concluded that the Whistleblowing concerns about ventilation and patient safety were valid but that they were already known and there was an action plan in place. There is now agreed policy that any changes from building regulations or original specifications must be signed off by infection control. The investigation had highlighted that the IPCT found Dr Peter's frequent communication difficult to manage given she was not an infection control doctor at the time and had no role in the day-to-day management of IPC."[1369]

417. There were four aspects of Dr de Caestecker's report which were explored in some detail:

- The scope of her report and why she did not investigate why 6 ACH were not achieved across the hospital,
- The section at the top of the third page that dealt with the issue of Air Change Rate,
- Why she included material about how (to quote her statement) "the IPCT found Dr Peter's frequent communication difficult to manage given she was not an infection control doctor at the time and had no role in the day-to-day management of IPC"[1370], and
- The statement in the report and also in the letter that there were no increased levels of infection, and the recent prevalence survey showed that RHC had lower rates than the Edinburgh Children's Hospital.

418. It was put to Dr de Caestecker that she should have followed up the third aim of Dr Redding which was to ensure that lessons were learned[1371] and considered whether lessons had been learned about the hospital being built below standard and with a ventilation system that is not compliant with SHTM-03-01. She accepted that she did not do that and maintained that it was her job to look at whether the concerns raised were taken seriously and acted

[1369] Dr De Caestecker, Statement, Questions 62(e)
[1370] Dr De Caestecker, Statement, Questions 62(e)
[1371] Bundle 14, Volume 2, Document 87 at page 74

on.[1372] It was put to Dr de Caestecker that it might it have been of value to investigate and answer the question, which might have prompted earlier action. She could see that, but didn't feel that she could investigate that via the Whistleblowing. She did not consider it her role. [1373]

419. The top of the third page of the report[1374] contained specific text about the issue of what the impact was of the fact that most of the hospital had three air changes per hour rather than the six required by SHTM 03-01 (2009 Draft). Dr Peters was unaware of any discussion with the infection control team. She was not aware of any risk assessment coming to that conclusion.[1375] Following evidence from Dr de Caestecker[1376], an email from Dr Kennedy of 10 July 2018 which was copied to Dr Inkster including text approved by Dr Inkster was produced by NHS GGC.[1377] The agreed text in that email summarises the position on Air Changes as follows:

- Each air change reduces contamination the room by approx. 63%
- 3 air changes dilutes airborne contamination to 5% of level at start of time period
- 5 air changes dilutes airborne contamination to 0.67% of level at start of time period.
- Rule of thumb (CDC guidance, personal communication with PHE) is to aim for <1%
- Scottish hospital building note recommends 6 air changes per hour.
- QEUH general single room accommodation achieves 3 air changes per hour
- This was deemed adequate as rooms meant to be at slight negative pressure to corridor
- Investigations in 2016 revealed the negative pressure was not as spec

[1372] Dr De Caestecker Transcript, page 27 and 28
[1373] Dr De Caestecker Transcript, page 28 to 32
[1374] Bundle 27, Volume 4, Document 6 at Page 83
[1375] Dr Peters, Transcript, Day 2, Pages 81-83
[1376] Dr De Caestecker Transcript, pages 42 to 43
[1377] Bundle 27, Volume 14, Document 6, Page 37

• Additional risk to patients in standard accommodation negligible for most pathogens (3 ACH still brings contamination down to 5%, single accommodation, closed doors etc)

• Higher risk pathogens (MERS/MDR-TB) – alternative pathways now in place – no transmission of these pathogens noted in QEUH/RHC

• Other risk would be Aerosol Generating Procedures – advice to keep FFP3 mask on whilst in room, and for period of time after end of procedure. 1 hour normally but extended to 2 hours in QEUH/RHC on basis of recent SBAR.

420. We did not have the opportunity to ask Dr Inkster or Dr Kennedy whether these words are exactly what Dr Inkster sent to Dr Kennedy, but in contrast with the first paragraph on page three of the Stage 2 Whistleblowing they do appear to be consistent with Dr Inkster's evidence on this issue[1378] and her SBAR of June 2016[1379].

421. Dr de Caestecker looked to see if there had been a risk assessment carried out about the reduced air change rate and could not find one.[1380] Dr de Caestecker did not think the absence of actions on the risk assessment of air changes was an example of an organisation not wanting to face up to a decision they have made. She noted that there had been a huge amount of work into improving the environment in parts of the hospital. Though, she noted that there had been no work done to the ventilation outside of Wards 2A, 4B and other isolation rooms.[1381]

422. Dr de Caestecker was challenged about why her report sets out a list of potential failings and issues around Dr Peters. She insisted that these issues came out in the interviews she conducted and felt that she had to report it to put some help and support in place. She confirmed that she did not provide any indication to Dr Peters about the complaints or provide her with the report. She wanted Dr Rachel Green to speak to Dr Peters about it in a more supportive way, but did not know whether this was done. She noted that both

[1378] Dr Inkster, Transcript, Day 1, Page 154
[1379] Bundle 4, Document 11, Page 52
[1380] Dr de Caestecker Transcript, page 10
[1381] Dr de Caestecker Transcript, page 25

Dr Redding and Dr Peters had working relations with the IPC team and insisted that they raised the issue of behaviour first.[1382]

423. The letter to Dr Redding and Dr Peters of 4 May 2018 states on the second page[1383] and the Stage 2 Whistleblowing report states on the fifth paragraph of the third page[1384] that "there were no increased levels of infection, and the recent prevalence survey showed that RHC had lower rates than the Edinburgh Children's Hospital." It was put to Dr de Caestecker that this might not have been relevant and she accepted that what is written was about the national and routinely produced data about E. coli, Staphylococcus aureus, C. difficile that was available, and what was given to her by Tom Walsh and Sandra Devine.[1385] Given that the letter and report were written at the time of the Water Incident in Ward 2A, and around the time of the Water Incident IMT Full Incident Report of 5 June 2018[1386], it is difficult not to reach the conclusion that this response is, at best, misleading.

424. Dr Redding was asked about the part of the Stage 2 report that referred to Dr Peters. [1387] She challenged the substance of the complaint in her statement by pointing out that that "all Microbiologists need to know about issues that impact on our ability to do our job, both during the day and out of hours. If we are not aware of the status of ongoing issues or concerns, then we cannot ensure that the IPCT are kept fully informed." She also stood up for Dr Peters and was clear that:

> "I've known Dr Peters for many years and she's a very, very dedicated, hardworking microbiologist and she puts a lot of effort into ensuring that a team works well together to deliver a service, whether that be a microbiology service in the laboratory or a clinical microbiology service which interfaces with clinicians, and there are many people who would speak up for her ability in both those things."[1388]

[1382] Dr de Caestecker Transcript, pages 33 and 34
[1383] Bundle 14, Volume 2 at Page 224
[1384] Bundle 27, Volume 4 at page 83
[1385] Dr De Caestecker Transcript, page 44-46
[1386] Bundle 27, Volume 5, Document 19, Page 46
[1387] Dr Redding Statement, paras 184-185 and Dr Redding, Transcript, Pages 147-151
[1388] Dr Redding, Transcript, Page 148

425. Dr Peters rejected these criticisms in general, but did accept that there had been a period when Dr Inkster, mainly through the IMT process, felt that she was asking too much of communication. Dr Peters explained that they discussed it, she took on board her comments and changed the way she communicated.[1389]

426. It was put to Dr de Caestecker that up until summer 2018, there had been a significant issue raised by Dr Peters about the infection risk in the new hospital linked to the environment which turned out to be right. She stated that she did not think that people were trying to deflect from the concerns raised by Dr Peters by drawing out a list of flaws in her behaviour. Dr de Caestecker stated that she was not aware of Dr Peters not receiving replies to e-mails that she sent about her concerns.[1390]

427. As part of her investigations, Dr de Caestecker did not find a stage 4 HAI SCRIBE carried out for the new building, as required by SHFN 03, part B of 2014.[1391]

428. Regarding the conduct of the Whistleblowers, Dr Armstrong was referred to the positioning paper for NHS GGC[1392]. Paragraph 69 refers to the conduct of Whistleblowers undermining infection control. Dr Armstrong agreed with that analysis.[1393]

429. It was put to Dr Armstrong that this was understood to describe behaviour from 2015 to 2019. She was asked what steps she took to address these serious issues with those doctors. Dr Armstrong explained that the 2015 review mentioned it. She regretted that they did not have a meeting. It should have been shared at that point, in a delicate way. Dr Green worked with Dr Peters in 2017/2018. Regarding Dr Inkster, Dr Armstrong had hoped that from January to March 2019 trying to get more support and mentoring for her might

[1389] Dr Peters, Day 2, Transcript, Pages 85-86
[1390] Dr de Caestecker, Transcript, page 46 to 49
[1391] Dr de Caestecker Transcript, page 10
[1392] See Bundle 25, page 1282.
[1393] Transcript, Dr Armstrong, page 213 and 214

have helped. She was not sure if it did.[1394]

430. Dr Armstrong was asked if at paragraph (j) she was saying that Dr Peters or Dr Inkster provided inaccurate information to patients and families. Dr Armstrong thought there was evidence given by the board on specific cases. It could have been in relation to the Serratia case in 2018.[1395]

431. It was put to Dr Armstrong that the following IMT minutes contradict entirely what was in the positioning paper. She was not aware of that. She accepted that she was the responsible officer for the health board. She does revalidation and appraisals for doctors. There were behavioural patterns over a number of years that are difficult to address.[1396]

432. It was put to Dr Armstrong that nobody had addressed this with Dr Inkster. Dr Armstrong thought that without a formal process it was difficult. She was not sure there was enough for disciplinaries. She wondered what they could have done different and if they could have done more.[1397]

433. It was put to Dr Armstrong that she agreed that the doctors had undermined infection control, but that there was not something to take up with disciplinary or to report to the GMC. Dr Armstrong thought there was some evidence of undermining the infection control team. That was addressed at the time by Dr Green. Dr Armstrong considered that when you see behaviours re-occurring, it becomes difficult. She did not have personal experience of all the instances.[1398]

434. Regarding paragraph (m), there was reference to making false allegations about colleagues. It was put to Dr Armstrong that the presumption was this was about Professor Steele and the joke. Dr Armstrong said it was not. There was a case in 2016 where one of the individuals made false allegations against three colleagues. An investigation was conducted, and it was

[1394] Transcript, Dr Armstrong, page 214 and 215
[1395] Transcript, Dr Armstrong, page 215 and 216
[1396] Transcript, Dr Armstrong, page 216
[1397] Transcript, Dr Armstrong, page 216 and 217
[1398] Transcript, Dr Armstrong, page

disproved. What that does to people is makes them anxious.[1399]

435. It was put to Dr Armstrong that the positioning paper came a year and a half ago. It might be used to suggest that the Inquiry should not listen to the views expressed by these doctors. She was asked when Dr Peters and Dr Inkster were first wrong about the flaws in the built environment. Dr Armstrong thought they should be listened to. She thought there were significant issues with the QEUH. She thought Dr Inkster and Dr Peters did pick those up. There was a balance. It was not all good or all bad. The Inquiry should listen to Dr Inkster and Dr Peters.[1400]

436. Dr Armstrong was asked if the positioning paper sought to undermine the messenger rather than focusing on the message. Dr Armstrong rejected that. There were behaviours which had been quite damaging to people within NHS GGC. They had to raise some of those issues because the danger is one is too anxious to raise some issues. What the Inquiry heard from Sandra Devine was that some behaviours continue and are detrimental.[1401]

Concern about unusual infections at the start of 2018

437. In January 2018, two cases of Pseudomonas aeruginosa (PsA) were identified in PICU. Those cases were said to be linked in place and time to another two cases on the unit (long-term colonisation). The cases were at opposite ends of the ward, and typing was said to have confirmed different strains so there was no evidence of cross-transmission.

438. Between January and May 2018, there were five patients identified with a blood stream infection caused by Klebsiella in Ward 2A. These infections were not investigated at the time.[1402] Nor were these infections reported to HPS/ARHAI.[1403]

439. Around the end of January 2018, Cupriavidus was isolated from the blood of a

[1399] Transcript, Dr Armstrong, page 218 and 219
[1400] Transcript, Dr Armstrong, page 219 and 220
[1401] Transcript, Dr Armstrong, page 221 and 222
[1402] CNR Overview Report, Example 8.2, Bundle 6, Document 38 at Page 1063
[1403] Bundle 27, Volume 3, Document 25, Page 482

Ward 2A patient who was receiving IV therapy prepared in the aseptic pharmacy[1404]. Against the background of the two previous cases of Cupriavidus linked to the aseptic pharmacy (in 2016 and in 2017), Professor Gibson recalled Dr Inkster, an experienced microbiologist, being greatly concerned[1405]. Thomas Romeo recalled being instructed by her to obtain a sample from ward 2A around that time.[1406] A PAG in respect of Cupriavidus was convened on 5 February 2018 and the Minute records discussion of potential sources other than the aseptic pharmacy[1407]. Dr Inkster explained that three were too many cases as this was an unusual organism.[1408] At a subsequent PAG on 19 February 2018, it was agreed to undertake further water testing of taps and showers in patient rooms. On 27 February 2018, water testing results confirmed the presence of Cupriavidus in patient rooms. These rooms were taken out of use and plans were made for chemical dosing of the water with silver hydrogen peroxide.[1409] The main water supply was tested, as well as various outlets: taps (including flow straighteners) and shower heads. The main water supply tested negative for isolates. However, there were positive tests for various gram-negative bacteria (different strains) and fungal growth in various locations in the QEUH/RHC, including Ward 2A, 2B and 4B. A SBAR sets out the investigation findings.[1410]

440. Throughout February and March 2018, further bacteraemias occurred in Ward 2A. By 1 March 2018, in addition to the Cupriavidus case, one case of Pseudomonas and two cases of Stenotrophomonas maltophilia had been isolated.[1411] By March 2018, a further four cases of Stenotrophomonas maltophilia had occurred in patients in various locations of the hospital: 1 patient in Ward 2A; 1 patient in PICU; 1 patient in Ward 2B for line care, and 1

[1404] Bundle 2, p82; Bundle 1, p.54.
[1405] Transcript of evidence of Professor Brenda Gibson, p.81.
[1406] Thomas Romeo transcript page 126
[1407] Bundle 2, p.82.
[1408] Dr Inkster, Statement, Para 559
[1409] Dr Inkster, Statement, Para 560
[1410] Bundle 4, Document 27, Page 124
[1411] In response to PPP 5: NSS reported that it was unaware of the two cases of Stenotrophomonas maltophilia that had been isolated by 1 March 2018. Accordingly, the cases were not considered in the report which NSS published in May 2018: Initial report on the findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children water contamination incident and recommendations for NHS Scotland (Bundle 7, Document 1, Page 3)

patient in Ward 3C (renal ward).

441. Witness 1 recalled his daughter having two serious infections during this period[1412].

442. On 19 February 2018, a meeting was held to discuss the possibility of converting PPVL rooms to negative pressure rooms. A large number of people from NHS GGC Estates, HPS and HFS were present, including Annette Rankin, Ian Powrie, Alan Gallacher, Christine Peters and Malcom Thomas, the last mentioned being the designer of the concept of PPVL rooms and lead author of HTMs. Dr Peters asked him whether the fact that extracts were not in the correct place in a PPVL room would invalidate them, and his opinion was that it would. He also confirmed to Dr Peters verbally that the PPVL rooms in QEUH deviated from his design[1413]

443. Ms Harvey Wood recalled looking back at the finding of 3 instances of Elizabethkingia miricola in 2016 to 2017 and wondered, with the benefit of hindsight, whether that was the first indication of problems[1414]. She tried to put together an analysis to understand what was going on[1415].

444. Dr Peters also produced a report[1416] in which she noted that in addition to Cupriavidus, there were other gram-negatives. In 2017, some of these organisms, including both Brevundimonas and Delftia, were found in Ward 2A. She suggested that Mycobacterium colonisation was a risk with the use of biocide[1417]

445. In around February and March 2018, patients and families noticed obvious changes in the use of water on Ward 2A[1418].

446. Whatever the position within NHS GGC may be now, at the time, the test results caused sufficient concern about the safety of the water to mandate an

[1412] Statement of Witness 1 para 8
[1413] Dr Peters witness statement para 156
[1414] Kathleen Harvey Wood, Transcript, page 28
[1415] Kathleen Harvey Wood, Transcript, page 33
[1416] Bundle 14 Volume 2 document 160 page 613
[1417] Dr Peters witness statement para 160
[1418] See, for example, the transcript of evidence of Suzanne Brown, at p.51.

urgent and dramatic response. Witnesses recalled water testing being increased around this time in response to concern about infections[1419].

The Water Incident

447. On 1 March 2018, Dr Inkster contacted Ms Rodgers to inform her that water testing had isolated Cupriavidus[1420]. Dr Valyraki explained that samples were taken from Ward 2A outlets, the main supply tank, and the aseptic pharmacy[1421].The Inquiry understands that water testing, at this time, was less comprehensive than it would subsequently become[1422]; and that testing specifically for Cupriavidus was not something that was done as a matter of course[1423]. The Inquiry's understanding is that NHS GGC nevertheless does not accept that the Cupriavidus infection in early 2018 was linked to the water supply, in the same way – as highlighted above – they do not accept any causal link between any of the infections identified in the history of concern and the built hospital environment.

448. IPC staff issued an immediate instruction that immuno-compromised patients must not be exposed to the water on Ward 2A. Due to the urgency of the instruction, action was required before an IMT could be convened. Ms Rodgers and Dr Inkster formulated a plan which is recorded in an email timed [13:55] on 1 March 2018 from the former to the latter. The email is not held by the Inquiry but is understood to be recounted in Ms Rodgers's witness statement[1424]. Immediate steps included restricting patient access to showers, staff/family use of hand gel, bottled water for washing and teeth brushing. This may also have been the case in the adult wards, although the available evidence is that it may have been for only a couple of days. Dr Hart recalled that the situation in the adult wards was "a lot better" than the children's wards, which "had terrible problems"[1425]. In the meantime, Estates liaised with DMA Canyon to arrange silver hydrogen peroxide dosing. Further testing was

[1419] Evidence of Jennifer Rodgers and Emma Sommerville.
[1420] Witness statement of Jennifer Rodgers, para.119.
[1421] Dr Kalliopi Valyraki, Witness Statement, page 557 (Witness Bundle)
[1422] See e.g., comments of Professor Leanord: Bundle 6 at p.1230.
[1423] Bundle 1, p.66 at p.67.
[1424] Witness statement of Jennifer Rodgers, para. 122.
[1425] Witness statement of Dr Alastair Hart, para. 73.

underway.

449. On 1 March 2018, Dr Inkster was unable to hold an IMT due to adverse weather conditions (the "Beast from the East") but produced a summary report which was sent by email to key individuals including Dr Armstrong, Mr Walsh, Ms Devine, Professor Gibson and Mr Hill[1426] and escalated the incident to HPS as a HIIAT red[1427], before holding an IMT the following day (2 March 2018)[1428]. It met regularly between then and 27 March 2018.

450. Dr Inkster described the 'Water Incident' as a complex and evolving incident which was, from an IMT perspective, managed in three phases: Phase 1 was between February to April 2018 and was concerned with positive water results from outlets. Phases 2 and 3 were in May to June 2018, and August to September 2018, and were concerned with the drainage system.[1429] At the start, Dr Inkster was looking at a potential point source. She suspected a link initially through the aseptic pharmacy.[1430] She described the discovery of Cupriavidus as strengthening the hypothesis that the water was the source.[1431]

451. Dr Armstrong explained that she had no concerns about the water before 1 March 2018. It was put to Dr Armstrong that there had been a series of IMTs about segments of the water supply in previous years. She was asked if she had not heard of them or if were they not presented to her as a wider issue. Dr Armstrong explained that she would normally hear about these things when she met the IPC team. They met regularly. They would tell her about infections. The other way, which was the more formal way, was that the ambers or reds would come to the board infection control committee. She noted that some of these were PAGs, which she would not be aware of. She was assured by the work of the IPC team to test the water when required.[1432] Dr Armstrong recalled that in March 2018 everyone thought there was a water

[1426] Bundle 14, Volume 2, Document 87 at Page 75
[1427] Bundle 27, Volume 3, Document 24, Page 482
[1428] Bundle 1, Document 13, Page 52
[1429] Dr Inkster, Statement, Paras. 561-562
[1430] Dr Inkster, Transcript, Day 1, Page 164
[1431] Dr Inkster, Transcript, Day 1, Page 167
[1432] Transcript, Dr Armstrong, page 94 and 95

issue. They did not know what it was, but they took it extremely seriously.[1433]

452. Dr Armstrong was asked, as medical director, what the system was in NHS GGC that was doing the job of ensuring the water system was safe. She said that was not in her remit. The Director of Estates was better placed to address that. A huge amount of work was done to improve the system.[1434]

453. At the first IMT meeting on 2 March 2018[1435], it was recorded that multiple outlets on Ward 2A had tested positive for Cupriavidus. Testing had also revealed Pseudomonas and other gram-negative organisms[1436]. Professor Gibson recalled that water testing subsequently revealed the presence of fungal pathogens[1437]. The IMT's initial hypothesis was that water outlets were the source of the bacteria; and that the presence of flow straighteners – identified as being "high risk" – may have encouraged biofilm formation. The water was to be dosed that day and that was to be followed by resampling. HPS later concluded that a number of workable hypothesis were being explored at this time; including ingress contamination at the point of entry of the water supply, regressional contamination at taps/outlets or flow straighteners or contamination at installation or commissioning.[1438] None of HPS, the Lead ICD nor treating clinicians knew of the risks identified in the 2015 DMA Canyon L8 Risk Assessment or the 2017 DMA Canyon L8 Risk Assessment, although it seems likely that some of the Estates staff attending IMT meetings at this point knew or ought to have known about both risk assessments.

454. At an IMT on 6 March 2018[1439], Professor Gibson and Dr Murphy asked whether the concerns of the clinical teams regarding the safety of the environment in Ward 2A had been escalated higher. Dr Inkster informed them that these concerns had been "reported to the highest level in NHS GGC and

[1433] Transcript, Dr Armstrong, page 129
[1434] Transcript, Dr Armstrong, page 95 and 96
[1435] Bundle 1, p.54.
[1436] Transcript of evidence of Professor Brenda Gibson, p.81.
[1437] See the IMT minute dated 6 March 2018; Bundle 1, p.56 at p.57; IMT minute dated 21 March 2018, Bundle 1, p.75; transcript of evidence of Professor Brenda Gibson, p.82.
[1438] Bundle 7, Document 1, Page 3 at page 10
[1439] Bundle 1, Document 14, Page 56

HPS over 2 years ago". [1440]

455. Professor Gibson and Dr Murphy each confirmed in their evidence that they had been dissatisfied with the apparent lack of response from senior management within NHS GGC and those external to NHS GGC to whom the concerns had been reported.[1441] To Professor Gibson's mind, the presence of a combination of fungus and environmental gram-negative bacteria suggested something fundamentally wrong with the infrastructure[1442]. Dr Kennedy explained that the professional judgment of senior clinical staff, microbiologists, and the clinical team looking after the patient is key to spotting an unusual organism. He clarified that this was the only way to spot an unusual organism[1443]. He accepted that an unusual organism was something rarely seen in a clinician's career[1444].

456. Professor Dancer commented that an unusual organism is one that has not been seen for a few years or never seen by the microbiologist. She explained that it is more likely to find really unusual organisms in vulnerable patients because there are millions of bacteria, viruses, and microbes in the environment[1445]. It was explained by Mr Walsh that electronic surveillance will not pick up an unusual infection. However, he highlighted that the backup was the microbiology laboratories in which both infection control doctors and microbiologists would pick up any unusual types of organisms and create an alert. A problem assessment group ("PAG") meeting or incident management team ("IMT") meeting would flow from that[1446]. He asserted that he would expect an experienced microbiologist to be aware of very unusual organisms and to escalate where there is one infection rather than waiting for a sequence of the same unusual organism infection[1447]. He also thought that microbiologists in the lab should be made aware of any increased risks such

[1440] Bundle 1, Document 14 at page 57.
[1441] Transcript of evidence of Professor Gibson, p.90; transcript of evidence of Dr Murphy, p.33.
[1442] Transcript of evidence of Professor Brenda Gibson, p.86.
[1443] Dr Iain Kennedy, Transcript, page 77
[1444] Dr Iain Kennedy, Transcript, page 3
[1445] Prof Stephanie Dancer, Transcript, page 41
[1446] Thomas Walsh, Transcript, pages 4 and 5
[1447] Thomas Walsh, Transcript, pages 9 and 10

as the Legionella report for the QEUH noting a high risk[1448].

457. The clear indication at that time was that Ward 2A patients were at risk of infection from the water system. The driving concern for Professor Gibson at this stage was the presence of Pseudomonas and Stenotrophomonas. Exposure to these organisms presented potentially life-threatening consequences for the Ward 2A patient group[1449]. It was accepted by Mr Purdon in evidence that as a member of this IMT, he should have mentioned the existence of the 2015 DMA Canyon L8 Risk Assessment in the IMT on 12 March 2018 but did not do so[1450]. During this time, the IMT reported several gram-negative infections within Ward 2A, and also in the PICU and renal ward (RHC Ward 3C)[1451]. The Inquiry understands that NHS GGC's position is that none of these infections were linked to the water system.

458. A few points of context require to be noted here about the concerns of Professor Gibson and Dr Murphy. Firstly, it is clear that issues around the ventilation in Ward 2A had been escalated by clinicians in 2015 and there had been some progress to upgrades, but as the options appraisal document from the NHS GGC Acute Service Committee from March 2017 noted, Ward 2A remained out of compliance with the standards in SHTM 03-01[1452]; Secondly, Dr Peters and Dr Inkster had raised infection control issues that extended more widely than ventilation, to include availability of water testing results when they had sought to resign their ICD sessions in July 2015; Thirdly, a group of microbiologists had raised a Stage 1 Whistleblow in September 2017 and that had resulted in a 27 point action plan; and Fourthly, Dr Redding had instigated Stage 2 Whistleblowing procedures due to what she saw as a failure to address concerns raised in the autumn of 2017. The concerns expressed by Dr Murphy and Professor Gibson at that IMT on 6 March 2018 had real merit.

[1448] Thomas Walsh, Transcript, page 11
[1449] Transcript of evidence of Professor Gibson, p.91; IMT minutes dated 12 March 2018, Bundle 1, p.63.
[1450] Colin Purdon, Transcript, p69
[1451] Transcript of Evidence of Professor Brenda Gibson, p.84.
[1452] Bundle 27, Volume 7, Document 6, Page 158

459. Following the discovery of microbiological contamination of water outlets, NHS GGC requested support from HPS and HFS on 16 March 2018.[1453] A teleconference took place on 17 March 2018.[1454] Dr Armstrong requested it because she wanted early expert input into what was quite an unusual situation at the time with Cupriavidus, an unusual organism, and wanted input from HPS, HFS and also Public Health England.[1455] Professor Steele attended from HPS and Mr Hoffman PHE. It was only at this point that Dr Inkster received the Minute of the 6 June 2014 Special Meeting about the Horne Optitherm Taps[1456] from Ms Devine.[1457]

460. Professor Steele explained that he had been contacted by colleagues within HPS regarding providing technical support to NHS GGC. His role was to go to meetings to assess if they had the resources available. In March 2018, he understood that the issue that the health board was dealing with was regarding the domestic water system. He was led to believe that it had been compromised and contaminated. He did not know at the time if it was.[1458]

461. Within HPS, Mr Storrar was asked to review the systems at the Queen Elizabeth, and because he was unaware of the design philosophy of the site, he sought documentation from NHS GGC. He got large volumes of technical information, drawings, specifications and within that were the 2015 DMA Canyon L8 Risk Assessment and the 2017 DMA Canyon L8 Risk Assessment.[1459] Mr Storrar brought them to Professor Steele's attention. The 2015 report contained many recommendations. Professor Steele was led to believe that not much was done between the reports. In his role as Director of HFS, Professor Steele then took the two reports to Ms Grant in June. Professor Steele met with Jane Grant, CEO of NHS GGC, in June 2018. He asked if he could come and see her and share some information. Ms Grant would have had no understanding of what a pre-occupation risk assessment was. He stated that they talked about the need for the risk assessment and

[1453] HPS Initial Summary Report, May 2018 – Bundle 7, Document 1 at page 5
[1454] Summary Note: Bundle 14, Volume 2, Page 107
[1455] Dr Inkster, Transcript, Day 1, Page 165
[1456] Bundle 15, Document 9, Page 692
[1457] Dr Inkster, Transcript, Day 1, Page 166
[1458] Professor Steele, Transcript, Page 3 to 6
[1459] Professor Steele, Transcript, Page 5

what it was about. Ms Grant was unaware of the technical requirement.[1460]

462. Professor Steele considered that the board was responsible for carrying out a pre-occupation risk assessment. Professor Steele confirmed that he did not seek any assurance that he would be able to fix the problems. He knew that Ms Grant had brought together expertise within the board who did have experience of risk assessments, such as Mr Leiper. In a very short period, Mr Leiper had done a lot of work to improve governance and training.[1461]

463. The Inquiry has now had sight of two SBARs that provide some assistance. The first, dated 5 July 2018, refers to reports relating to the commissioning of the water system having been "*identified in recent days*"[1462]. The second, dated 8 August 2018[1463], suggests that identification of the said reports took place in June 2018. The matter was considered by the Oversight Board in its final report. Rather laconically perhaps, the DMA Report is described as having "*surfaced*" in the context of providing information to HPS/HFS for the purposes of their review of issues in March 2018.

464. At the IMT of 19 March 2018, it was reported that two patients in Ward 2A had pyrexia (high temperature) as a result of possible fungal growth. Further potential cases were identified in Ward 3C, and the IPCT commenced an investigation [1464]

465. On 20 March 2018, the Chief Nursing Officer invoked the National Framework, which offers additional support to Health Boards in responding to HAI incidents/outbreaks and to ensure assistance from HPS.[1465]

466. The IMT minute of 23 March 2018 records the hypothesis that pathogens predominantly found in soil and plant material could have got into the system at the time of commissioning.[1466]

[1460] Professor Steele, Transcript, Pages 5-7
[1461] Professor Steele, Transcript, Page 8 and 9
[1462] Bundle 4, p.126.
[1463] Bundle 4, p.128.
[1464] Bundle 1, Document 18, Page 70
[1465] HPS Initial Summary Report, May 2018 – Bundle 7, Document 1 at page 5
[1466] Bundle 1, Document 20, Page 81 at 84

467. The understanding of Glasgow II witnesses was that the IMT's hypothesis evolved as its investigations progressed. Testing indicated that the problem with the water supply extended beyond Ward 2A; gram-negative organisms were discovered in other areas within both the RHC and QEUH, including a finding of Cupriavidus in Ward 4B. This pointed away from a hypothesis linked to specific outlets towards one of widespread contamination of the water system[1467].

The Water Technical Group

468. On 6 April 2018, the first meeting of the Water Technical Group ("WTG") took place.[1468] It was chaired by Ms Kane and reported into the IMT. Eddie McLaughlan confirmed that he and Ian Storrar were in the group to provide support to NHS GGC. He remarked that chemical dosing of water systems was an admission that something had gone wrong with the design, build and operation of the water system[1469].

469. Ms Rankin gave evidence that the focus of the Water Technical Group ("WTG") was on the water incident, particularly gram-negative bacteria such as Cupriavidus, Stenotrophomonas, and Acinetobacter[1470]. She recalled becoming involved at the request of Mary Ann Kane following positive samples in Ward 2A and that they were looking to move patients over to Ward 4B[1471]. She recollected there was discussion at the WTG about fitting point of use filters (POUFs) and dosing of the water system was already underway[1472].

470. At the first meeting, representatives from Horne Taps attended and, according to the Minutes, the same ground that was covered in the 6 June 2014 Special Meeting about the Horne Optitherm Taps[1473] seems to have been gone over again. Horne representatives advised that issues with Pseudomonas in flow straighteners were known, but not other organisms, and that the flow

[1467] Transcript of evidence of Professor Brenda Gibson, p.84.
[1468] Bundle 10, Document 1, Page 10
[1469] Eddie McLaughlin, Transcript, page 37
[1470] Annette Rankin, Transcript, page 77
[1471] Annette Rankin, Transcript, page 78
[1472] Annette Rankin, Transcript, pages 79 and 80
[1473] Bundle 15, Document 9, Page 692

straighteners would require to be decontaminated and replaced as required. Ms Lisa Ritchie stated that she emphasised at the meeting that risk management was key, and Pseudomonas elimination was the holy grail. She considered eliminating Pseudomonas to be a challenging but essential objective[1474]. The WTG met regularly from April 2018, sometimes weekly.[1475] The WTG considered reviewing information on water temperature to identify trends but were advised that the majority of water temperature data had been lost due to a system failure. The group also discussed long term solutions to de-contaminate the water system. Options included: shock dosing; thermal cleaning and chemical cleaning (including Chlorine Dioxide). Whichever option was selected would require a full risk assessment and consideration of what would cause minimum disruption to patients. The WTG were agreed that POUF would only be fitted to high-risk areas rather than the whole campus.

471. The Minutes of the 13 April 2018[1476] and 20 April 2018 meetings of the WTG confirm that those present clearly understood and accepted that at this point there was widespread contamination of the water system. The minute of the 13 April 2018 meeting records that:

> "It was noted that every floor had positive and negative readings whereby this would indicate widespread water infection."

472. Then the minute of the 20 April 2018 records that:

> "Every floor is showing some contamination with various species so we can assume there is a widespread contamination in the buildings. A review of commissioning data indicates there was TVC which were off the scale but now we need to determine the way forward and solution to the contamination."

473. Ms Rankin recalled that there was an acceptance in the meeting that there was a widespread water issue throughout the entire new building site, the new campus of both hospitals, the RHC and the QEUH[1477]. The actions taken from her recollection were fitting POUFs as a temporary solution, chlorine dioxide,

[1474] Lisa Ritchie, Witness Statement, page 6
[1475] Bundle 10
[1476] Bundle 10, Document 2, Page 9 and Bundle 10, Document 3, Page 14
[1477] Annette Rankin, Transcript, page 81

and decontamination of the flow straighteners in the Horne Optitherm tap[1478].

474. Mr Powrie confirmed, the phrase 'widespread water contamination' was regularly used. [1479]

475. Given that those attending one or both of these meetings included: the Interim Director of Facilities (Ms Kane), the General Manager of Estates (Mr Gallagher), Deputy General Manager – Estates (Mr Powrie) and the Lead ICD (Dr Inkster), it is not now open to NHS GGC to argue that at this point the water system of the QEUH/RHC was not contaminated.

476. It seems remarkable that on 17 April 2018, Room 6 in Ward 2A was closed due to flooding. Ms Cuddihy was occupying this room when the bathroom flooded. Her parents reported this incident and had to move rooms. This is evidence of environmental failings involving water and drainage. Sampling of the ward, and indeed this room, took place on 14 April 2019 resulting in confirmation of Mycobacterium Chelonae in the shower room, the room that had been flooded. This room was occupied by Ms Cuddihy between 15-17 April 2018. Samples were also taken in rooms 16 and 17, again proving positive for Mycobacterium chelonae. Ms Cuddihy occupied room 17 from 1 May 2018 to 5 May 2018. Mycobacterium chelonae was also identified within room 16.[1480]

477. A number of remedial steps were taken by NHS GGC in March 2018. The evidence indicates that a range of steps were taken both to investigate and control risks thought to be posed by the water system. Karen Connelly (whose presence at the IMTs was essentially to see that what needed done was done) recalled this was a 'very intense period'. She explained that 'they had problems with infections and didn't seem to be resolving them'. In an interesting phrase, she said they were trying to 'find a cause and a solution at the same time'.[1481]

[1478] Annette Rankin, Transcript, pages 83 and 84
[1479] Mr Powrie, Transcript, Page 91
[1480] Professor Cuddihy, Statement, Para 121 and response to PPP5 from Professor Cuddihy
[1481] Transcript of Karen Connelly p 27

478. Immediate steps were taken to restrict access to water. Water coolers were removed. Immunocompromised patients were not to wash using water from sinks or showers. A note was issued to parents informing them they could use the CLIC Sargent facility to have a shower[1482]. They were to drink only bottled water. Bottled water was to be used for brushing teeth. It was even to be used for cleaning[1483]. BMT patients were to use sterile (not bottled) water. Parents and staff could use sinks but had to use hand gel thereafter.

479. All rooms in the RHC housing immunocompromised patients were to receive twice daily Actichlor cleans. Rooms were being sealed off and deep cleaned during this period[1484]. An increased hand hygiene and cleaning regime was implemented. Nursing staff had to use additional hand hygiene before performing line care.

480. The water supply was dosed with silver hydrogen peroxide at least four times, but this did not eradicate the gram-negative organisms[1485], so taps were replaced and sanitised. Sinks in the Prep and Treatment rooms are said to have been removed. The water supply to Ward 2A had to be shut off completely to facilitate dosing. Portable handwash basins were provided at these times. Portable sinks were provided on around 13 March 2018[1486].

481. Point of use filters were installed to tap and shower outlets in areas with high-risk patients (not throughout the entire hospital), with the filters to be changed every 31 days and taps to be tested weekly[1487]. Mr Kelly explained that a POUF is a filter device which is fitted to a water outlet such as a tap or a shower. It filters water down to 0.2 micron, which is a level that is likely to prevent the escape of microbiological organisms[1488].

482. Evidence was heard from Colin Purdon that the POUFs were capable of

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[1482] Witness statement of Lynn Kearns, photograph of note at LK/03.
[1483] See, for example, the witness statements of Lynn Kearns at para. 31; witness statement of Sharon Ferguson at para. 109.
[1484] Witness statement of Suzanne Brown at para. 43.
[1485] IMT minute dated 21 March 2018, Bundle 1, pp.76-78.
[1486] Witness statement of Lynn Kearns at para. 50; see also the photograph produced by Lynn Kearns at LK/02.
[1487] Colin Purdon, Transcript, page 81
[1488] Dennis Kelly, Witness Statement, page 19 (Witness Bundle page 62)

retaining atypical mycobacterium[1489]. This was a view also shared by Mr MacMillan, who claimed that POUFs can result in retrograde contamination, although he insisted that they were a good idea if maintained properly[1490]. Mr Kelly claimed that POUFs should be used in both high risk and low risk wards, but qualified his comments by highlighting he was a 'water guy', not a clinician[1491].

483. Dr Lee accepted that POUFs are sensible precautionary measures[1492]. However, she acknowledged that the POUFs reduce the space between the tap and basin floor which can result in contamination of the outlet if the patient touches them[1493]. It is very difficult to wash hands without touching the outlet when a POUF is fitted as there is reduced space[1494]. A further concern identified by Dr Lee was that if the filter is not fitted by a trained and competent person, then there may be leakage around the filter which results in the water delivered through the outlet becoming contaminated[1495].

484. Filters were installed initially on Ward 2A, but their use was extended to other areas of the RHC, and to Ward 4B in the QEUH. Signs were put up warning against the use of the water for drinking and advising that showers should be run for a period before use[1496]. The IPCT was said to have had an increased presence on Ward 2A during this time[1497]. The lead ICN in the RHC, Susan Dodd, agreed that the POUFs were quite large and, once fitted to the taps, reduced the amount of space to clean hands, so from a practical level there was a risk of staff re-contaminating their hands by touching the filter or touching the handwash basin. The water pressure was slower and there was a concern that the water might be hitting the drain and aerosolising. There was a lot more splash with the POUFs fitted to the taps resulting in wet

[1489] Colin Purdon, Transcript, page 81
[1490] Melville MacMillan, Transcript, page 165
[1491] Dennis Kelly, Transcript, page 209
[1492] Dr Susanne Lee, Transcript, page 111
[1493] Dr Susanne Lee, Transcript, page 112
[1494] Dr Susanne Lee, Transcript, page 113
[1495] Dr Susanne Lee, Witness Statement, page 8 (Witness Bundle page 37)
[1496] Witness statement of Witness 6; see also the witness statement of Colette Gough at para. 152 in which Mrs Gough recalls seeing similar signs in August 2018 and of David Campbell at paragraph 43 who recalls similar signs in Ward 6A.
[1497] Sharon Ferguson, Witness Statement, Para 111

floors.[1498] Lynn Pritchard reported broadly the same sort of experiences in the adult hospital.[1499]

485. Dr Lee's view was that consideration should be given to the removal of outlets in hospitals with very high-risk patients who are extremely vulnerable to waterborne infections, as splashes can reach up to two metres from an outlet. She pointed to evidence from Holland showing that removal of outlets reduced the number of waterborne infections. She also noted that unused en-suites in single rooms increase the risk of stagnation, Legionellosis, Pseudomonas, and other gram-negative bacteria. Moreover, she added that this increases costs as flushing must be carried out at the outlets[1500]. A further risk is that if POUFs are only fitted in high-risk areas, then, as Dr Kennedy conceded in evidence, vulnerable patients may go elsewhere in the hospital outside their POUFs-fitted ward and risk infection from the water supply[1501]. A decision was made to prescribe prophylaxis (Ciprofloxacin) to high-risk patients on Wards 2A and 2B[1502]. The IMT minute dated 16 March 2018 indicated that if families asked about Ciprofloxacin, staff were to tell them "*it's just a precaution due to issues with the water supply*"[1503]. The clear evidence of Professor Gibson and of Dr Murphy is that the language used in the IMT meeting did not capture what required to be said to patients and families about the use of prophylaxis. Professor Gibson's clear understanding was that prophylaxis was being used in direct response to a risk of infection; the word "*precaution*" would have underplayed the situation[1504]. The recollection of at least some relatives as to what was actually said to them was slightly different. They recalled being told by consultants on a one-to-one basis that their child was being placed on antibiotics to "*protect them from the water*"[1505]. To be clear, there is no evidence that clinical staff (or anyone else), in their explanation to patients, did

[1498] Susan Dodd, Transcript, Page 41
[1499] Lynn Pritchard, Transcript, Pages 150-154
[1500] Dr Susanne Lee, Transcript, pages 156 and 157
[1501] Dr Iain Kennedy, Transcript, page 15
[1502] Transcript of evidence of Angela Howatt, p.21
[1503] Bundle 1, p.66 at p.68
[1504] Transcript of evidence of Professor Brenda Gibson, p.96; witness statement of Dr Dermot Murphy, para. 142.
[1505] See for example the witness statements of Sharon Ferguson at para. 63; and transcript of evidence of Lynn Kearns, at p.49

anything other than try to fully and candidly explain the use of prophylaxis to patients and families at this time.

486. On the same date, 16 March 2018, families were informed that the water to the ward would be shut off altogether (understood by one witness to be for a second time although the date of the first shut down is not known)[1506]. No witness at Glasgow I recalled being given a clear explanation about the nature of the problem with the water, why they were not to use it or why it was being turned off. Ms Ferguson recalled at a meeting in March 2018 being informed that there was nothing wrong with the water and that it was tested often[1507].

487. The restrictions placed on water use were particularly difficult for families and patients. Initially, witnesses from Glasgow 1 were not overly concerned about being told not to drink tap water. They found the instruction to run the showers before use curious; it caused some to think about Legionella, but overall these were not matters of significant concern. However, in Glasgow 2 the Inquiry heard evidence that young and teen patients were distressed about the lack of washing facilities[1508]. Washing with bottled water means washing with cold water[1509]. BMT patients received sterile water to drink but the taste was unpleasant[1510]. Perhaps most distressing was the uncertainty about whether it was safer to clean or not clean. Families were instructed about the importance of washing and showering every day to minimise the risk of infection. As of March 2018, they understood that washing or showering might increase the risk of infection.

488. Concern emerged with the appearance of filters on taps (and showers) and with the dousing of drains with chemicals. Although filters were placed on taps and instructions given that showering could resume, concerns about the safety of the water endured, at least in the minds of patients and families. The only communication about these matters came by way of passing comment

[1506] Witness statement pf Lynn Kearns at para. 51.
[1507] Transcript of evidence of Sharon Ferguson, at p.37; witness statement at para. 113.
[1508] Transcript of evidence of: Professor Brenda Gibson, p.85; Emma Sommerville, transcript of evidence, p.31.
[1509] Transcript of evidence of Emma Sommerville, p.39.
[1510] Transcript of evidence of Emma Sommerville, p.37.

from staff or workmen. The position appears to have been somewhat different on the adult wards, where Dr Hart recalled that the nurses and particularly the ward sister went around telling patients that there was a concern about the water quality from the taps and that people would be coming into rooms to fit filters onto them, which would "hopefully keep the water safe"[1511].

489. Nonetheless, absent a clear statement from NHS GGC about what was wrong with the water or drainage system, rumours circulated[1512] and concerns grew. It was obvious that there was a problem, but patients and families were left to speculate about what it might be. Statements made about the safety of the water supply did not succeed in allaying those concerns. Overall confidence in the water supply fell. Witnesses reported extreme concern that a state-of-the-art healthcare facility could not achieve that most basic of healthcare facilities: a functioning water system[1513].

490. The most acute disruption to the water system occurred in March 2018 when patients and families recalled being informed firstly that they could not wash using the hospital water supply (effectively depriving patients of hot running water) and then that the water supply was being shut off altogether. Lynn Kearns provided a powerful description of the effect of these events upon her son who, following a spell in PICU, had an endotracheal tube removed on 10 March 2018[1514]. That was a distressing and messy event. All her son wanted to do was to have a hot shower. Mrs Kearns' son waited seven days for a hot shower, and even then, was only able to have one because he was given a day pass to go home. In the interim, Mrs Kearns was provided with a small basin of water and then a portable sink with which to wash her son. Neither solution was adequate, and only contributed to her son's loss of dignity. Matters deteriorated when the water was turned off altogether and patients were instructed to use bed pans.

491. As mentioned above, parents were instructed that, if they wished to have a

[1511] Witness statement of Dr Alastair Hart, para. 75.
[1512] See, for example, the transcript of evidence of David Campbell, at p.30.
[1513] See, for example, the transcript of evidence of Suzanne Brown, at p.67; and witness statement of John Henderson at para. 10.
[1514] Transcript of evidence of Lynn Kearns, at p.33.

shower, they could take a taxi to the CLIC Sargent facility located outwith the hospital grounds. Some witnesses did not consider this a realistic option because of the time during which their children would be left alone[1515].On 20 March 2018, Shona Robison, at that time the Cabinet Secretary for Health, Wellbeing and Sport provided answers to the Scottish Parliament in response to questions about "contamination" of the water supply to Ward 2A. Ms Robison referred to steps taken by NHS GGC to address the issue and reported that no patient with a bacterial infection associated with the incident gave cause for concern. According to Professor Cuddihy, NHS GGC, around the same time, issued a press release indicating that the full water supply would be returned to normal within 48 hours after appropriate testing had been carried out[1516]. The water supply to Ward 2A was reinstated on 22 March 2018 [1517].

492. The water supply was restored on 22 March 2018, but no explanation was provided as to why the water was now considered safe. Mrs Kearns recalled that, in the absence of an indication to the contrary, her family assumed the water was safe to use[1518]. Other witnesses remained concerned about the safety of the water supply. Suzanne Brown's son had used the hydro pool on the ground floor of the RHC to help ease muscle pain caused by his treatment; she stopped this in early 2018 when concerns about the water supply emerged. She recalls feeling guilty about exposing her son to a risk of infection[1519]. This feeling of guilt was echoed by a number of witnesses who felt that they had exposed their children to risk just by using the water. Parents were in a Catch 22 situation: washing their children was necessary to ward off infection; but washing them was apparently perceived to risk exposing them to that very thing.

493. Regarding steps taken to communicate that to the patients and families in the Schiehallion unit, Dr Armstrong explained that she wasn't close to that issue. Dr Armstrong accepted that it was a good idea when fitting Point of use filters

[1515] See, for example, the witness statement of Stevie-Jo Kirkpatrick, at para. 75.
[1516] Transcript of evidence of Professor Cuddihy, (26 October 2021 (am)) at p.48.
[1517] Witness statement of Lynn Kearns at para. 60.
[1518] Witness statement of Lynn Kearns at para. 54.
[1519] Witness statement of Suzanne Brown at paras. 77 and 122.

to taps that you give as clear an explanation as possible.[1520]

494. The disruption to the water supply also affected staff on the ward. The restrictions on the use of water had an obvious impact on clinicians and nurses who had, throughout their careers, relied on a clean water supply for hygiene[1521]. Nurses and doctors were instructed to leave the ward to use the bathroom or to wash their hands. One witness recalled the water supply being shut down without warning being given to doctors on the wards. She recalled that one particular consultant, who was fastidious about handwashing, was frustrated and concerned about the potential infection risks posed by the situation[1522]. Witnesses were concerned that the job of staff on the ward was hampered by the lack of a reliable water supply.

495. Disruption was caused by the installation and regular changing of POUFs, drain cleaning, vent and chilled beam cleaning, and the replacement of pipes and taps. These processes involved a combination of external contractors and Estates personnel entering patient rooms[1523].

496. Perhaps most disruptive was the introduction of HPV cleaning in June 2018. Witnesses recalled significant disruption caused by the deep cleaning of rooms. Rooms had to be emptied in advance of cleaning. Room cleaning resulted in frequent room moves in which patients and their belongings were moved from room to room. Patients and families had to decant rooms which for some had, in effect, become their homes. Families did not return to their original rooms unless that was requested and could be accommodated[1524]. There was evidence that room moves could result from patient requirements for specific room types, but the perception of Glasgow 1 witnesses was that the high frequency of room moves was linked to HPV cleaning. David Campbell recalled the appearance of people living out of suitcases[1525]. Aneeka Sohrab recalled moving rooms hundreds of times; on some occasions she would

[1520] Transcript, Dr Armstrong, page 129 and 130
[1521] See, for example, the witness statement of Emma Sommerville, para. 99.
[1522] Transcript of evidence of Molly Cuddihy, (am) at p.60.
[1523] See, for example, the witness statement of Dr Anna-Maria Ewins, para. 215.
[1524] Transcript of evidence of Melanie Hutton, p.31.
[1525] Transcript of evidence of David Campbell, at para. 15.

leave the ward for a short period and return to find that her daughter was not in the room where she left her[1526]. Patients and their families were unable to settle and staff time was taken up assisting with moves.

497. Overall ward capacity was restricted by IPC measures and remedial works. Restricted capacity can result in Schiehallion patients being cared for on other wards[1527].

498. Nursing, domestic and auxiliary staff were heavily involved in implementing the logistics of these measures on the ward[1528]. Workloads increased and changed. Nurses were taken away from what should have been their focus: patient care[1529]. There was consistent evidence that June 2018 was a particularly difficult time for staff, patients and families.[1530]

499. A serious concern expressed by a number of witnesses related to the displacement of Schiehallion patients to other wards within the RHC. Witness perception was that displacement was a result of a lack of capacity on Wards 2A and 2B contributed to by room cleaning and other building issues. Molly Cuddihy recalled that during the HPV cleaning all patients who did not have to be on the ward were moved to other wards[1531].

500. It should be acknowledged that some witnesses who described experiences on other wards were there because of the expertise available on those wards (for example, neurological or surgical wards). It should also be noticed that some witnesses described positive experiences on other wards[1532].

501. However, one consistent theme was that the "Schiehallion Umbrella" did not travel effectively to other wards. Parents identified two perceived concerns: the risk of infection and a lack of specialised care. Mr and Mrs Gough provided clear and detailed evidence of the nature of these concerns[1533] which was

[1526] Aneeka Sohrab, Transcript, at Page 38
[1527] See, for example, witness statement of Professor Brenda Gibson, para. 28.
[1528] See, for example, witness statements of: Kathleen Thomson, para. 210; Dr Shahzya Chaudhury, para. 39.
[1529] See, for example, the transcript of evidence of Emma Sommerville, p.51.
[1530] See, for example, the evidence of Melanie Hutton, Jennifer Rodgers and Professor Gibson.
[1531] Transcript of evidence of Molly Cuddihy, (pm) at p.5.
[1532] Karen Stirrat, for example, spoke highly of her and her son's experience on the neurology ward.
[1533] Cameron Gough, Transcript, at p.105.

supported by a number of other witnesses. Cleaning protocols did not travel to other wards. In some cases, even basic cleanliness was not achieved[1534]. Immunocompromised children mixed with non-immunocompromised children. Some witnesses spoke of a rule that Schiehallion children should always be placed in a VAC room when on other wards, but if there was such a rule, it was not applied consistently. Witnesses described how infection risk concerns led to an isolating and lonely existence on other wards.

502. Witnesses did not recount a consistent position in relation to the water supply on other wards within the RHC. Some recalled seeing filters or being provided with bottled water. Others had the opposite experience and formed the impression that other wards were unaware of the risk posed to immunocompromised children by the water within the RHC.

503. The parallel concern related to a perceived lack of experience of dealing with patients with the highly specialised requirements of the Schiehallion patient group. Most Glasgow 1 witnesses were careful to emphasise that no criticism was intended of staff themselves; but the simple fact was that those staff members did not have experience of the particular demands of caring for paediatric haemato-oncology patients. For example, staff on other wards did not have an understanding of the requirement for precision medication or of making frequent observations. They did not have the same skill set in relation to use of cannulas, Hickman lines and port-a-caths. Staff on other wards appeared to lack understanding of the nature of temperature spikes and the speed at which the condition of Schiehallion patients could deteriorate. When life threatening deteriorations did occur, parents did not have confidence that staff on other wards were in control of the situation[1535]. Parents perceived that their children were placed at increased risk when they were outwith Wards 2A and 2B.

504. The overall effect of these concerns was to erode parents' trust in the safety of the hospital environment for their immunocompromised children. It was a

[1534] Transcript of evidence of Colette Gough, at p.82. Mrs Gough recalled discovering dried brown matter on the bed rail of the patient bed.
[1535] See, for example, transcript of evidence of Colette Gough, at pp.52-53.

deeply unsettling experience for parents who had built up trust in the processes and procedures of the Schiehallion Unit. Mr Gough described bringing a 'crash bag' on every visit to the hospital. It contained items such as bottled water and cleaning materials to enable Mr and Mrs Gough to cater for every eventuality.[1536] Mr and Mrs Gough recalled reaching a stage, later in 2018, where they switched from wishing that their son would be home for Christmas to just wishing that, if he was in hospital for Christmas, he would at least be in the Schiehallion Unit.[1537]

505. Post filter water testing had indicated that filters were successful in controlling organisms. However, filters were not considered to be a long-term solution. Filters were a control measure; they did not tackle the source of the organisms. They also required regular replacement. Mr Redfern's understanding was that if the water system was successfully treated, filters would not be required in the long term[1538].

506. That filters alone were not a complete solution to the problem was acknowledged in the IMT final report. Long term measures were considered, including: Chlorine Dioxide dosing, replacement of taps containing flow straighteners in high-risk areas, maintenance of taps with flow straighteners in other areas and longer-term use of filters in high-risk areas[1539]. A separate group, the Water Technical Group, was established to investigate solutions.

507. In the meantime, the IMT agreed that the success of the filters meant that other control measures could be stepped down[1540]. Post-filtered water could be used for washing. Ciprofloxacin use ceased. However, the use of bottled water continued. In the eyes of patients and families, concerns about the safety of the water supply had not been fully resolved. They continued to entertain doubts about the safety of the water supply. Those doubts would only increase with the passage of time.

[1536] Witness statement of Cameron Gough, at paras. 223-228.
[1537] Witness statement of Cameron Gough, at para. 81.
[1538] Transcript of evidence of James Redfern, p.49.
[1539] Bundle 8, p.53.
[1540] IMT minute dated 27 March 2018: Bundle 1, p.86.

508. During this IMT, assistance was requested from a number of sources including HPS/HFS and external consultants. For example, the Inquiry has a copy of what bears to be a draft of a report prepared by Dr Susanne Lee, a consultant clinical scientist [1541]. NHS GGC commissioned advice from her. She considered issues in relation to the water system. She concluded that temperature control of the water system may not have been achieved due to the presence of waterborne microorganisms[1542], the lag of at least 12 months from filling the water system and occupation which allowed biofilm to develop and establish[1543], the Water Safety Group ("WSG") did not comply with the latest best practice (WHO, HSG 274, and HTM 04-01) and is still geared towards Legionella[1544], the WSG should adopt the water safety plan approach for all uses of water on the site[1545], it was concerning that a multiple barrier water safety plan approach had not been adopted given high risk patients and an over-provision of water outlets contributed to low flow in parts of the water system[1546], the sluice rooms should be based in centre of the ward[1547], and the removal of flow straighteners[1548]. Dr Lee considered the question of whether evidence that environmental strains did not match patient isolates permitted a conclusion that water could be ruled out as a potential source of infection. She said, "It is likely that water was the source and cannot be ruled out because the [isolates] do not match.[1549]"

Water Incident Debrief meeting of 15 May 2018

509. A debrief meeting in relation to the IMT took place on 15 May 2018. It was chaired by Laura Imrie, Nurse Consultant from HPS. The minute of the meeting is the *Notes of the Water Incident Debrief meeting on 15 May 2018*[1550]. It was widely seen to be helpful.[1551] Lynn Pritchard attended

[1541] Bundle 8, p.134.
[1542] Paragraph 3.1, page 2, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1543] Paragraph 3.1, page 3, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1544] Paragraph 3.4, page 4, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1545] Paragraph 3.5, page 4, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1546] Paragraph 3.6.1, page 5, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1547] Paragraph 3.6.2, page 6, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1548] Paragraph 3.7. page 6, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1549] Paragraph 3.9, page 8, Draft Meeting Report, prepared by Dr Susanne Lee, dated 25 April 2018
[1550] Bundle 14, Volume 2, Page 211
[1551] Susan Dodd, Transcript, Page 91-92 and Lynn Pritchard, Transcript, Page 155

because, as she explained, a lot of the mitigations were also put in place in the QEUH, particularly for the BMT unit where patients were not permitted to use the showers.[1552]

510. Dr Inkster produced a Full Incident Management Team Report covering the IMTs from 2 March 2018 to 13 April 2018 dated 5 June 2018. That concluded ""that the source of exposure is contaminated water supply" throughout the QEUH and the RHC, that contamination took place during installation, leading to development of a thick biofilm. Temperature control and maintenance were seen to have been factors.[1553] (The Inquiry holds two versions of the report, the second being undated.) It was thought possible that infections were linked to the water as they were linked by "time/place/person". However, testing was continuing in order to establish if a more definite link could be proven. As at the date of the report, there had been no further bacteraemias, and so it was thought that control measures had been successful. [1554] This initial cohort of infections formed the basis for the investigation by HPS, which resulted in their initial report in May 2018.[1555]

511. There is every indication that this report was widely circulated without attracting disagreement about that conclusion. Dr Armstrong did not remember if she saw it, but she must have.[1556] Dr Armstrong would have been aware there was something in the water. She knew it concerned the patients.[1557] Dr Armstrong was asked if she had a view now as to whether there was a connection between the infections seen in Ward 2A in the first months of 2018 and the water supply. Dr Armstrong explained that at the time they all believed it and put in measures to deal with it. She was uncertain what the point of entry was. The question was whether the environment was more risky than other hospitals.[1558]

[1552] Lynn Pritchard, Transcript, Pages 154-155
[1553] Bundle 27, Volume 5, Document 19, Page 46
[1554] Bundle 8, Document 6, Page 53 (clearly misdated in the Bundle to 13 April 2018 which was the last IMT)
[1555] Bundle 7, Document 1, Page 7
[1556] Transcript, Dr Armstrong, page 96 and 97
[1557] Transcript, Dr Armstrong, page 97 and 98
[1558] Transcript, Dr Armstrong, page 98 to 100

512. Dr Murphy's evidence about the unusual pattern of infections was clear. When clinicians first recognised the unusual pattern of infections, they did not "jump" straight to the conclusion that there was some link to the built environment[1559]; it is not their practice, as evidence-based specialists, to jump to conclusions. His views, and those of his colleagues, were based on years of observing infection patterns in their patients and discussion with colleagues looking after similar patients. By March 2018, Dr Murphy understood there to be evidence of a contaminated water supply. He and his colleagues shared the concern of IPC that the infection pattern was linked to the built environment[1560]. By September 2018, Dr Murphy found it difficult to escape the conclusion that there was a systematic problem with the built environment[1561]. Dr Murphy said that, following careful reflection, he came to the view that there was a contribution from the built environment to the infection pattern seen in the Schiehallion patient population[1562]. He was further of the view that some of the infections which were in his view linked to the environment caused patients to become very unwell, and in some cases resulted in the requirement for care in the PICU[1563].

513. Dr Kennedy considered contaminated water to be where water contains a substance that should not be there such as a chemical and this has an impact on the wholesomeness of the water. The amount of contaminant may be stricter for a vulnerable patient group compared to the standard public water supply[1564]. Ms Pritchard's understanding at the time was that there was contamination, within the pipes from when the hospital was built; that, through a period of time, there had been a buildup of biofilm in the pipes.[1565] Mr Redfern confirmed that the conclusions set out in that report[1566] accorded with his understanding of the situation in March/April 2018[1567]. Whilst a number of Core Participants, including NSS, accept this hypothesis, NHS GGC did not

[1559] Transcript of evidence of Dr Dermot Murphy, p.24.
[1560] Transcript of evidence of Dr Dermot Murphy, p.30.
[1561] Transcript of evidence of Dr Dermot Murphy, p.58.
[1562] Transcript of evidence of Dr Dermot Murphy, p.130.
[1563] Transcript of evidence of Dr Dermot Murphy, p.138.
[1564] Dr Iain Kennedy. Transcript, page 3
[1565] Lynn Pritchard, Transcript, Page 157
[1566] Bundle 8, p.53.
[1567] Transcript of evidence of James Redfern, p.43.

state their position in relation to this question in their response to Counsel to the Inquiry's Closing Submissions for Glasgow II.[1568]

514. It was put to Dr Armstrong that there was a discussion of the incident and the contaminated supply at the meeting on 15 May 2018. Dr Armstrong said that, at that time, she would've been aware there was something in the water. She knew it concerned the patients. Regarding whether the water system was contaminated, Dr Armstrong said it was better to raise that issue with someone with better expertise.[1569]

515. Dr Lee discussed her concern about open-ended pipes on site during the construction phase. If the pipes are open it allows for dust, nutrients, insects, even potentially rodents to get into the pipework and leave nutrients behind. She said that these nutrients will then be a food source for bacteria and other microorganisms to feed on[1570].

516. In April 2018, three patients were identified as being colonised with Acinetobacter baumanii in PICU. A further two colonised patients were identified in May 2018. PAG/IMT meetings took place in relation to the incident between 11 May and 6 June 2018[1571]. The IMT retrospectively identified a further case colonised in February 2018, bringing the total to six cases. The earlier patient remained in the unit. Two of the patients were in adjacent bed spaces, and a domestic audit identified cleaning concerns. All isolates were sent for typing. IPCT raised concerns over 'TBP' adherence, and a review of TBPs in the unit was undertaken. IPCT continued to monitor for new cases.

517. Dr Inkster explained that Acinetobacter is one of the more common environmental organisms seen, but If there was any level of Acinetobacter, she would be looking for an environmental source.[1572]Her view is that one can find airborne dispersal of Acinetobacter, this outbreak persisted over a number of years, and may be related to the ventilation issues within PICU when the

[1568] NHS GGC's submission in response to Counsel to the Inquiry's Closing Submission in respect of Glasgow 2.
[1569] Transcript, Dr Armstrong, page 97 and 98
[1570] Dr Susanne Lee, Transcript, page 132
[1571] Bundle 2, Document 37, Page 95 and Bundle 1, Document 25, Page 105
[1572] Dr Inkster, Transcript, Day 2, Page 112-113

ward was non-compliant with SHTM 03-01.[1573]

518. Dr Tom Makin, Senior Consultant with Legionella Control International, contributed to the TWG, at a meeting on 10 May 2018, at which he formed the view that Chlorine Dioxide had already been identified as the best option to address contamination in the water system.[1574] A Chlorine Dioxide dosing system was eventually instigated to treat the water supply. Tim Wafer described that task as being to implement the vision communicated by Ian Powrie.[1575] Continuous dosing of the RHC is understood to have begun at some point in November 2018 and in the QEUH at some point in December 2018[1576]. Ian Powrie confirmed that it took about 6 months to construct the system and another 6 months for good results to emerge.[1577] Eddie McLaughlan stressed that chemical dosing was an issue which was more complex than it sounded.[1578] It introduced a new raft of risks, including overdosing. It was potentially damaging to the seals in the water system. Its effect on bacteria was not black and white. Another issue was that, by killing off some bacteria, more resistant ones might have a greater chance of growing.[1579] Tim Wafer acknowledged some risk to the fabric of the system but considered it to pose less potential damage at the concentrations used than would be posed by the presence of biofilm. In practice, he considered a chlorine dioxide system to give extra resilience, and in the context of medical environments where ageing systems were often involved, to be necessary in practice.[1580] The Inquiry understands that dosing continues and is intended as a long-term solution to the problems encountered with contamination of the water supply. Dr Makin in his oral evidence spoke to having seen WTG minutes from 26 April 2019 and 22 April 2021 which indicated initially a 'significant improvement' and later 'excellent water quality'.[1581] Tim Wafer in

[1573] Dr Inkster, Statement, Para 535
[1574] Tom Makin transcript page 32
[1575] Tim Wafer transcript page 145
[1576] Witness statement of Jennifer Rodgers, para. 221.
[1577] Transcript of evidence of Ian Powrie p96
[1578] Transcript of evidence of Eddie Mclaighlan p38
[1579] Transcript of evidence of Eddie McLaughlan p41 was that chlorine dioxide by killing off some bacteria could give other more resistant bacteria an opportunity to grow.
[1580] Tim Wafer transcript page 169
[1581] Witness statement of Tom Makin at pages 26-27.

his evidence spoke to his company still being involved in water testing, and that "the delivery of the chlorine dioxide is good, and the levels being achieved around the site are good".[1582]

The idea of an Executive Control Group

519. In light of debate about how important decisions such as the decant and the fitting of a Chlorine Dioxide dosing systems were and should be made Dr Inkster's evidence that she informally proposed an 'Executive Control Group' to Dr Armstrong in May 2018 is of interest. She explained that because of the complexity of the incident there needed to be director-level oversight because an IMT Chair can't direct resource and get things to happen, and she was concerned that things were slowing down. She highlighted delays as she saw them in making decisions around chlorine dioxide installation because board level people wanted to wait for reports. She was also concerned that having a number of different groups (the IMT, the WTG and the Operational Group) the communications to senior members of staff were coming from all sorts of different angles. People would come to IMTs with laptops, and they would sit, and type and press send before the end of the IMT, before she or Sandra Devine got a chance to brief Dr Armstrong. She wanted to be managed by a group, but in a predictable way.[1583]

520. Dr Armstrong was asked if it was a good idea to have an executive control group and for IMT chair to report to it. Dr Armstrong did not recollect that discussion with Dr Inkster, but her general view was that what was needed was for operational managers to take the actions required. She saw a distinct separation of roles between the operational managers and clinicians. That was important to the General Management model in the NHS in Scotland.[1584]

Gram-negative infections in May and June 2018

521. Between 28 April and June 2018, there were a total of 17 cases of patient infection with GNB bacteria in Ward 2A, with some patients displaying multiple

[1582] Tim Wafer, Witness Statement, Page 166
[1583] Dr Inkster, Transcript, Day 1, Page 173-176
[1584] Transcript, Dr Armstrong, page 101 to 103

organisms. A total of 23 organisms were isolated in patients' samples:

522. Ms Rankin recalled attending a water incident debrief meeting on 15 May 2018 chaired by Laura Imrie. She explained that the purpose of the meeting was to have a small debrief for lessons learned. By this point, she recalled that the POUFs were on, the chlorine dioxide to sanitise the system was being procured, and her recollection was the meeting was managed as business as usual[1585].

523. By May 2018, the BICC, AICC and CCGC were all aware that the problem with water contamination was extensive and involved both RHC and QEUH.[1586] Dr Armstrong recalled that they all thought at that point there was a water issue. They did not know what it was, but they took it extremely seriously.[1587] On 6 May 2018, a single case of Pantoea was identified[1588] in Ward 2A and was reported to HPS[1589]. Four cases of Acinetobacter baumanii were identified within PICU in June 2018[1590]. Three cases of Cupriavidus were identified in June 2018[1591]. In addition, there were eight cases of Stenotrophomonas maltophilia were identified in June 2018[1592]. Six cases of Enterobacter cloaecae (including one patient that was infected twice and 2 isolates in separate patients on the same day),[1593] and four cases of Pseudomonas were identified in June 2018.[1594]

524. Witnesses recalled a further period of concern about infections in May and June 2018. Concerns began with a cluster of Enterobacter Cloacae infections in patients on Wards 2A and 2B. Haley Winter recalled that between 28 April and 2 May 2018 her son had a line infection which was subsequently confirmed by the CNR to be Enterobacter Cloacae[1595]. Sharon Ferguson's son had a septic shock event on 14 May 2018 which was also confirmed to have been caused

[1585] Annette Rankin, Transcript, Pages 85 and 86
[1586] AICC: Bundle 13, Document 15 at page 116. BICC: Bundle 13: Document 51 at page 376.
[1587] Dr Armstrong, Transcript, Page 129
[1588] Bundle 21, Document 4, page 141
[1589] Bundle 6, Document 37, page 943; Bundle 1, Document 27, Page 114
[1590] Bundle 1, Document 25, page 105
[1591] Bundle 1, Document 24, page 100
[1592] Bundle 1, Document 24, page 100
[1593] Bundle 6, Document 38, page 1065
[1594] Bundle 6, Document 37, page 943
[1595] Haley Winter, Witness Statement, at para. 74

by an Enterobacter Cloacae infection[1596].

525. Molly Cuddihy recalled experiencing temperature spikes on 13 April and 9 May 2018 which were suspected to be linked to an infection, although blood cultures taken at the time did not immediately reveal the nature of the infection.[1597] Ms Cuddihy experienced a third severe infection event on 31 May 2018 during which fluid resuscitation was required.[1598] On 1 June 2018, Ms Cuddihy was informed that the blood cultures taken on 9 May 2018 confirmed that she had contracted Mycobacterium Chelonae, an extremely rare gram-positive bacterial infection.[1599] On 1 June 2018, Dr Inkster emailed Ms Rankin at HPS to update her about the existing HIIORT for Ward 2A and reported that "we have a case of Mycobacterium chelonae bacteraemia in a 2A patient -reported to us yesterday. This is the typical patient group for such an infection - immunosuppressed with a line. This is another environmental organism with numerous potential sources, very unlikely to be water related with filters on. We will continue to monitor for further cases."[1600]

526. Dr Peters explained that Mycobacterium Chelonae was difficult to treat. It was very resistant. Very toxic antibiotics were required. It was, she said, 'a hard journey for patients'. She felt that perhaps more could have been done with the cases which were discovered. [1601] It was accepted by Ms Rankin that Mycobacterium Chelonae is an unusual organism. She clarified that it is not a gram-negative bacteria but is in fact gram-positive. She explained that an unusual organism is one that people do not see commonly or is not reported regularly. She considered that one case of Mycobacterium Chelonae should be HIIAT assessed and ARHAI might trigger it and might consider it a green risk[1602].

527. The Inquiry has discovered that the results of Ms Cuddihy's Mycobacterium Chelonae infections were not correctly recorded in NHS GGC systems. Her

[1596] Sharon Ferguson, Witness Statement, at para. 69.
[1597] Molly Cuddihy, Witness Statement, paras. 90, 94.
[1598] Molly Cuddihy, Witness Statement, para. 95.
[1599] Molly Cuddihy, Witness Statement, paras. 97-98.
[1600] Bundle 27, Volume 7, Document 61 at page 596
[1601] Dr Peters, Transcript, Day 2, Pages 59-61
[1602] Annette Rankin, Transcript, pages 70 to 73

infections had been labelled in the system as "'Gram positive bacilli' and also "presumptive mycobacterium sp" not "Mycobacterium Chelonae" and this explains why external parties reviewing data supplied by NHS GGC (Oversight Board, CNR Expert Panel, the Inquiry's own experts) have missed this particular Mycobacterium Chelonae from their chronologies.[1603] This analysis was confirmed by Dr Inkster who reported that results from the reference laboratory would sometimes not get added to the electronic laboratory records leaving the original identification of the organism as the record.[1604] This was noted by the CNR who concluded that the Telepath system did not systematically offer the basis for recording the results of typing bacterial isolates (mainly derived from reports provided by the Public Health England reference laboratory at Colindale, London but some data also from the Scottish Microbiology Reference Laboratories), either by annotating the original specimen results page or within a patient's results at a later date (when the typing information was received).[1605]

528. It was accepted by Ms Rankin that the Mycobacterium Chelonae cases in 2016 and 2018 not being reported (only the 2019 case was formally reported and the 2018 on reported by email) challenges the efficacy of the reporting system because people are not reacting to unusual infections[1606]. Reliance is placed on the microbiologists in the laboratory reporting to the clinical team who will liaise with the Infection Control team to alert them. She conceded that the working relationship between the labs, clinicians and Infection Control team is very important as there needs to be a two-way dialogue[1607].

529. Witness 1 recalled that his daughter became extremely unwell with an infection having been in isolation on Ward 2A for a period of months[1608].

530. Leann Young recalled that in May 2018, her son contracted VRE (Vancomycin

[1603] Dr Mumford, Transcript, Page 117 to 119
[1604] Dr Inkster, Transcript, Day 2, Pages 119-120
[1605] CNR Overview Report, Bundle 6, Document 38, Page 1069
[1606] Annette Rankin, Transcript, page 72
[1607] Annette Rankin, Transcript, page 75
[1608] Statement of Witness 1 para 45

Resistant Enterococcus) and in June that he contracted Aspergillus[1609].

531. A PAG was convened on 18 May[1610], followed by an IMT on 29 May 2018[1611]. The IMT's initial hypothesis was that infections could be linked to the drains. The water supply was believed to be 'clean'. There was concern that biofilm may have formed in the drains, resulting in 'aerolisation' of the biofilm (and contamination of the sink area) when the taps were turned on. Black grime had been observed by nursing staff and reported to IPC[1612].

532. On 31 May 2018, Annette Rankin, Nurse Consultant for Infection Control at HPS produced an initial report on the 'water contamination incident' at the QEUH/RHC (the HPS Initial Report).[1613] The HPS report covered seven bloodstream infections with three different organisms and was discussed with Ms Rankin. She conceded that they were not aware of all the information when they produced the report. For example, she was not aware of the DMA Canyon report nor the earlier reports of drain contamination. She argued that HPS did not have the 'big picture'[1614]. She accepted that the HPS report is very limited and that more hypotheses could have been considered for the water infections such as flow straightener maintenance, or the presence of flow straighteners, the dusty chilled beams, and the ventilation system issues outlined by the Innovative Designs Solutions ("IDS") report. She also conceded that HPS was drip fed information and did not have the whole picture[1615].

533. The report identified three organisms of concern (Cupriavidus; Pseudomonas and Stenotrophomonas maltophilia), which caused infections in a cohort of 7 patients between January and March 2018. The report records that the clinical aspect of the incident was closed, given that no new cases had been identified since 3 April 2018.

[1609] Witness statement of Leann Young at paras. 20 – 22.
[1610] Bundle 2, p.102.
[1611] Bundle 1, p.91.
[1612] Witness statement of Angela Howatt, para. 61; witness statement of Emma Sommerville, para. 94; 130. Susan Dodd, Transcript, Page 38
[1613] Bundle 1, Document 1, Page 3
[1614] Annette Rankin, Transcript, pages 105 and 106
[1615] Annette Rankin, Transcript, pages 108 and 109

534. The report records that HPS, HFS and NHS GGC had initiated a detailed investigation into the contaminated water system within the hospitals, and that the results from ongoing water testing appeared to confirm that 'regressional seeding of contamination' continued to occur and supported 'the theory that a whole system remedial approach is required.' Water sampling had revealed not only the three organisms associated with the incident, but 'numerous additional gram-negative bacilli and fungal species.'

535. In June 2018, Dr Peters and Ms Harvey Wood did a presentation for the clinicians, including Professor Gibson and Dermot Murphy, which showed, "a striking epidemiology of gram-negative organisms."[1616] This was eventually formed into a PowerPoint Presentation by Kathleen Harvey-Wood and Dr Christine Peters: *Bacteraemia rates and Resistance Paediatric Haemato-oncology 2014-201*8, 30 August 2018.[1617]

536. Mr Powrie accepted that there were no duly appointed holders for water management such as an Authorised Person at handover[1618]. In 2017, Mr Powrie recalled bringing in Mr Romeo as "acting Authorised Person for water[1619]", yet Mr Romeo conceded that he had not been properly trained to be an Authorised Person for water[1620]. Mr Brattey's evidence was that it only clicked in April or May 2016 that colleagues were doing stuff that they were not qualified to do. He conceded that he did not make any enquiries at the time about who was an Authorised Person because he was so busy. He also realised around this time that he was doing the tasks of the Authorised Person for ventilation but assumed colleagues above him must have known that[1621].

537. The drains were swabbed, and, on 4 June 2018, it was reported that various gram-negative organisms had been identified, including Enterobacter Cloacae, Pseudomonas, Sphingomonas, Cupriavidus, Acinetobacter and Klebsiella. Pseudomonas, Stenotrophomonas, and Acinetobacter had also

[1616] Dr Peters, Transcript, Day 2, Page 90
[1617] Bundle 27 Volume 6, Document 9, page 107
[1618] Ian Powrie, Transcript, Page 66
[1619] Ian Powrie, Transcript, Page 125
[1620] Thomas Romeo, Transcript, Page 130
[1621] David Brattey, Transcript, Pages 29-30

been grown in patient blood cultures[1622]. Visual inspection revealed black grime in the drains of the hospital (both QEUH and RHC). The grime could be seen in the horizontal section of the drain from the sink running back for two to three inches. It was *very black, slimy grime that was built up in the entirety of the drain*.[1623] Dissection of a sink waste pipe showed exposed metal parts with biofilm present.

538. At the IMT of 4 June 2018, there was discussion of contamination of the drains. Results of sampling the drains Ward 2A had shown various gram-negative environmental organisms including *Enterobacter cloacae, Pseudomonas aeruginosa, Sphingomonas, Cupriavidus pauculus, Acinetobacter ursingii* and *Klebsiella oxytoca*. All these organisms were seen in blood stream infections in Schiehallion unit patients in 2018 (except Sphingomonas, which was seen in 2017). It was Dr Inkster's view that the cases of Enterobacter cloacae blood stream infection were associated with the drains. Cleaning of the drains and HPV environmental decontamination were carried out, but did not have a lasting effect on drain contamination. Control measures for the outbreak continued to concentrate on environmental risk into September when there was a further cluster of seven patients with environmental gram-negative blood stream infection.[1624]

539. The number of gram-negative infections on Wards 2A and 2B increased over the course of June. At an IMT on 15 June 2018 to discuss the water system incident, a clinician raised a concern about a mycobacteria infection. This was a very unusual infection. Although it had been queried as an environmental case and reported to HPS in an email[1625] and SGHD, no water testing was reported as having been done. It was also reported that a patient from the Beatson had the same sort of infection. That patient had not been an inpatient at RHC or QEUH, but they had attended the latter for clinics.[1626] As of 15 June, there was thought to have been some seventeen patients infected with gram-negative organisms, some of whom were infected with multiple

[1622] Bundle 1, Page 9.
[1623] Susan Dodd, Witness Statement, Para 75
[1624] Bundle 1, Document 23, Page 94
[1625] Bundle 27, Volume 7, Document 61 at page 596
[1626] Bundle 1, Document 30, Page 128

organisms[1627]. Another patient had been infected with an atypical mycobacterium (Mycobacterium Chelonae)[1628]. (There is also a suggestion of a further patient, with a connection to the Beatson, having this infection at the time.)

540. During July and August 2018, a further two instances of patient infection with Enterobacter cloacae occurred. They were not reported to HPS.[1629] No investigation appears to have taken place in relation to these infections, which were retrospectively identified by the CNR.[1630] Dr Inkster had consulted Mr Hoffman over sinks and drains.[1631] He was not a fan of cleaning drains due to the risks and felt the key was ensuring that everything that went into the drain stayed there.

541. The advice from IPC was that at least some of these infections (the gram-negative ones) were associated with contaminated drains[1632]. The Inquiry's understanding – as stated elsewhere - is that NHS GGC does not accept that any of the infections over this period were linked to the built environment.

542. The IMT's hypothesis on the source of the contamination was that, although water coming out of the filters was clean, the flow of dirty water into drains after handwashing could cause a biofilm to build up (as could disposing of other liquids into clinical hand wash basins). The biofilm could be dispersed and aerosolised, causing a risk of infection[1633]. Professor Gibson and Dr Murphy recalled advice that this was likely to be a site-wide problem. Whether emerging at this time or later, a hypothesis would develop in which the proximity of the point of use filters to the sinks was considered a factor in causing contamination of the water/drains.

543. Ms Harvey Wood recalled looking back at the finding of three instances of Elizabethkingia miricola in 2016 to 2017 and wondering, with the benefit of

[1627] IMT minute dated 15 June 2018, Bundle 1, p.128.
[1628] Bundle 1, p.128.
[1629] Bundle 27, Volume 3, Document 25, Page 482
[1630] CNR Overview Report: Bundle 6, Document 38, Page 1065
[1631] Bundle 14, vol 2140
[1632] Transcript of evidence of Professor Gibson, p.109.
[1633] Bundle 1, p.99.

hindsight, whether that was the first indication of problems. She tried to put together an analysis to understand what was going on.[1634] There was an increase in the number of positive cultures, but also mixed cultures. Another unusual feature was the mixture of different gram-negatives in the cultures. Together with Dr Peters she made a presentation[1635] in July 2018 to the clinicians in paediatric oncology. This showed in a series of graphs the increase she found. Things were being found with names their team had not seen before.[1636] There were a few even she had to look up. There was no doubt they were unusual. They had increased from what had been seen in Yorkhill. Dr Mathers was happy to bow to the view of experienced colleagues that these were unusual.[1637]By the time he attended a meeting about Cryptococcus he was able to say, 'By that time, I was not surprised about going to a meeting with yet another new organism.'

544. Ward 2A was shut down for two weeks around Easter 2018[1638].The number of visitors to the ward was restricted, and parent information was provided to prevent the build-up of clutter in patient rooms[1639]. Senga Crighton recalled being informed by staff that the ward was closed to visitors in an effort to manage unexplained infections[1640]. A sign was placed on the door which read "Ward closed to ALL visitors; Parents only allowed in ward. Thank you!"[1641].

545. The IMT once again put in place a range of control measures. This time, they were designed to minimise the risk of infection from contaminated drains, rather than from the water supply itself. A programme of works to address the concern was commenced. These included drain cleaning and replacement of waste pipes. Hydrogen Peroxide Vapour cleaning ("HPV") was instigated[1642]. The following remedial steps were taken to address the perceived problem with the drains: drains were cleaned and then decontaminated with Hydrogen

[1634] Kathleen Harvey Wood, Transcript, at Page 33
[1635] Bundle 27 Vol 6 page 107
[1636] Kathleen Harvey Wood, Transcript, at Page 40
[1637] Dr Alan Mathers, Transcript, at Page 35
[1638] Senga Crighton, Witness Statement, at Para. 30
[1639] Bundle 1, Document 22, page 92
[1640] Senga Crighton, Transcript, pages 23 and 24
[1641] Senga Crighton, Transcript, page 30
[1642] Professor Brenda Gibson, Witness Statement, Para. 139

Peroxide Vapour in Wards 2A, 2B, 7A, 7D, PICU and elsewhere on site, waste pipes and sink drains were replaced, and enhanced hand hygiene measures, involving the use of alcohol gel after washing, were introduced[1643].

546. The TWG continued to meet during May 2018. Relying on the advice of Tom Makin, the group had determined by 8 June 2018 that chemical cleaning with Chlorine Dioxide was the preferred biocide to strip the biofilm from the water system[1644].

547. In May 2018, it was agreed by the Technical Water Group that flow straighteners on taps were to be replaced on a 3 monthly basis and taps were to be steam cleaned and put back with POUFs in place. Until taps were replaced, caution was required to ensure that the taps did not “re-seed” the system. Only taps in Wards 2A and 4B were to be replaced- the rest of the QEUH/RHC was to be monitored.[1645]

548. In a discussion about the "black muck" that nursing staff were reporting as refluxing from the drains back into the sink in around May 2018[1646], Dr Inkster explained that there was always a problem in the drains, but the application of POUFs brought the discovery of the problem forward, because the volume and speed of water generated by the POUFs dislodged the biofilm. She recalled that there was a lip in the sink promoting pooling and stagnation of water. In addition, there was corrosion of an aluminium spigot further back in the drain, with white sealant obstructing the drain resulting in stagnation.[1647]

549. By 16 May 2018, the Technical Water Group had instructed over 2,000 water samples to be taken and mapped to floor plans of the hospital and within schematic diagrams. The conclusion was that there was a biofilm build up in the water system which required to be eradicated, and which would require preventative measures to be put in place to prevent re-occurrence[1648].

[1643] Bundle 6, Document 37, Page 943
[1644] Tom Makin, Witness Statement, Page 21
[1645] Bundle 6, Document 37, Page 958
[1646] IMT Minute, 29 May 2018, Bundle 1, Document 22, Pages 91 and 92
[1647] Dr Inkster, Transcript, Day 1, Pages 177-178
[1648] Bundle 6, Document 37, Page 958

550. Witnesses at Glasgow I did not recall receiving clear communication from hospital management about the infection outbreaks during this period or in relation to the methods being used to tackle them. But witnesses observed for themselves chemicals and crystals being poured down drains[1649] and rooms being sealed off to be cleaned using Hydrogen Peroxide Vapour ("HPV")[1650]. Ms Ferguson recalled that on around 5 June 2018 she was given a piece of paper referring to a "new method of cleaning" on Ward 2A, which she understood to relate to the HPV cleaning. One witness recalled being informed that the ward was under investigation for "environmental issues"[1651]. Some witnesses had an understanding that the pipes behind sinks were to be changed because "bugs were sticking to the plastic in the pipes"[1652]. Dr Hart recalled that patients on the adult wards were told they could not use the taps as there were bugs in the water and people were trying to figure out why[1653]

551. Hand hygiene measures for staff were stepped up. IPC peer audits were instigated. Education was given to staff and patients about good infection control practices. Signs were put up warning families and staff not to put liquids (tea, coffee etc) down clinical hand wash basins[1654].

552. During the decontamination of the drains, patient chemotherapy and BMTs were delayed or stopped altogether. Admissions to the ward were restricted. Patients were prescribed Ciproflaxacin, a prophylaxis[1655]. This was restarted in early June and continued until around 21 June. Ms Ferguson recalled that on 7 June 2018, she was handed a second note indicating that the drainage and chilled beams were being cleaned and that her son would be given antibiotics[1656]. Suzanne Brown recalled that leaflets were only handed out after events on the ward appeared in the news[1657]. During this time frame, some witnesses recounted discussions with clinical staff about preventative

[1649] Leann Young, Witness Statement, at Para. 21
[1650] Sharon Ferguson, Transcript, at Page 50
[1651] Denise Gallagher, Transcript, at Page 24
[1652] Leann Young, Witness Statement, at Para. 25.
[1653] Dr Alastair Hart, Witness Statement, at Para 77
[1654] Jennifer Rodgers, Witness Statement, at Paras 111-115
[1655] Bundle 6, Document 37, Page 943
[1656] Sharon Ferguson, Witness Statement, at Para. 149
[1657] Suzanne Brown, Transcript, at Page 54

medication[1658]. Denise Gallagher was informed by her son's consultant that he would be placed on Ciprofloxacin to guard against environmental infection, although the nature of those environmental concerns was not explained. Ms Young recalled being informed that all children with" central lines" would receive Ciprofloxacin as a precautionary measure[1659].Dr Peters was concerned about what she considered was a failure to keep microbiology colleagues informed. She wrote an email to colleagues outlining the toxicities and risk management needed on a case-by-case basis. [1660]

553. One of the hypotheses for the increased number of infections was overuse of Meropenem. Dr Peters reviewed 17 patients involved in the IMT chaired by Dr Inkster, and noted that only one patient with Stenotrophomonas had been on Meropenem[1661]

554. By this stage, clinicians expressed their concern that the IMT was not in control of the environment as there had been ongoing issues since the ward opened[1662] . They were so concerned about the safety of the environment that they queried whether it was safe to continue to admit patients to the ward. Professor Gibson recalled that clinicians were not confident that IPC and, ultimately, the Board, had the environment under control[1663]. Attempts to resolve the numerous issues on Ward 2A since opening had not resulted in a safe environment[1664].

555. Professor Gibson informed the IMT meeting on 4 June 2018[1665] that she and her fellow clinicians were not comfortable admitting new patients to Ward 2A. Admissions were restricted as a result. Patients would be assessed on a case- by-case basis. If patients were well enough, they would be admitted to wards other than Ward 2A. Ward 2B was thought to be just as high risk as Ward 2B; chemotherapy was not to be administered on Ward 2B until after

[1658] Denise Gallagher witness statement at paras. 10 and 70
[1659] Leann Young, Transcript, at Page 20
[1660] Dr Peters, Witness Statement, para 163
[1661] Dr Peters, Witness Statement, para 164
[1662] Bundle 6, Document 37, Page 943
[1663] Bundle 1, p.109 at p.112.
[1664] Professor Gibson, Transcript, p.111; IMT minute dated 8 June 2018, Bundle 1, p.112
[1665] Bundle 1, p.94

drain cleaning and HPV cleaning had been completed.

556. The final IMT meeting took place on 21 June 2018, at a point when control measures appeared to have prevented further infections[1666]

557. Also in June 2018, Professor Cuddihy wrote to the then Chief Medical Officer for Scotland, Catherine Calderwood, outlining his concerns about the environment on Ward 2A and about the rare infection contracted by his daughter[1667]. This prompted a response from Dr Jennifer Armstrong, Medical Director of NHS GGC, dated 23 July 2018. The letter was spoken to by Professor Cuddihy in his evidence. Dr Armstrong sought to reassure Professor Cuddihy that the Incident Management Team set up by NHS GGC would get to the root cause of the infections and that everything that was being done accorded with NHS guidance as well as relevant policies and procedures. Dr Armstrong explained that the March 2018 infection outbreak stemmed from a problem with water whereas the outbreak in May 2018 involved a problem with drains. The letter indicated that the issues with water and drains had been successfully resolved and that Ward 2A had returned to near normality with no new reported cases. Dr Armstrong's assessment of matters did not accord with "the chaos" Professor Cuddihy was witnessing for himself on Ward 2A. It might be thought that the conflict between his view and that of Dr Armstrong was resolved when, two months later, Ward 2A was completely shut.

558. In July 2018, Professor Gibson requested a meeting with Dr Murphy and the microbiology team, at which she expressed her concerns about both infections and antibiotic use. At a follow up meeting in September 2018, Dr Peters put on a presentation which demonstrated a "striking epidemiology" of gram- negative organisms, with notable spikes in 2017 and 2018. While gram-positive bacteria were reducing, the range of gram-negatives and polymicrobial infections were unusual. The presentation also looked at antibiotics and found that Meropenem use per gram-negative had actually

[1666] Bundle 1, p.136
[1667] Professor John Cuddihy, Transcript (26 October 2021 (am)) at Page 83

decreased. [1668]

The Return of adult BMT to Ward 4B

559. On 30 June 2018, the Adult BMT patients returned to Ward 4B from the Beatson[1669] some three years after they had been decanted, due to concerns about the ventilation system[1670].

The 'emergence' of the DMA Canyon L8 Risk Assessments

560. Professor Steele had become aware of the DMA Canyon risk assessment reports in June 2018. Professor Steele stated that Iain Storrar was asked to review the systems at QEUH/RHC. Mr Storrar was getting large volumes of technical information. Within that package were the two DMA reports. It was part of a big data dump. Mr Storrar brought them to his attention. In June 2018, Professor Steele met with Jane Grant, the CEO of NHS GGC, to share this information with her. Jane Grant did not understand what a pre-occupation risk assessment was, nor that there was a technical requirement for one. Ms Grant was concerned about the narrative of the reports. Professor Steele did not seek any assurance from Jane Grant that he would be able to fix the issues. He knew that Ms Grant had brought together expertise within the Board, such as Mr Leiper, who had experience of dealing with risk assessments and closing out action plans. Mr Leiper had done work to improve the governance, understanding, and relevant training for those on site. He had also put in place the appropriate scheme of delegation for managing the water system.[1671]

561. Professor Steele considered that the Board was responsible for carrying out a pre-occupation risk assessment. The building was not ready for a risk assessment before handover because the systems were still being balanced by the construction team.[1672]

[1668] Dr Peters witness statement para 166
[1669] Bundle 1, Document 28, page 120; Bundle 13, Document 16, page 127
[1670] Bundle 13, Document 33, page 258
[1671] Transcript, Professor Steele, pages 4 to 9
[1672] Transcript, Professor Steele, page 8

562. At 8:30am on Saturday 30 June 2018, Dr Inkster was contacted by Dr Armstrong to tell her that she had been alerted to the fact that HFS had found the DMA Canyon risk assessment reports. These reports appear to have been a genuine surprise to both Dr Armstrong and Dr Inkster. Dr Armstrong asked Dr Inkster to assess whether patient safety was a concern due to the findings. She had to collect the reports from Mr Walsh's office in the old Yorkhill Hospital.[1673] On 2 July 2018, Dr Inkster received electronic copies and an SBAR written by Mr Walsh.[1674] After initial suggestions that Dr Inkster was to be involved in the review group, Mr Best was placed in charge, with Mr Walsh as primary contact with HPS and HFS.[1675]

563. The SBAR is dated Friday 29 June 2018 so Mr Walsh as ICM clearly had the 2015 DMA Canyon L8 Risk Assessment at least a day before the lead ICD. The SBAR was updated on 5 July 2018[1676] and then again on 8 August 2018.[1677] The 5 July 2018 SBAR records that an investigation into the increased rates of infection within ward 2A RHC had revealed "…higher than normal levels of bacterial counts in the water supply…Further testing in other clinical areas [had] yielded similar results."

564. Dr Armstrong gave evidence that she had not read either the 2015 or 2017 DMA Canyon L8 Risk Assessments. It was put to her that, despite that, she prepared a presentation to the board about them. Dr Armstrong does not have the expertise to understand the reports. She does have the expertise to know when things are relevant.[1678]. Dr Armstrong explained that you do not assume an expertise you do not have.[1679]

565. Dr Armstrong was referred to her presentation[1680]. She was clear that she had not read the DMA Canyon reports when she made this presentation. At that point they had been talking to the board about the reports. She was trying to

[1673] Dr Inkster, Statement, Para 633
[1674] Bundle 14, Volume 2, Page 251 and Bundle 13, Document 131, Page 291
[1675] Bundle 14, Volume 2, Page 257
[1676] Bundle 4, Document 27, Page 126
[1677] Bundle 4, Document 27, Page 128
[1678] Transcript, Dr Armstrong, page 106 and 107
[1679] Transcript, Dr Armstrong, page 106 and 107
[1680] See Bundle 27, Volume 8, page 58.

make the board members aware this was an issue. She was saying they found this report.[1681]

566. It was put to Dr Armstrong that she had explained that she had not read the reports before making the presentation. Dr Armstrong was asked what that shows about how the board deals with her presentations. If she was not prepared to read the report, they would not ask her any hard questions. Dr Armstrong said there was a briefing note. There was a group set up under the leadership of Jonathan Best. A project team was set up to look at the report. They would then report back to the board. Dr Armstrong accepted the board needed to do crisis management. She was not sure why she ended up doing the presentation. She thought at that stage they only had an interim director of Estates. They were keen to let the board know about the reports. It was not within her remit to talk about the DMA Canyon reports. She did not have the expertise.[1682]

567. Dr Armstrong was asked what she knew about the considerations around implementation. Dr Armstrong explained that there was a contractor report identified, there was a process that looked at the reports, and looked at the actions which were not done and ensured that they were done.[1683]

568. It was put to Dr Armstrong that Tom Walsh gave evidence that he ended up running the process of actioning the DMA Canyon Report. Dr Armstrong thought Tom Walsh went into a team to support it. The team was set up to deal with that as well as looking at other documents. She did not know if he was running it.[1684]

569. Significantly, Dr Inkster is of the view that at the time of the water incident Ms Kane, Mr Powrie and Mr Gallagher would have known about the DMA Canyon reports and yet did not bring it to her attention.[1685] As Dr Inkster put it:

[1681] Transcript, Dr Armstrong, page 107 and 108
[1682] Transcript, Dr Armstrong, page 233 to 236
[1683] Transcript, Dr Armstrong, page 236 and 237
[1684] Transcript, Dr Armstrong, page 237
[1685] Dr Inkster, Transcript, Day 2, Page 189

> "What particularly shocked me was that when I was running the water incident IMT in 2018, I was trying to work out what had happened in this water system and I was trying to generate hypotheses, when in fact, people in the room had had sight of the report and knew exactly what was going on in the water system and didn't say anything about it. If they had spoken up at that point, then we could have implemented relevant control measures very quickly and we could have removed the children much sooner which in turn would have prevented infections. This had an obvious impact on patient safety and care."[1686]

570. It was put to Dr Armstrong that Dr Inkster had said there was a measure of disquiet at sitting in meetings with the very people who may have known about the DMA Canyon reports and should have told her. Dr Armstrong did not think that she would have been in meetings about water with those people. Maybe in the IMT in March 2018. It would have been rare.[1687]

571. Dr Inkster was of the view by July 2018 that it was too late for the reports to make a difference to what was then being done by means of control measures. As she put it "We would have had to have known from the beginning for it to have made much difference."[1688]

572. At some point during the summer of 2018 (date unknown), the water system was placed on the IPC risk register.[1689]

573. From at least June 2018, the Authorised Person (Water) for the whole QEUH Campus was Melville MacMillan.[1690] In August 2018, a number of other Authorised Persons (Water) were trained and appointed. They included Kerr Clarkson.[1691]

574. It was explained by Mr Clarkson that an audit involves providing information to the AE, Mr Kelly, to evidence that the management system complies with L8. In 2018, the information was in physical files, but it is now all on Microsoft Teams which means the audit can be done in less than a day whereas it used

[1686] Dr Inkster, Statement, Para 645
[1687] Transcript, Dr Armstrong, page 105 and 106
[1688] Dr Inkster, Statement, Para 434
[1689] IR, para 8.17.5; 9.8.2
[1690] Kerr Clarkson, Transcript, Page 4
[1691] Kerr Clarkson, Transcript, Page 5

to take 3 or 4 days.[1692] Mr Kelly's evidence was that he had still had bacterial opportunity concerns. It was apparent to him that records were missing, and he could not be confident that tasks had been completed. However, the competency of the Estates staff had improved and there were 20 fewer recommendations in Mr Kelly's July 2018 audit[1693]. Mr Kelly was in post as Authorising Engineer (Water) for the QEUH campus by May 2017.[1694] What appears to be the first Authorising Engineer Audit ("AE Audit") of the QEUH was carried out in May 2017 [1695]

575. By way of further context, by this stage NHS GGC also had available to it a report prepared by Intertek dated 11 July 2018[1696]. They undertook examination of flow straighteners within the hospital and tested for various microbiological pathogens. This report set out findings following an investigation of flow straighteners and other features of the water system. The report prepared by Intertek and the two SBARs are referred to in the appended timeline.

576. In his evidence, Dr Makin made reference to findings in that report, and offered a qualified view that the widespread nature of the results indicating heavy contamination on the used flow straighteners, but not on unused flow straighteners, was indicative of a source of contamination within the water system itself.[1697] Dr Lee was horrified when she discovered flow straighteners were in the QEUH/RHC as she had been involved in the Belfast Pseudomonas outbreak, which ultimately found the flow straighteners were heavily contaminated with millions of Pseudomonas, and in turn resulted in guidance being issued by the Department of Health to avoid their use [1698].

577. A separate issue bearing upon the hot water system related to the performance of the Energy Centre. Matthew Lambert of Innovated Design Solutions was commissioned to prepare a report covering in part the question

[1692] Kerr Clarkson, Transcript, Pages 62-65
[1693] Dennis Kelly, Transcript, page 183
[1694] Kerr Clarkson, Transcript, Page 12
[1695] Bundle 18, Volume 2, Document 112, Page 909 (A44312600)
[1696] Bundle 6, p.632.
[1697] Tom Makin transcript page 84
[1698] Dr Susanne Lee, Transcript, pages 152 and 153

of whether the Energy Centre was enabling the hot water to circulate in the control system at the required temperatures. He found that it was not, and that knock-on effects could in particular be that the control system water was insufficiently hot, when present at the calorifiers/plate heat exchangers, to heat the water circulating in the domestic hot water system to or above the required 60C; which might in turn be compounded by increased drawing-down elsewhere in the domestic hot water system, meaning that it became even more difficult to bring temperatures into the required range.[1699]

Gram-negative infections in August and September 2018

578. On 6 August 2018, the IPCT reverted to standard triggers for reporting cases. This was challenged by HPS on 4 September 2018. Ms Rankin appeared surprised by the decision to revert to standard triggers.[1700] Dr Inkster felt that the IPC management was being too rigid.[1701]

579. In August 2018, HPS produced a draft report on their findings of the investigation into the contaminated water system, entitled "Technical Review Water Management Issues NHS GGC QEUH and RHC". The draft report was produced by Mr Storrar of HFS and Ms Rankin of HPS[1702].

580. The focus of the draft report was on the technical aspects of the water systems within QEUH and explaining and exploring possible mechanisms of contamination of the system. The report concluded that contamination of the water system in the hospital had occurred, either (i) during the construction phase and through lack of adequate maintenance, leading to build up of biofilm and consequently the proliferation of GNB, or (ii) that biofilm had built up in the tap flow straighteners and regressed back into the water system. HPS recommended that NHS GGC implement the recommendations set out in the DMA reports. [1703]

581. At some point the focus by HPS (as seen in the initial report produced in May

[1699] Matthew Lambert, Transcript, page 112-118
[1700] Bundle 27, Volume 8, Document 31, Page 120
[1701] Dr Inkster, Transcript, Day 2, Page 195-196
[1702] Bundle 19, Document 21, Page 174
[1703] Bundle 19, Document 21, Pages 242-245

2018) upon Cupriavidus, Stenotrophomonas and Pseudomonas had been broadened to include "*all gram-negative bacteria which had been identified within the water/drains*"[1704].

582. According to the August 2018 report, between 29 January 2018 and 31 May 2018, there were seventeen patient infection cases identified in Wards 2A/2B[1705]. Little specification of these is provided. It is difficult to reconcile the infection numbers reported by NHS GGC with the HPS report. The report records that there had been no new reported cases since 31 May 2018. It may be that HPS were unaware of the infections which occurred in June 2018 (i.e., after 31 May 2018).

583. HPS reported that an "exact link" between "patient cases and the water system" was said not to have been made.[1706] It is unclear what the authors intended to suggest here, and the report proceeds to hypothesise a link between "environmental and person contamination" and *Enterobacter* within the drains. Professor Jones discussed the issue of an infection link and observed that the rate for positive blood cultures due to gram-positive organisms was lower in NHS GGC. He further noted that Professor Leanord's study showed no commonality between patients and concluded the cases were sporadic[1707]. Dr Valyraki recalled water sampling having been undertaken in PICU and isolates from patients having been sent for typing. She did not consider that a link between the hospital and the environment and the two patients with Pseudomonas aeruginosa was identified[1708].

584. There was widespread contamination of the hot and cold-water systems within QEUH, the hypothesis being that this had occurred at one or more times during installation. Although, ventilation systems were considered during a literature review, the report identifies no investigation of, or consideration being given to, the QEUH ventilation systems at this point[1709].

[1704] Bundle 19, Document 21, Page 179
[1705] Bundle 19, Document 21, Page 179
[1706] Bundle 19, Document 21, Page 329
[1707] Professor Brian Jones, Witness Statement, page 40 (Witness Bundle page 606)
[1708] Dr Kalliopi Valyraki, Witness Statement, page 559 (Witness Bundle)
[1709] Bundle 19, Document 21, Page 174

585. The reprieve was brief. August and early September 2018 saw a further rise in gram-negative infections on Ward 2A. Concerns about the water system persisted. The families of new patients on the ward recalled being warned of issues with the water[1710].

586. On 29 August 2018, thick black and yellow grime was visible in the drains of Ward 2A, following the cleaning regime which had been implemented only 4-6 weeks prior.[1711] The drains continued to be treated[1712]. Drain swabs confirmed the presence of gram-negative bacteria some of which were the same as organisms as isolated in-patient blood[1713]. Swabs taken from the drains revealed: coliforms; Delta acidovarons; Chryseomonas indologenes; Cupriavidus, Pseudomonas aeruginosa, and Klebsiella oxytoca.[1714] Dr Lee claimed that it was likely that due diligence had not been followed in relation to the fitting of the drains given that debris had been found in the water tanks[1715].

587. Between 5 August and 5 September 2018, a further three instances of patient infection with gram-negative bacteria occurred in Ward 2A. All three cases were caused by gram-negative organisms which had been isolated from the drains. Two out of three of the cases matched swabs taken from the drains[1716].

588. There were further issues with the water facilities, such as taps being sealed off in the parent kitchen and the dishwasher being placed out of use[1717]. The news of the water issues was known outwith the RHC. Some witnesses at Glasgow I spoke of staff in other hospitals informing them that there were issues with the water in Glasgow.

589. IPCT continued to be present on the ward. Dyson fans which had been brought in to address the temperature issue were removed on the instructions of the

[1710] Cameron Gough, Transcript, at Page 94.
[1711] Bundle 1, Document 35, Page 149
[1712] Annemarie Kirkpatrick, Witness Statement, at Para. 61
[1713] Bundle 1, Document 35, Page 149
[1714] Bundle 1, Document 35, Page 149
[1715] Dr Susanne Lee, Witness Statement, Page 50 (Witness Bundle page 79)
[1716] Bundle 1, Document 35, Page 149
[1717] Annemarie Kirkpatrick, Witness Statement, Para. 61.

IPCT[1718]. A meeting took place between parents and the IPCT to discuss protocols and cleaning[1719]. Parents were instructed not to pour drinks down wash hand basins.

590. Formal communication from hospital management about the environmental issues on the ward was described by many witnesses at Glasgow I as non-existent. Some recalled informal discussions with nurses and with domestic staff and among parents[1720]. One witness recalled expressing concerns about the water to a junior doctor and a response along the lines of, "If this was my child, I wouldn't put her near the water either"[1721].

591. Further infections were reported during this period. One witness recalled a point in time when all five patients within the TCT unit were unwell; and two who were preparing to go home had contracted infections[1722]. Ms Ferguson's son contracted another line infection on 4 August 2018. At a meeting with Professor Gibson and Dr Theresa Inkster (microbiologist), Ms Ferguson was informed that her son had contracted an environmental bug called Stenotrophomonas. Ms Ritchie explained that Stenotrophomonas maltophilia is a gram-negative bacteria commonly found in environments such as soil, water and plants. It is an opportunistic pathogen primarily affecting individuals with weakened immune systems. It is resistant to many common antibiotics, making infections difficult to treat and often requiring specialised antibiotics like trimethoprim-sulfamethoxazole. It has an ability to thrive in hospital environments, which makes it a significant cause of hospital acquired infections, posing a considerable risk in health care settings, particularly to vulnerable patient populations[1723].

592. In early September 2018, Mr and Mrs Gough's son experienced a life-threatening line infection which was subsequently confirmed to be Serratia Marcescens.[1724] Dr Valyraki recalled that water samples were taken from

[1718] Annemarie Kirkpatrick, Transcript, Page 41
[1719] Aneeka Sohrab, Transcript, Page 22
[1720] Colette Gough, Transcript, at Page 22
[1721] Charmaine Lacock, Transcript, at Page 94
[1722] Annemarie Kirkpatrick, Transcript, at Para. 60
[1723] Lisa Ritchie, Witness Statement, Page 7
[1724] Cameron Gough, Witness Statement, at Paras. 136; 158.

Theatre 8 and that the Serratia isolate was sent for typing. In her view, it seemed that there was no link between the hospital and the patient[1725].

593. The IMT was reconvened on 5 September 2018[1726]. The IMT's hypothesis was that contaminated drains were again the source of infections[1727]. At the same time, on around 6 September 2018, Mr and Mrs Gallagher's son developed an infection subsequently confirmed to be Stenotrophomonas. Mrs Gallagher recalled a troubling discussion with a nurse on Ward 2A. Mrs Gallagher observed a lot of activity around Room 23 and was aware that a child who had been in that room had recently died. On enquiring whether there was an issue with the room, the nurse's response was "you are closer than you know"[1728]. By 13 September, the IMT considered that duty of candour discussions were mandated in relation to some patients[1729].

594. Mr Redfern understood that by this stage POUFs were suspected as having caused an unintended risk of infection; the proximity between the sink and the filter caused a splashing effect[1730]. The SBAR of 17 August 2018 prepared by HPS[1731] agreed the hypothesis to be as Mr Redfern described.

595. Mr Redfern went further than this, however. He said that his understanding was that a combination of contaminated drains and splashing gave rise to a risk of infection[1732]. He understood that a requirement to replace the sinks arose from this. Other possible causes were considered, for example, dripping water from chilled beams[1733]. Both clinicians and IPC expressed concerns that the IMT was no closer to identifying a source of the problem or a resolution for it[1734].

596. Concern among nursing staff by this stage had reached the point that they had contacted their union for advice on continuing to treat patients in an

[1725] Dr Kalliopi Valyraki, Witness Statement, Page 560 (Witness Bundle)
[1726] IMT Minute 5 September 2019, Bundle 1, Document 35, Page 149
[1727] Bundle 1, Document 35, Page 149
[1728] Denise Gallagher, Transcript, at Para 58
[1729] Bundle 1, Document 37, Page 160
[1730] Mr Redfern, Transcript, Pages 57-58
[1731] Bundle 3, Document 11, Page 79
[1732] Mr Redfern, Transcript, Page 59
[1733] Professor Gibson, Transcript, Page 123
[1734] Bundle 1, Document 836, Page 156

environment considered to be unsafe[1735]. On 17 September 2018, Mr and Mrs Gough met with their son's consultant and Dr Inkster to discuss their son's infection with Serratia. Dr Inkster confirmed that the infection was linked to a bug in the drains and that their son was one of six children who contracted infections that weekend.[1736] This meeting is the subject of criticism of Dr Inkster by NHS GGC[1737] in which it was suggested that Dr Inkster had mislead the Goughs because the IMT Minute of 10 September 2018[1738] had reported that Serratia had not been found in the drains. Dr Inkster was taken to the minute of the IMT of 13 September 2018[1739] and by revealing a small amount of the redacted text it was confirmed that at that date (and therefore before her meeting with Mr and Mrs Gough on 17 September 2018) the fact of their son's Serratia blood test result had been recorded in those IMT minutes alongside the fact that the drains had been swabbed in his room and were positive for Serratia. Dr Inkster did not mislead Mr and Mrs Gough, her statements to them are entirely consistent with the terms of the IMT Minute. Dr Inkster explained that she said what she said because she "was being open and transparent with the family about the investigation, as per duty of candour and as per GMC guidance for a doctor".[1740] It is submitted that this was an entirely manufactured and baseless criticism of Dr Inkster by NHS GGC.

597. By this IMT there appear to have been some 22 cases of gram-negative infections associated with the issues on Wards 2A/B. Dr Inkster appears to have said at the 13 September 2018 IMT that duty of candour discussions were required with some of the families involved[1741].

598. At a meeting with Professor Gibson, Mr Redfern and Dr Inkster, Mrs Gallagher was also informed that there was a problem with the drains on

[1735] Bundle 1, Pages 169 and 173
[1736] Cameron Gough, Witness Statement, Paras. 158-160, Page.79.
[1737] Bundle 25, Document 62, Page 1262 at Page 1271 (Paras. 37 to 39)
[1738] Bundle 1, Document, 36, Page 154
[1739] Bundle 1, Document 37, Page 160
[1740] Dr Inkster, Transcript, Day 2, Page 136-140
[1741] Bundle 1, Document 37, Page 132

Ward 2A[1742].

599. Yet again, NHS GGC does not accept that there was a link between the environment and infections in September 2018 or indeed that the environment presented any risk[1743].

600. Around this time the IMT began to consider the possibility of decanting patients out of Wards 2A and 2B. Whatever view NHS GGC may now claim to have about the risk to patients, the evidence given by Glasgow II witnesses about the rationale for the proposed decant was clear: the ward environment was thought to present a risk of infection to patients. The source of the problem had not been identified, control measures had been unsuccessful and there was a need to get to the bottom of the problem[1744]. It bears notice that reports of infection continued right up to the closure of Ward 2A on 26 September 2018. Charmaine Lacock and Senga Crighton recalled their children experiencing infections in the days leading up to the closure[1745].

601. Professor Gibson had an additional concern at this point: that the IMT did not have the expertise to resolve a problem of this complexity; no-one had seen a problem like this before[1746]. Clinicians were unanimous in their evidence that, as of September 2018, they were so concerned that the unit did not provide a safe environment for their patients, they wanted to leave it.

602. In August 2018, the Technical Water Group continued to consider the options to treat the contaminated water system. Shock dosing of the system would be difficult to deliver given the extent of disruption to the hospital, so the plan was to be for continual dosing, with increasing amounts of Chlorine Dioxide being injected into the system and the results monitored over a 3-month period. If the results were not within limits, a risk assessment would be required[1747]. Testing of flow straighteners showed that biofilm had built up after a

[1742] Denise Gallagher, Witness Statement, Para 69
[1743]NHS GGC's submission in response to Counsel to the Inquiry's Closing Submission in respect of Glasgow 2.
[1744] Professor Gibson, Transcript, Page 125
[1745] Charmaine Lacock, Witness Statement, at Para. 41; Senga Crighton, Witness Statement, at Para. 58.
[1746] Professor Gibson, Transcript, Page 128
[1747] Bundle 10, Document 18, Page 73

month[1748].

603. Mr Purdon recalled that the remains of a sponge and stones were in the raw water tanks[1749]. Dr Lee claimed that the leaving of debris in water tanks and a failure to achieve target temperatures was indicative of the installation contractors' poor understanding, lack of supervision and lack of training[1750]. Bulk storage tanks also had positive results which were attributed to environmental conditions. Namely, the presence of cockroaches, fungal odour, rooms not being ventilated, water ingress, and dried algae present on the floor**.** The area was to be disinfected, repainted with anti-fungal paint, repairs made, and pest control called in, with testing to be done once the work had been completed[1751]. Air sampling in the tank room found fungi. A leak was found in one tank and one manhole cover, which was repaired. HEPA filters had been installed[1752].

604. A timeline was agreed for the Chlorine Dioxide system. Shock dosing of the water supply was ruled out after discussion with clinicians due to smell, effects on pipework and the need to decant the hospital. The Technical Water Group noted that it might take 3 years for Chlorine Dioxide to be effective, but as the pipework was new it would not provide any resistance to Chlorine Dioxide so the effect may be quicker[1753].

605. Discussion was held on the need for work in Ward 2A/2B with regard to pipework, drains, and ventilation. The potential cause of the issues was discussed and whether they were being caused by water/drains/ventilation, a combination or simple hand washing. A decant of the ward would allow full investigation to take place. It was noted that only haemato-oncology (and not BMT) patients were affected even though biofilm was found in both areas.[1754]

606. Prior to September 2018, IPCT had initially been visiting Ward 2A daily, but

[1748] Bundle 10, Document 1, page 72
[1749] Colin Purdon, Witness Statement, Page 52
[1750] Dr Susanne Lee, Witness Statement, Page 17 (Witness Bundle page 46)
[1751] Bundle 10, Document 22, Page 83
[1752] Bundle 10, Document 23, Page 88
[1753] Bundle 10, Document 24, Page 93
[1754] Bundle 10, Document 24, Page 95

those visits had reduced to twice weekly, following the implementation of environmental and equipment cleaning regimes. There were less people and clutter on the ward and both environmental and domestic audits had scored well[1755].

607. In light of the drain swab testing results and patient infections, the IMT carried out further investigation of drains and trough sinks within the hospital. The investigations revealed that only some drains and trough sinks were affected. The issue was thought to be confined to the RHC only (and not the QEUH)[1756].

The decant of Ward 2A patients to Wards 6A and 4B.

608. Mr Redfern provided evidence about the circumstances of the decision to decant and the decision to move to Wards 4B and 6A[1757]. He explained that in September 2018, there was a continuing concern about the risk of infection and an appreciation that the work required to investigate and resolve it required the removal of patients from the ward[1758]. Dr Kennedy gave evidence that the decision to decant Ward 2A was made in September 2018 by the executive group, CEO, Jane Grant, Dr Jennifer Armstrong and the COO, Grant Archibald[1759].

609. The Inquiry heard evidence from Ms Rankin that the primary driver for the decant of children in ward 2A was the emerging issues with the drains which had black effluent and there were POUFs in place increasing the splash zone risk [1760]. She ultimately accepted that if it was not safe in Ward 2A then it would not be safe in Ward 6A, as they both had the same water and ventilation systems[1761] (although she did highlight that Ward 6A did not have the same issue with the visibly dirty drains and emphasised that the decant

[1755] Bundle 1, Document 36, Page 162
[1756] Bundle 1, Document 36, Page 155
[1757] James Redfern, Witness Statement, Para 87
[1758] James Redfern, Transcript, Page 89
[1759] Dr Iain Kennedy, Transcript, page 19
[1760] Annette Rankin, Transcript, page 99
[1761] Annette Rankin, Transcript, Page 100

was intended to be very short-term)[1762].

610. Regarding the decant of ward 2A, it was put to Dr Armstrong that the Inquiry had heard evidence from Mr Redfern about his options paper. Dr Armstrong was asked who made the decision to decant the Schiehallion patients to the main building. Dr Armstrong explained that for a decision of that magnitude, it was proper for the IMT members to come to meet senior members of the executive team on 14 September and set out their rationale. They were looking for approval of the decision. At this point in time, Dr Armstrong described her relationship with Dr Inkster as reasonable.[1763]

611. There was a clear line of evidence at Glasgow 1 that Ward 6A was considered unsuited to the provision of paediatric cancer care, and that the move to Ward 6A was therefore detrimental in itself[1764].

612. None of the Glasgow 2 witnesses suggested that Ward 6A was anything other than a sub-optimal solution for housing Schiehallion Unit patients. Rather, it was intended as a short-term solution to an urgent problem. As Professor Gibson indicated, the challenges presented by Ward 6A were considerable[1765]. Inpatient and day care services were combined on a single ward. Available space was compromised. Rooms had to be used flexibly. The TCT Unit was lost. There was no dedicated playroom. Young patients had to share lifts with adult patients (until a dedicated lift was allocated).

IMT of 14 September 2018

613. At an IMT meeting on Friday 14 September 2018, a two-phase contingency plan was discussed[1766]. Phase one involved immediate restrictions on admission to Ward 2A, with patients being diverted, on a risk assessed basis, either to district hospitals or to the haemato-oncology unit in Edinburgh. Phase two was a decant of the patients in Wards 2A and 2B. Mr Redfern, as General Manager, had responsibility for operational aspects of the decant. He said that

[1762] Annette Rankin, Transcript, Page 101
[1763] Dr Armstrong, Transcript, Page 108 and 109, and 114 and 115
[1764] Molly Cuddihy, Transcript, Page 10
[1765] Professor Brenda Gibson, Transcript, Page 137
[1766] Bundle 1, Document 38, Page 164

his two objectives were to maintain the service for (i) the general paediatric haemato-oncology and day care service and (ii) the BMT national service for Scotland. The IMT recommended a decant to Executive Management

614. The IMT recommended the reinstatement of weekly cleaning of sinks and shower drains. Patient pathways were recorded to/from theatres with a view to identifying sinks/drains in those areas for review. A drain survey and a ventilation survey were commissioned.

615. On the afternoon of 14 September 2018, a meeting took place chaired by the Chief Executive, Ms Grant and attendees (by reference to a note by Mr Walsh[1767]) included Mr Walsh, Dr Inkster, Mr Hill, Ms Devine, Ms Kane and Mr Redfern. This executive group decided not to proceed with the decant at that time, but ordered various steps including examination of all drains in the RHC for black biofilm, a definition of works to be completed in Wards 2A/2B over a four week decant, the preparation of a risk assessment for a four week decant, and discussion about optimising access to BMT services for both adult and children's services during the decant. Although not recorded on that note as an attendee, Professor Steele appears to have been present according to his email to Mr Powrie on 16 September 2018.[1768] Dr Armstrong considered that for a decision of that magnitude, it was proper for the IMT members to meet the executive team on 14 September 2018 and set out their rationale. On 14 September 2018, the board did not approve the decant.[1769]

616. Over the weekend of 15- 16 September 2018, Dr Inkster was in contact with Mr Hoffman by email.[1770] Amongst the issues they debated was whether droplets or aerosols from the drains were the possible source of infection. Dr Inkster recalled having a different opinion from Mr Hoffman who considered droplets were possible source (as a lot of energy is required for aerosols) while Dr Inkster thought it was aerosols or droplets. She noted that Mr Hoffman had not seen the drains which were not normal drains by any means. She did agree with Mr Hoffman that whatever is in the drains should be on a

[1767] Bundle 27, Volume 7, Document 8, Page 241
[1768] Bundle 12, Document 133, Page 938
[1769] Transcript, Dr Armstrong, page 108 and 109
[1770] Bundle 14, Volume 1, Document 91 at pages 140-148

one way free-flowing route and nothing coming back into the sink. It was put to Dr Inkster that she did not tell the IMT about Mr Hoffman's advice at the next meeting on 17 September 2018 when she reported other parts of her discussion by email over the weekend.[1771] Her response was that Mr Hoffman hadn't seen the condition of the drains and that it was for her as an ICD to assess the advice from Mr Hoffman as an engineer and to focus on what to target in terms of routes of transmission.[1772]

617. In her Statement Ms Rankin explained that prior to the decant the Scottish Government had asked if there were any options to move the patients out with the hospital/area temporarily and requested assurances that the children were safe.[1773]

618. The impacts on nursing staff in particular were considerable. Nurses experienced increased scrutiny and workloads accompanied by intense periods of anxiety and low morale. However, one thing was clear; patient safety and care remained at the heart of their concerns. This can be seen most acutely in September 2018 when nurses approached their professional unions out of a concern that the environment in which they were treating patients was unsafe. As was explained by Ms Sommerville, nurses were not confident that patient safety was being adhered to or that, by September 2018, the safety concerns had been resolved[1774].

619. As can be seen from the repeated attempts to escalate safety concerns to senior management / board level, clinicians had a similar concern about treating patients in an environment believed to present a risk of infection to patients[1775].

620. Ms Sommerville identified an impact that was particularly distressing for nurses working in this field. At the outset of her evidence, Ms Sommerville explained that nurses often choose to practise in paediatric haemato-oncology because

[1771] Bundle 11, Document 39 and Page 171
[1772] Dr Inkster, Transcript, Day 1, Page 195-200
[1773] Ms Rankin, Witness Statement, Page 27
[1774] Emma Sommerville, Transcript, Pages 52 and 58
[1775] Professor Brenda Gibson, Witness Statement, Para 187

of the opportunity to build relationships with patients and families as they progress through their journeys[1776]. These events jeopardised those relationships. Nurses, patients and families were placed into a stressful and pressurised environment. Nurses were on the frontline not only of implementing many of the IPC measures but of attempting to explain them to families (often without clear answers to give them). The focus of discussions with families shifted from care and treatment to issuing warnings and instructions to families about infection control measures. Relationships and trust suffered as a result[1777].

621. The impact on patients and families who were diverted to other centres is obvious. Families who had just been hit with a diagnosis of cancer were told that they had to travel and 'set up' in an unfamiliar city, sometimes hundreds of miles away from home and family support.

622. The impact on the BMT programme was particularly acute. Witnesses explained the care with which a transplant is planned[1778]. The transplant is planned around a short window of opportunity. If that window is missed, a donor may be lost, or a patient may no longer be in a position to receive the transplant. Dr Ewins recalled that the doubts about the safety of the BMT rooms in 2015 placed her in a position where she had to weigh up the risks of missing the opportunity to carry out a transplant on a very sick child against carrying out that transplant in a potentially unsafe environment. Clinicians felt that they should not have had to factor the safety of the built hospital environment into the already very finely balanced decision making surrounding a transplant; they expected that they would be provided with a safe environment in which to treat patients[1779].

623. Families are well aware of the risks involved in transplants; they too were impacted by knowledge that a delay or disrupted plan could have dire

[1776] Emma Sommerville, Transcript, Page 20
[1777] Emma Sommerville, Transcript, Page 60
[1778] Dr Anna Maria Ewins, Supplementary Witness Statement; Emma Sommerville, Transcript, Page 51
[1779] Dr Anna Maria Ewins, Supplementary Witness Statement, Paras 20 and 26

consequences[1780]. But while clinicians might know that a delay is reasonably safe in a particular case, that perspective does not translate easily to an anxious family[1781].

IMT of 17 September 2018

624. The IMT met again on 17 September 2018 and were told by Kevin Hill that the executive group had not approved the decant.[1782] In evidence, the then lead ICN Susan Dodd explained that the staff in Ward 2A were extremely anxious about the safety of patients and did not feel assured that patients were safe.[1783] A statement from Professor Gibson was read out at the start of the IMT:

> "I am in London today, but there will be Clinical representation at today's IMT. I understand that the IMT 's recommendations from Friday were not approved at the meeting with Board members and that no decision was taken. I hope that I am expressing this correctly.
>
> There has been another positive blood culture over the weekend which is extremely worrying. As doctors, we are often called on to give expert opinion/advice in Court. We would start off by stating our qualifications and why we might be considered experts in that field. At the IMT we should adhere to the same principle. Can you please assure me that any advice taken or given on how to proceed with this worrying situation involves individuals who would be considered expert in the field of ventilation and drainage. We should only be following expert advice."

625. Clinicians were concerned about the decision, and a paper was sent to the Director for Women and Children requesting that the decant go ahead.

626. Sandra Devine was challenged about not supporting Dr Inkster (i.e. allying herself with Dr Armstrong against Dr Inkster, clinicians and HPS).[1784] She disputed that characterisation. Everyone was trying to work together.

[1780] Professor Brenda Gibson, Transcript, Page 56
[1781] Professor Brenda Gibson, Transcript, Page 59
[1782] IMT Minute, Item 6, Bundle 1, Document 39, Page 171; James Redfern, Transcript, Page 106
[1783] Susan Dodd, Transcript, Page 48
[1784] Ms Devine, Transcript, Page 128

627. Concern among nursing staff by this stage had reached the point that they had contacted their union for advice on continuing to treat patients in an environment considered to be unsafe and this was reported in an IMT Minute[1785].

628. The IMT continued to try to understand and manage the outbreak. The minute records action points related to drain cleaning, requirement for further water samples and a reminder that patient wash bowls are single use only. The IMT remained of the view that a decant was necessary as there remained issues that could not be addressed whilst the ward was occupied and to find a permanent solution to the issues around the water and drains.

629. On 17 September 2018, Mr Redfern prepared an options paper for the decant[1786]. Options under consideration were an alternative ward within the RHC, an adult ward in the QEUH, a mobile unit constructed on the QEUH campus, a ward in the Beatson, transfer/diversion of patients to an alternative paediatric service within Scotland, and a transfer/diversion to an alternative paediatric service outwith Scotland. It was recalled by Ms Rankin that one of the preferred options was to have an on-site unit brought in (assemble HEPA filtered portacabins) but the time to procure it was fairly significant[1787].

630. Various criteria were applied to the decision making. A move to the Beatson was ruled out on the basis that it would involve separating paediatric patients from other paediatric services within the RHC (PICU, theatres, hospital at night service). A move to another site was not deemed practical. A modular build was ruled out as a result of an estimated construction time of 12 weeks (at a time when it was thought the decant would be short term) and concerns about patient pathways.[1788]

631. A move to a ward within the RHC was discounted due to concerns about the safety of the environment within the RHC for vulnerable patients. Mr Redfern's evidence was that the QEUH and RHC shared a single water supply. The

[1785] Bundle 1, Pages 169 and 173
[1786] Jamie Redfern, Witness Statement, Paras. 88-90; Bundle 6, Document 13, Page 38.
[1787] Annette Rankin, Transcript, page 101
[1788] James Redfern, Transcript, Page 108

reason the environment in the RHC was thought unsafe was because of the risk of splashing from the sinks. The sinks in the QEUH were of a different type; it was therefore thought the QEUH would provide a safer environment[1789].

632. It was agreed that the preferred option was to decant BMT patients to Ward 4B; the adult BMT service would free up a number of rooms. The remainder of Ward 2A and 2B patients would be moved to an adult ward in the QEUH.

633. On Tuesday 18 September 2018 a meeting called the Water Review Meeting made the decision to decant the patients from Ward 2A.[1790] Confusingly and inaccurately the Oversight Board thought the "Technical Water Group" ("TWG") which appears to have been its name for the WTG that made the decant decision. [1791] After a few moments when some witnesses seemed to think the decision was made by the IMT it seems now beyond doubt that the decision was made by this Water Review Meeting at 8am on the Tuesday before the IMT of that day. The decision makers were Ms Grant - Chief Executive, Dr Armstrong - Medical Director, Mr Archibald - Chief Officer (Acute), Mr Best - Director Acute Services, Mr Leiper - Lead Project Manager, Mr Walsh – ICM, and Ms Kane - Interim Director of PPFM. The meeting "agreed that due to the bio film being found in some sink areas within this ward and the patient demographic it would be appropriate to decant this patient group to another area in order to carry out investigatory works and get to the bottom of this problem".[1792] Two points should be noted. Firstly, there was no person present with any expertise in IPC (Mr Walsh not being an ICD or ICN) and secondly these senior NHS GGC officials made their decision in part because of a recognition that biofilm was an issue.

634. Dr Armstrong appeared to have forgotten the role of the Water Review Meeting on 18 September 2018 in approving the decant. It was not mentioned to her. It was put to Dr Armstrong that on 14 September 2018 there had been an IMT which was followed up by the meeting that afternoon where it was noted that no decision was made. On the morning of the 18th, the note of the

[1789] Bundle 6, Document 13, Page 38
[1790] Bundle 19, Document 35, Page 614
[1791] Bundle 6, Document 37, Page 945
[1792] Bundle 19, Document 35, Page 614

Water Review Meeting showed the decision was made and reported to the IMT on the 18th. She accepted that this must be right.[1793]

635. By 19 September 2018, Ward 6A in the QEUH had been identified as the ward to which patients would move. Ward 6A was a general ward; its patients were moved to Gartnavel General Hospital[1794]. Ward 6A was not designed for haemato-oncology patients and did not benefit from any form of specialist ventilation.

636. The decant itself required considerable planning; it was a huge logistical operation. Ms Rodgers and Mr Redfern (and others) provided detailed evidence about this in their witness statements and oral evidence[1795]. In summary, witnesses understood that a number of steps were taken to prepare Ward 6A to receive Ward 2A/2B patients. Witnesses recalled being assured that following preparatory works done by IPC and Estates, Ward 6A would be a safe environment for the decanted patients. Ward 4B and 6A in the adult hospital were inspected by F&E and IPCT and made ready for patients. Steps taken included: repairs being made, full deep cleans (including of the drains and vents), and POUF being fitted to taps and showers and portable HEPA filters were in place.[1796]. No instructions were given on where to place or how to use the portable HEPA filters.[1797] The move took place on 26 September 2018[1798]. Wards 2A/2B were closed. BMT patients were transferred to Ward 4B in the QEUH (adult BMT unit). All other patients were moved to Ward 6A QEUH. Lead ICN for the RHC, Susan Dodd, explained that she felt Ward 6A was a safe place to decant the Ward 2A children as it was the best option, but she was nervous it was not absolutely safe due to water and drain issues.[1799]

637. Dr Inkster opined that she was comfortable with the move from Ward 2A to Ward 6A in the circumstances even though it had no HEPA filters and positive pressure. However, there were mitigating factors since ward 6A did not have

[1793] Dr Armstrong, Transcript, Pages 112 and 113
[1794] Bundle 1, Document 41, Page 182
[1795] Jamie Redfern, Witness Statement, Paras 94-96
[1796] Susan Dodd, Transcript, Pages 50-54
[1797] Susan Dodd, Transcript, Page 53
[1798] Jennifer Rodgers, Witness Statement, Paras 183-210
[1799] Susan Dodd, Transcript, Page 51-52

the trough sinks and did not appear to have the same issue with drains.[1800]

The Journey to Ward 6A

638. Concerns about the new arrangement began with the route which patients were required to take to reach Ward 6A. Although Ward 6A could have been accessed through the RHC, patients and families had been advised in September 2018 that they should use the QEUH Discharge Lounge entrance (due to risks posed by ongoing cladding works). The Discharge Lounge entrance was described as an unpleasant place. It was a congregation point for smokers (and, as one witness indicated, individuals with addiction issues[1801]). Molly Cuddihy recalled that, as a vulnerable patient undergoing treatment for cancer, passing through a crowd of smokers was an unsettling experience.[1802]

639. Once into the QEUH building, patients had to use the public lifts to travel to Ward 6A (although it was understood that latterly a dedicated lift arrangement was put in place). The public lifts were a source of some anxiety for patients and families who were hyper-aware of the need for cleanliness. Use of these lifts required immunocompromised children to mix with the general adult population of the QEUH[1803]. The lifts themselves were described as being unclean.

Staffing in Ward 6A/4B after the decant

640. Ms Rodgers spoke of a diseconomy of scale in the provision of nursing services[1804] on Wards 6A and 4B. Schiehallion nurses providing care for transplant patients within an adult unit (Ward 4B) had to stay with their patients, meaning that they were not available to provide other care on Ward 6A[1805]. Additional resource was put in place, drawing from the paediatric haemato-oncology nurse group or from other paediatrically trained nurses. Staffing had

[1800] Dr Inkster, Transcript, Day 1, pages 207-208
[1801] Transcript of evidence of David Campbell, at p.41.
[1802] Witness statement of Molly Cuddihy, para. 171.
[1803] See, for example, the transcript of evidence of Cameron Gough, at p.142; transcript of evidence of David Campbell, at p.43.
[1804] Witness statement of Jennifer Rodgers, paras. 222 – 228; transcript of evidence, at p.88.
[1805] Transcript of evidence of Dr Dermot Murphy, p.50. See also, the transcript of evidence of Professor Gibson, p.140.

to be adjusted to enable the Hospital at Night team (a team of doctors and advanced nurse practitioners covering the night shift) to provide that service safely to Ward 6A patients[1806]. Concern about this diseconomy of scale was significant enough that it was put on the ward risk register[1807].

Adjacency to other paediatric services

641. Although the Schiehallion Unit moved to Ward 6A, all of the other paediatric services remained in the RHC including the clinics, the pharmacy, dental service, surgical wards, and PICU. Patients and families were physically remote from the paediatric services located in the RHC building. Some witnesses expressed a general concern about the length of time it took to travel between the two buildings[1808].

642. A striking illustration of the concern about the distance between Ward 6A and the RHC was provided by Mrs Kirkpatrick[1809]. Following admission to Ward 6A on 24 December 2018, Stevie-Jo's condition deteriorated, requiring rapid transfer to the PICU. The PICU crash team, consisting of at least 6 people (doctors, nurses and porters), ran from the PICU in the RHC to Ward 6A carrying a significant amount of equipment. They were exhausted upon reaching Ward 6A, and Mrs Kirkpatrick doubted that they would, physically, be in a position to perform resuscitation if required. There followed a discussion about how to effect the transfer from Ward 6A to PICU and what to do in the event that Stevie-Jo crashed and required resuscitation en route.

643. Initially, the plan was to use the dedicated (adult) patient lifts, but the PICU team's access card did not work on lifts in the QEUH. A decision was then made to use the public lifts which required the entire group, now consisting of around 10 people, to take a public route through the QEUH to reach the RHC. It was thus necessary for the team to discuss and plan what to do in the event of Stevie Jo crashing in a public area. All of this discussion took place in the presence of Mrs Kirkpatrick and Stevie-Jo. Mrs Kirkpatrick observed that the

[1806] Transcript of evidence of Professor Brenda Gibson, p.139.
[1807] Witness statement of Emma Sommerville, para. 22.
[1808] See, for example, the transcript of evidence of Aneeka Sohrab, at p.47.
[1809] Transcript of evidence of Annemarie Kirkpatrick, at p.46

PICU team were frustrated and concerned about the situation. Unsurprisingly, Mrs Kirkpatrick described this as a terrifying experience[1810].

644. Ward 6A is located on one of the 'wings' of the QEUH. Mr Gough spoke to its layout under reference to a diagram provided by NHS GGC[1811]. The day care unit (formerly Ward 2B) was situated at the far end of a long straight corridor which housed inpatient bedrooms. The location of day care was a further source of anxiety for families. Children attending day care with suspected infections or viruses such as Chickenpox were required to pass through the inpatient section of the ward which housed immunocompromised patients.

645. Ward 6A was understood to be a general adult ward comprising single en-suite bedrooms. It had no specialist ventilation or VAC rooms. Paediatric patients requiring bone marrow transplants were allocated rooms on the adult BMT Unit on Ward 4B. This in itself was a sub-optimal solution. Ward 4B had limited space and was an adult ward which was not designed to cater for children or to accommodate their families[1812]. Similarly, Ward 6A was not designed to cater for children and families. Rooms did not contain a pull-down bed; camp beds were provided but were uncomfortable and took up space in the room during the day. Although a minor point, the décor of the rooms was dull and not designed for children.

646. The paediatric haemato-oncology service is a "user service"; it uses other services within the hospital as opposed to being a provider of services. When in Wards 6A and 4B, it was geographically removed from the other services it used frequently, for example, radiology, gastroenterology, nephrology and theatre. It was more time-consuming for clinicians from those disciplines to travel to the adult hospital.

647. On a linked point, Dr Murphy described another impact of the loss of adjacency to paediatric colleagues. An important benefit of location in the RHC had been the ability of Schiehallion clinicians to have short informal discussions with paediatric colleagues of other disciplines regarding patient care. Of particular

[1810] Witness statement of Annemarie Kirkpatrick, para. 139.
[1811] Bundle 2, p.41.
[1812] Transcript of evidence of Mark Bisset, at p.54.

importance was the ability to secure early involvement of PICU colleagues. Dr Murphy explained that modern PICU medicine promotes early involvement of ITU staff instituting measures designed to prevent patients from having to go to PICU. Whilst PICU staff could still travel to Ward 6A to perform that care, the ease with which Schiehallion staff could obtain informal 'check-ins' was reduced[1813].

648. Professor Gibson and Dr Ewins expressed a nervousness about the patient pathway between Wards 6A and 4B and the PICU[1814]. The physical distance to PICU was increased, as was the travel time. Mitigations were put in place to minimise this risk. A SOP was created[1815]. The route was carefully planned and tested before the decant[1816]. Directional signage was installed. Dr Murphy's view was that mitigations reduced the risk to an acceptable level; had the risk not been so reduced, the ward would not have moved[1817]. This did not mean that anxiety was about this matter was also removed.

The patient experience on Ward 6A

649. The Glasgow 1 witnesses gave powerful evidence about the impacts on patients of being situated on Ward 6A. Witnesses were grateful that Schiehallion staff moved with the Unit. However, in many other respects the Schiehallion experience did not compare to that evident when the Unit was located in RHC. Absent from Ward 6A were the parents' kitchen, playroom and TCT Unit. The loss of these facilities was felt keenly by patients and families. Parents lost the practical advantages of a kitchen facility on the ward and the ability to feed their children as needed. Travelling to the central atrium of the QEUH to heat food up in a communal microwave was not viewed as a realistic or safe option. Parents could ask nurses for a glass of water or cup of tea but were reluctant to add to their workloads[1818]. Significantly, parents lost

[1813] Transcript of evidence of Dr Dermot Murphy, p.52.
[1814] Transcript of evidence of Professor Brenda Gibson, pp.138; 142; witness statement of Dr Anna Maria Ewins, para. 30.
[1815] Witness statement of Jennifer Rodgers, paras. 189 - 191.
[1816] See, for example, witness statement of Emma Sommerville, para. 173.
[1817] Transcript of evidence of Dr Dermot Murphy, p.57.
[1818] Transcript of evidence of Denise Gallagher – nurses went from looking after 20 patients to 50 people including patients and their families (at p.50).

the important support network formed through interactions with other parents. They lost their respite[1819].

650. Children lost the use of the playroom[1820]. A table and chairs were set up in a corridor, but this rather inadequate solution was considered a health and safety hazard. Parents were concerned about the infection risk posed by-passing day-care patients and about obstruction caused in the corridor[1821]. Play leaders had no storage and were spread too thinly in their attempts to provide an individual service to patients in their rooms. From a physical perspective, some parents were concerned that the increased time spent in bedrooms was detrimental to the battle against muscle atrophy faced by these patients. Mrs Kirkpatrick recalled suggesting to nurses that a frequently empty meeting room could be turned into a playroom but was told that would not be possible because it was used as a meeting room for doctors[1822].

651. Children lost access to the Medicinema and Radio Lollipop located in the RHC[1823]. Charity access to the ward was restricted which meant that patients and families lost out on many of the important services provided by charities[1824].

652. The TCT unit was lost entirely. Patients were not allowed into each other's rooms. Without access to a common room, teenage patients were, in effect, "confined to barracks". The teenage support network was lost. Molly Cuddihy recalled that, despite his best efforts, the TCT support co-ordinator was unable to operate effectively in this new set up.[1825]

653. Overall witnesses painted a bleak picture of life on Ward 6A. Stevie-Jo Kirkpatrick described it as a depressing and lonely place[1826]. Molly Cuddihy said that, for her, being "sick" is a mindset and Ward 6A put her in that

[1819] Transcript of evidence of Alfie Rawson, at p.23.
[1820] Although it is understood that a playroom may now have been installed.
[1821] Transcript of evidence of Aneeka Sohrab, at p.48.
[1822] Transcript of evidence of Annemarie Kirkpatrick, p.33.
[1823] Transcript of evidence of David Campbell, at p.50.
[1824] Transcript of evidence of Colette Gough, (pm) at p.63.
[1825] Transcript of evidence of Molly Cuddihy, (pm) at p.10.
[1826] Witness statement of Stevie-Jo Kirkpatrick at para. 52.

mindset. It was on Ward 6A that she "gave in" to a feeding tube[1827]. Parents recounted a similar effect on their younger children who were stuck in their rooms with limited entertainment and few opportunities for socialising. Children became "institutionalised"[1828] in a ward that was described as feeling like a "prison"[1829]. The means of normalising cancer were gone; children became defined by illness; they changed from being "kids with cancer" to being "cancer kids"[1830].

654. Professor Gibson identified two factors that might have contributed to feelings of bleakness and institutionalisation described by patients. The first is that due to the concern about infection, the flow of patient visitors was reduced. The second is that from early 2020, the COVID-19 pandemic resulted in restrictions on the ward[1831]. Although unaware of the concerns at the time, Dr Murphy could understand why patients and families on Ward 6A might have felt isolated and alone[1832]. Ms Sommerville recalled a patient telling her that she had struggled with her mental health while on Ward 6A but that improved after the return to Ward 2A.[1833]

Environmental concerns on Ward 6A

655. The evidence indicated that the impacts on patients and families of the environmental concerns on Ward 6A were of a similar nature to those described in relation to Ward 2A. They are not repeated in detail here.

656. At a practical level Glasgow 1 witnesses recalled building works and room cleaning leading to capacity issues. This led to displacement to other Wards where patients and families experienced the consequences of the absence of the "Schiehallion Umbrella"[1834]. Witnesses perceived that the use of source isolation was prevalent on Ward 6A.

[1827] Transcript of evidence of Molly Cuddihy, (pm) at p.16.
[1828] Transcript of evidence of Colette Gough, (pm) at p.12.
[1829] Transcript of evidence of Denise Gallagher, p.56.
[1830] Transcript of evidence of Cameron Gough, at p.145.
[1831] Transcript of evidence of Professor Brenda Gibson, p.144.
[1832] Transcript of evidence of Dr Dermot Murphy, p.64.
[1833] Transcript of evidence of Emma Sommerville, p.62.
[1834] See, for example, the transcript of evidence of Cameron Gough, at p.86.

657. Families experienced disruption caused by the closure of Ward 6A in January 2019. The consequences for newly diagnosed patients who could not access the Schiehallion Unit in the autumn of 2019 are presently unknown.

658. What little communication there was in relation to the environmental issues did not reassure patients and families. Witnesses were understandably doubtful of reassurances. They had been assured that Ward 6A would be a safer environment than Ward 2A for their children, an assurance contradicted by their experiences. As discussed below, the continued disconnect between communication and experience further fractured trust between witnesses and hospital management. It also strained relationships between parents and clinical staff who could not provide the answers they sought[1835].

659. Overall, the impression was of an increasingly fraught and anxious situation which brought some parents close to breaking point.

660. The IMT meetings continued during October 2018.[1836]

661. On 1 October 2018, Professor Steele took up his post a Director of Estates

662. On 5 November 2018 the TWG provided the IMT with an outline scope of the work to be undertaken in Wards 2A/2B to address the contamination of the water system. The water supply was to be dosed with Chlorine Dioxide CD), taps and wash hand basins were to be changed, and elements of plumbing were to be replaced.[1837]

663. After the Ward 2A cohort had been decanted into ward 6A, Daryl Connor carried out an options appraisal. There were concerns that the location was not ideal. The objective was' to make it as good as it could be without complete rebuild, without complete plant replacement'[1838] This was sent to Alan Gallacher, Colin Purdon and Professor Steele.

[1835] See, for example, the evidence of Charmaine Lacock who recalled difficult discussions with clinical staff but acknowledged that her anger was borne of frustration at the lack of communication from hospital management.
[1836] Bundle 1, Documents 45-48
[1837] Bundle 1, Document 45, Page 199
[1838] Mr Connor, Transcript, Page 41

664. Mr Powrie recalled that he did not have all assets tagged and thought that all the assets were eventually tagged towards the end of the contract warranty period in 2017[1839]. Mr Gallacher accepted that it was 2019 when the QEUH/RHC had a fully compliant asset system[1840].

665. In late-October 2018, a PAG was held[1841], followed by an IMT[1842] to investigate 5 cases of Pseudomonas aeruginosa isolated from patients who had all had appendectomies in the same theatre during October 2018.

666. Sampling of drains identified Pseudomonas aeruginosa growth in the anaesthetic trough in the theatre. It does not appear that the hypothesis in these investigations was the water or ventilation systems as a whole.

667. An SBAR was used to brief the Chair of NHS GGC, Mr Brown, on or about 13 November 2018.[1843]. It opens by recognising that "23 cases have been linked to the water supply" and on its second page states:

> "A risk assessment was completed by the Senior Management Team in the Royal Hospital for Children and a recommendation was made to the GGC Board Directors who approved this recommendation, i.e. to move patients from 2A/B to suitable accommodation in the adult building."

668. The Ward 2A 'Water Incident' IMT was closed on at its final meeting on 30 November 2018 in the absence of any further cases.[1844]

December 2018

669. By December 2018, it was clear to patients and families that the decant would be for more than the two months initially indicated. While one witness could understand that the decant to Ward 6A was intended as only a temporary move, he was surprised that more was not done to improve the situation once it

[1839] Ian Powrie, Transcript, Page 46
[1840] Alan Gallacher, Transcript, Page 21
[1841] Bundle 2, Document 44, Page 115
[1842] Bundle 1, Documents 49 and 52
[1843] Bundle 4, Document 32, Page 133
[1844] Bundle 1, Document 54, Page 241

became obvious that it would require to provide a longer-term situation[1845].

670. Work was underway in Wards 2A/2B. The design of the ventilation system for all patient rooms (except BMT rooms) stipulated that the rooms were to be neutral/slightly negative pressure. Ventilation in all rooms (other than BMT rooms) ought to be positive pressure. An option appraisal was requested from a specialist ventilation engineer on what is required 'to rectify and bring the system up to standard'[1846].

671. In November 2019, there was media coverage of information which had been shared with Anas Sarwar about water being contaminated prior to the hospital opening, and a request by Ms Freeman to ask anyone with information to come forward. As a result of this Dr Inkster and Peters jointly wrote to her with a list of issues. This led to a meeting on 5th December 2019 with Jeane Freeman, Fiona McQueen, Lesley Shepherd and Drs Peter and Redding. Dr Inkster met with them subsequently.[1847]

672. On 10 December 2018, the minutes of the ACGC meeting record that the investigation into the 'water issues' in Ward 2A "*uncovered a ventilation issue which may require significant infrastructure work and prolong the current decant arrangements*"[1848].

673. The Chlorine Dioxide dosing went live for RHC on 10 November 2018 and in QEUH on 10 December 2018. A further 8 dosed lines to be installed in each of the 8 domestic hot water zones by 28 January 2019 with the works anticipated to concluded by February 2019[1849]. It was around this time, that Mr Kelly began to feel more comfortable about the water system[1850]. Chlorine Dioxide dosing continues to the present day.

674. Professor Leanord helpfully confirmed that a Chlorine Dioxide process does encourage some chlorine resistant organisms. It would reduce the bioburden

[1845] Transcript of evidence of Cameron Gough, at p.163.
[1846] Bundle 27, Volume 1, Page 43
[1847] Dr Peters, Witness Statement, Paras 235-237
[1848] ACGC Meeting Minutes, dated 10 December 2018 (A36407723)
[1849] Bundle 10, Document 36, Page 137
[1850] Dennis Kelly, Transcript, p207

but there could be others left which could infect patients. [1851] Dr Inkster was of the view that Chlorine Dioxide dosing would take a long time to reach an adequate concentration at the outlets, and also Chlorine Dioxide might slough off the upper layers, but it was never going to completely clear the biofilm that was well established. In Summer 2018, she confirmed there was a diversity of microorganisms in the water; bacteria she had never seen before and was having to look up.[1852]

675. In the winter of 2018, there were not the same drainage issues in Ward 6A as there had been in Ward 2A, but a regular drain cleaning program was in place to mitigate the risk.[1853] Mr Wilson stated that he did not believe that routine drain cleaning took place until 2018. He understood the reason why no drain cleaning had been done was because the act of cleaning the drains creates a risk of contaminating the surrounding area of the sink[1854].

676. Further upgrading work was identified and it was agreed that it would take 12 months to complete[1855]. Karen Connelly recalled finding mould behind panels in en-suites and discussion of the use of the wrong kind of board.[1856] Work was required to replace one of the air handling units, which would mean that the ward would be out of use for 'some months'[1857]. Dr Lee commented on the risk of using the en-suites with their design issues resulting in blocked drains etc. She told the Inquiry that the patient was in effect paddling in drain water which means they are exposed to the bugs, so there is a direct risk of infection if they have any cuts[1858].

HPS/HFS reports

677. On 20 December 2018, HPS produced a report entitled "*Summary of Incident and Findings of NHS GGC QEUH/RHC*" (HPS Summary report).[1859] The

[1851] Alistair Leanord, Transcript, Page 43
[1852] Dr Inkster, Transcript, Day 1, Pages 179-181
[1853] Dr Inkster, Transcript, Day 2, Page 31
[1854] Andrew Wilson, Witness Statement, page 81
[1855] Bundle 13, Document 19, Page 148
[1856] Transcript of the evidence of Karen Connelly p33
[1857] Bundle 6, Document 37, Page 962
[1858] Dr Susanne Lee, Transcript, page 160
[1859] Bundle 7, Document 2, Page 32

report is largely a summary of the HPS element of the Draft report which was produced by HPS and HFS in August 2018. It was produced in light of concerns expressed by NHS GGC about the length of the former report. The report's recommendations refer to those made in the August 2018 HFS/HPS report: namely to implement the recommendations of the 2015 and 2017 DMA Canyon reports. The HPS Summary Report advised that by 26 September 2018, NHS GGC had reported to it 23 cases of BSI relative to 11 different organisms potentially linked to water contamination, covering the period from 29 January 2018. Appendix 1 of the Summary report includes a timeline of cases.[1860] It is difficult to reconcile this timeline with the cases which are reported by NHS GGC. The timeline does not appear to include the patient infection with Cupriavidus bacteraemia, as well as patient infections with Stenotrophomonas maltophilia and Pseudomonas in June and September 2018. The report states that testing had confirmed widespread contamination of the water system and described the 23 cases as "*probable linked cases of bloodstream infections associated with wards 2A/2B RHC*". Under reference to infections detected/reported in/up to April 2018, HPS said that "*all cases [were] considered to be linked to the water system*". Between April and June 10 cases (5 Enterobacter, 3 mixed Gram-Negatives, 2 Stenotrophomonas maltophilia) had been reported. These organisms were also said to be present in drain samples within 2A/B. In addition to the organisms linked to water and to infections, there was "*evidence of fungal growth in the water system*". Impacts from infections linked to the environment could be stated: "This incident has resulted in a number of children requiring additional intervention and some delays in chemotherapy treatment, however, there was no associated mortality." The HPS Summary Report was published in February 2019.

678. A report entitled the HFS Water Management Issues Technical Review was published in March 2019[1861] Mr McLaughlan explained who had participated with Dr Geraldine O'Brien the HFS head of research (and the person responsible for Scribe). As set out in that report, the issue, in summary, was

[1860] Bundle 7, Document 2 at page 52
[1861] Bundle 7, Document 4, Page 70

that NHS GGC had found organisms in the water system linked to bloodstream infections associated with Ward 2A. After extensive sampling it became apparent the organisms were widespread and not limited to 2A.[1862] The report covered information up to 25th July 2018 and listed the issues which had been found. It did not read very positively. Mr McLaughlan was surprised by what he found[1863]. The conclusion was best practice had not been followed in a number of stages, from design through installation to handover and subsequent operation and maintenance Each may have impacted on the water system. The report listed some of the causes, contamination of pipe work during installation, water being in the system in August 2014 without evidence of proper handling and issues over water temperature control. It also noted the use of Sanosil at less than effective concentrations[1864]. Interestingly, the same report recorded a view on the involvement of Infection Control in building handover. As Mr McLaughlan put it,'….there's no conclusion as to whether Infection Control were invited and didn't engage for one reason or another, or whether they weren't aware of the role they had to play…..the only conclusion is the lack of evidence of adequate involvement' One interesting conclusion – given the membership of the Group which authored the Report[1865]- was that evidence which might have indicated widespread contamination was available in 2016, but missed due to the emphasis on critical areas."

The Ventilation system in Wards 2A and 2B

679. In January 2018, HPS issued a report entitled "*Ward 2B NHS GG&C SBAR Final HPS/HFS January 2018*". The report advised NHS GGC on the appropriate design to provide protective isolation to hematopoietic stem cell transplantation (HSCT) patients, namely HEPA filtered, positively pressured patient rooms with a pressure cascade system, designed to comply with SHTM 03-01 Ventilation for healthcare premises Part A - Design and validation (2009). The use of PPVL rooms for immunocompromised patients

[1862] Transcript of the evidence of Eddie Mclaughlin p45
[1863] Transcript of evidence of Eddie Mclaughlin p46
[1864] Transcript of evidence of Eddie Mclaughlin p61
[1865] Transcript of evidence of Eddie Mclaughlin p73

was considered unsuitable by HPS/HFS.[1866] On 19 February 2018, a meeting took place between NHS GGC Estates, HPS, and HFS to discuss the PPVL rooms.

680. Dr Peters described that Malcolm Thomas, the inventor of this concept, was there. She was able to ask him whether, if the extract was not in the right place, that invalidated the concept. He agreed but was taking it forward with Ian Powrie (who had always agreed with her on this point).[1867]

681. In addition to the very significant concerns around the water and drainage system, the September 2018 IMT also had concerns about the general build-up of dust despite increased cleaning, particularly around vents and chilled beams. The fact that the rate of air change per hour (ACH) was only 3 in the RHC (as opposed to 6 in the QEUH) might explain the levels of dust present. Air sampling had been undertaken on chilled beams, the results of which were reported to be negative.[1868] Mrs Barclay recalled seeing 'dust' blowing out of an air vent onto a patient bedroom[1869]. Annemarie and Stevie-Jo Kirkpatrick recalled being told by the TCT support co-ordinator of an issue with ventilation on the ward[1870]. Professor Cuddihy recounted learning of the discovery of significant levels of mould in the en-suite bathrooms caused by failure in the seals between the wall and floor[1871].

682. Investigations can be seen as having taken place after the decant. Certainly, by 11 October, the IMT understood that a report into the ventilation system had been commissioned and was awaited[1872].

683. Mr Redfern recalled that, in the course of an IMT discussion about the length of the decant to Ward 6A, he was told by Professor Steele to prepare for a longer period because the ventilation system on Wards 2A/2B was going to be replaced[1873]. This IMT must been after may have been after the Estates

[1866] Bundle 3, Document 8, Page 62
[1867] Dr Peters, Transcript, Day 2, Pages 78-70 and Statement Paras. 155-157
[1868] Bundle 1, Document 36, Page 154
[1869] Witness statement of Sharon Barclay at paras. 40 and 48.
[1870] Witness statement of Annemarie Kirkpatrick, para. 129.
[1871] Witness statement of Professor John Cuddihy at para. 246.
[1872] Bundle 1, p.204.
[1873] Mr Redfern, Transcript, Page 119.

SBAR of 12 November 2018 relating to ventilation on Ward 2A/2B[1874] as that seems to be when Professor Steele would have learned how long the task would take.

684. Mr Redfern did not have a good recollection of being made aware of the reason for the replacement[1875]. He initially indicated that his impression had been that the system was being upgraded. On closer questioning, it transpired that Mr Redfern had not seen, or at least did not recall seeing, the SBAR dated 12 November 2018 relating to ventilation on Ward 2A/2B[1876]. On reviewing it, Mr Redfern accepted that he would construe its contents as indicating that the ventilation system posed a potential risk to patients and that such a risk, once identified, required to be addressed[1877]. Melanie Hutton, who was at that time a Clinical Service Manager, and who was involved in the capital project board for the refurbishment of Ward 2A and 2B gave clear evidence on this issue: there was a requirement to replace the ventilation system because it presented a risk to patients[1878].

685. Reports were prepared in October 2018 by Innovated Design Solutions in relation to Wards 2A and 2B[1879]. In summary, the evidence indicates that the ventilation system on Wards 2A was completely replaced as part of a substantial refurbishment of both 2A and 2B costing in the region of £11 – 12 million. Witnesses spoke to an understanding that the ventilation system is now one of the safest ventilation systems in the world[1880].

686. Mr Lambert of IDS gave evidence during Glasgow III. He was a highly experienced M&E engineer. Having explained some of the challenges in terms of duct sizing and roof void space if one was trying to increase ACH, he explained that his initial instructions came from Mary Anne Kane and Alan Gallacher. They knew that the air change rate was less than 6, but did not

[1874] Bundle 4, p.132.
[1875] Transcript of evidence of James Redfern, p.120.
[1876] Bundle 4, p.132.
[1877] Transcript of evidence of James Redfern, p.127.
[1878] Transcript of evidence of Melanie Hutton, p.60.
[1879] Bundle 6 at p674 & p656 respectively.
[1880] For example, the transcript of evidence of: Professor Brenda Gibson, p.192; Dr Dermot Murphy, transcript of evidence p.133.

know what they were and wanted to look at the viability of increasing to six. Thereafter, he dealt with Ian Powrie.[1881]

687. During his analysis, other concerns about the suitability of the environment arose and he was asked to include them. He dealt with Ward 2B first. Although he did not have access to contract documents, he thought the' probable design intent' was of low air change rates and air movement towards the patient rather than away from the patient. This was wrong for immuno-compromised patients.[1882] He was testing against SHTM 03-01. He had to piece together information from inadequate drawings and a Zutec system, which was difficult to access.

688. For his Ward 2B Report[1883], he got the understanding of the group of patients from Zutec. He thought what was required was 10 air changes and positive pressure. The actual air change rates were 'abnormally low' even for a general ward, where he would have expected 6. In addition, he found only one Air Handling Unit, which would be a problem in the case of a breakdown. Further, the units had not been designed to provide spare capacity (should have been 125% according to ZUTEC), which was important once the system became dirty.[1884]

689. Chilled beam units were also not inherently designed to allow for increase in air change rate. The perforated inlets were hard to clean. The air change rate was about 2.8. Thermal wheels had been used which had some risk of allowing cross contamination. In his view, 'any potential risk associated with cross-contamination and ultimately patient safety should be completely mitigated wherever it's possible to do so.[1885] So, if you've got another heat exchanger, although-- albeit slightly less efficient, then it should have been considered or installed.'[1886] He could not know recall why he was not asked to

[1881] Transcript of the evidence of Matthew Lambert page 13
[1882] Transcript of the evidence of Matthew Lambert page 18
[1883] Bundle 6, Doc 33
[1884] Transcript at p 30
[1885] Dr Inkster accepted that her understanding of Thermal Wheels is limited but wondered if the thermal wheels may have been a cause of gastrointestinal outbreaks in 2017 relating to rotavirus, astrovirus, and vancomycin-resistant Enterococci (Transcript, Day 2, Page 30)
[1886] Transcript of evidence of Matthew Lambert p46

completely redo the system in 2B, other than it wasn't deemed viable from the NHS GGC perspective. One would have needed to rip out all the ductwork.

690. Mr Lambert thought that much in his 2B report was not a surprise when he sent it[1887] but he got no immediate reaction. He got on with his 2A report[1888]. He understood it was for Teenage Cancer Trust and BMT (but BMT was excluded from his report). Similar things were found. The air change rate was about 2.8.

691. There was one different issue with Ward 2A. The ventilation system for Ward 2A also served other areas in the hospital. Dirty air was being sent back to the AHU giving a risk of cross contamination[1889]. Everywhere else, the air from dirty areas was sent outside. Otherwise, Ward 2A was similar to Ward 2B. Mr Lambert was concerned. He said in his report,[1890]'…. the original accommodation design philosophy was not intended for use by patients with immune response impairment/deficiency. On the contrary, the existing ventilation strategy would appear only likely to promote the risks associated with uncontrolled ingress of infectious aerosols into patient areas." He maintained that view in his oral evidence.[1891] It was influenced by the way the extract in the en-suite was set up. He thought that significant modification or replacement of the system would be necessary, with 10 pascals of positive pressure, pressure monitoring, and with resilience built in.

692. Asked what reception he got to his even less complimentary Ward 2A report, NHS GGC (Mary Anne Kane, Alan Gallacher, Ian Powrie) wanted him to look at redesigning the systems. He then produced an outline for what should be provided in 2A.[1892] Essentially, positive pressure single rooms with 10 air changes and at 10 pascals, with resilience, and sealed rooms with HEPA filtration (which he had not found in ward 2A). Also, a pressurised entrance lobby.

[1887] Transcript of evidence of Matthew Lambert p 60
[1888] Bundle 6 p 674
[1889] Transcript p 69
[1890] Bundle 6 p 676
[1891] Transcript p 73
[1892] Bundle 27, vol 1, p43

693. Mr Lambert remained involved with the project up to tender stage, but then his remit was stopped, and others took it forward.

694. The Ward 2A project basically involved taking out what was there and putting in something new.[1893] There was an addendum to his brief of 10th December 2018 which was dated 15th March 2019[1894] and which related to Ward 2B. That was essentially,' leaving as much of the system in as you could, to try and improve it, and air cleanliness and air change rates without making large alterations to the existing system.' Principally, that involved centralised HEPA filtration, though there was also the problem of un-sealed rooms. Some more technical improvements were also considered.

695. Mr Lambert was asked about the M&E Clarification Log [1895] and a subsequent document.[1896] Asked whether that material, in his view, provided justification for moving to an air change rate of three, his clear view was that it did not.[1897]

696. In the weeks following the decant, nurses and consultants adjusted to the new way of life on Wards 6A and 4B. In December 2018, they were informed that the decant was being extended, likely for 12 months, to allow for the works to the ventilation system on Wards 2A and 2B. During that period, there were no significant concerns about infection on Ward 6A. That period of relative calm proved to be short lived.

Ventilation in Ward 4C

697. This issue straddles the winter of 2018/2019 effectively ending from the point of view of this narrative with the SBAR of Dr Inkster in July 2019[1898], but begins when, as Dr Inkster, explains in her statement[1899], after the Innovated Design Solutions Report and HPS Situational Assessment[1900], in late 2018 she decided to look at the ventilation in other high risk areas to ascertain

[1893] Transcript of evidence of Matthew Lambert p102
[1894] Bundle 27, vol 1 p 50
[1895] Bundle 16 p 1662
[1896] Bundle 17 p 2859
[1897] Transcript at p 122
[1898] Bundle 4, Document 37, Page 156
[1899] Dr Inkster, Statement, Para 372-378 (Hearing Bundle Page 125)
[1900] Bundle 7, Document 5, Page 194

whether the 'abnormal strategy' in Ward 2A was replicated elsewhere. One of the first areas she turned to was Ward 4C. Dr Inkster was pressed about whether this was in fact the same abnormal strategy as that exposed by the 26 May 2016 email from Mr Powrie[1901], but maintained that it was a different abnormality.[1902] The Inquiry Team understands that the ventilation system in Ward 4C is and always was that of a general ward, and therefore it is the same abnormality, but perhaps given the information available to her at the time Dr Inkster could not appreciate that.[1903]

698. Dr Inkster had a meeting with Dr Hart on 7 December 2018 and followed it with an email to Mr Powrie and others.[1904] She makes it clear that in light of the patient group the specification for this ward should be at least 6 air changes, positive pressure at 6Pa+, and HEPA filtered rooms. Dr Hart had earlier confirmed[1905] that the ward 'constantly' has patients with a recent history of neutropenia.[1906] Dr Inkster explained that, for Ward 4C, 6 air changes was the minimum acceptable specification, that it could not be done with the existing plant but could be done with a new plant room like Ward 2A.[1907]

699. Dr Inkster then had a meeting with Professor Steele on 10 December 2018 which was initially a meeting to catch up on water issues but moved onto ventilation. She explained that she told the Professor that she was working on this SBAR for Ward 4C and would be sending it to him by email. Her evidence was that he responded that he didn't want things in email because that meant they are out there. He suggested to her to print the SBAR off and hand it to him.[1908] Dr Inkster said there was no note of the meeting, but that she had prepared a reflective note where this response was recorded[1909].

700. Professor Steele confirmed that he was not aware of the air change rate and

[1901] Bundle 20, Document 68, Page 1495
[1902] Dr Inkster, Transcript, Day 2, Pages 36-38
[1903] PPP 12. Paras 6.109 to 6.133 – Bundle 26, Document 2, Page 44
[1904] Bundle 27, Volume 7, Document 20, Page 378
[1905] Bundle 27, Volume 7, Document 19 at page 375
[1906] Dr Inkster, Transcript, Day 2, Pages 32-33
[1907] Dr Inkster, Transcript, Day 2, Page 34
[1908] Dr Inkster, Transcript, Day 2, Page 38
[1909] Bundle 14, Volume 2, Document 103, Page 258 at 259

noted that Dr Inkster also said that she was concerned about Ward 4C.[1910] Regarding Ward 4C, Professor Steele gave evidence that HSE served an enforcement notice, which was challenged by NHS GGC, and which was currently sisted[1911]. Professor Steele confirmed that the ventilation system in Ward 4C is presently as built, with some improvements such as the installation of ceiling mounted HEPA units in the en-suites that scrub air already in the room. Professor Steele noted that a risk assessment was done as part of the HSE investigation into Ward 4C. However, he was not aware of a risk assessment for the whole system.[1912]

701. This meeting would go onto become a particular issue between Dr Inkster, Professor Steele and ultimately Dr Armstrong. In his statement he maintained that he did not recall the incident[1913], although Professor Steele accepted in evidence in the Inquiry that he did say that he did not want things in email because that meant they are out there albeit it "was a quick remark and said in a jocular manner.[1914]

702. Subsequently, on 24 January 2019, there was a site visit from the Health and Safety Executive attended by Drs Inkster and Peters, Tom Steele, Colin Purdon, Karen Connolly. Drs Inkster and Peters reported their long-standing concerns about the ventilation, and Tom Steele stated he had commissioned a review to explore why the hospital wasn't built to specification [1915]On 8 January 2019, Dr Inkster pressed Mr Walsh on timescales for a feasibility study for the ventilation in Ward 4C. The SBAR of July 2019[1916] is circulated to the Specialist Ventilation Group on 5 July 2019 at its request[1917]. An email to HPS on 30 December 2019 contains the following details from Dr Inkster:

[1910] Professor Steele, Transcript, Page 27
[1911] Professor Steele, Transcript, Page 35
[1912] Professor Steele, Transcript, Page 36 to 38
[1913] Professor Steele, Statement, Question 201, Hearing Bundle page 622
[1914] Professor Steele, Transcript, Page 32
[1915] Dr Peters witness statement paragraph 187
[1916] Bundle 4, Document 37, Page 156
[1917] Bundle 27, Volume 7, Document 21, Page 380

> "These patients were originally due to be placed in ward 48, John Hood devised the specification. They were moved to a general medical ward following the late decision to move BMT patients across from the BOC into ward 48.
>
> The response from GGC is not making any sense to me. The same haematology patient population in the north of the city is housed in a fully HEPA filtered ward (87, BOC) We also plan to upgrade ward 2A housing the paediatric equivalent haematology patients. The SHTM is very clear on the requirements for neutropenic rooms.
>
> Also worth noting that ward 4B is not fully HEPA filtered as stated in the media response. Only the rooms are. The corridor and other spaces are not, hence why we have had to implement a door closing policy. This was a risk highlighted by the HPS SBAR and microbiologists at the time of the upgrade in 2017. Air quality results from regular monitoring reflect this."

703. Dr Inkster's SBAR remains unimplemented, and the ward is the subject of an HSE investigation.

704. In 2019 and 2020, Daryl Conner was asked to do a similar options appraisal for Ward 4C to the one he had done for Ward 6A while operating as a decant. He accepted as a description of Ward 4C that it was 'less than completely compliant'.[1918] Rebuild was one of the options not pursued. What was done, was moderate rebalancing to achieve positive pressure, the installation of ceiling mounted HEPA filters, checks for dampness in en suites, ward corridor grills replaced by standard ceiling tiles, secondary filtration in the air handling units upgraded from F7 to F9, end electrical load circuits lifted to optimise air change rates.

Source Isolation in the Schiehallion Unit

705. Source isolation was a regular feature of the evidence at Glasgow 1. It was described as a procedure which would be implemented when there was a particular concern about the risk of – or from – infection: i.e., whether posed by one patient to others on the ward or vice versa or perhaps where there was thought to be a general risk of cross-contamination on the ward (for example,

[1918] Mr Connor, Transcript, Page 43

in the event of a viral outbreak). Patients placed "in source" were required to remain in their bedrooms for days or weeks at a time. Although parents could leave the room, they were not permitted to use communal facilities such as the parents' kitchen. Visiting was restricted. It was, in effect, a mini-lockdown[1919].

706. Among the Glasgow 1 witnesses, there was a consistent perception that the use of source isolation increased during 2017 and 2018. Witness 6 and Mrs Kirkpatrick recalled that, although source isolation was a feature when their children were in Yorkhill, it was more prevalent on Ward 2A. Some witnesses recalled periods when almost the whole ward was "in source"[1920].

707. That patients were 'in source' more frequently than would ordinarily be the case was the perception of many witnesses. What was also evident was that many parents and children became wearied by the use of source isolation. It made an already challenging situation worse. Children and parents alike felt isolated. Some Glasgow 1 witnesses painted a bleak picture of being stuck in a dark, hot and stuffy room, with no means to entertain their sick child (because there was no working television or Wi-Fi).

708. Parents were particularly frustrated at what they perceived to be a lack of communication in relation to source isolation. Some recalled that stickers were simply placed on bedroom doors with no further explanation. This added further to mounting anxiety about what was happening on the ward. Parents did not know if the use of source isolation was linked to suspected environmental infections, part of a new infection control protocol or the specific needs of their child.

Year: 2019

Introduction to 2019

709. In October 2018, Drs Redding and Peters had spoken to Anas Sarwar MSP, leader of Scottish Labour, and had thereafter written to Jeane Freeman, regarding their concerns regarding the culture at NHS GGC. This led to a

[1919] See, for example, witness statement of Stevie-Jo Kirkpatrick at paras. 19, 25.
[1920] Witness statement of Witness 6, para. 46.

meeting with Ms Freeman arranged by Mr Sarwar which took place in January 2019 at which they discussed their concerns. At the meeting, Dr Peters provided documentation to Ms Freeman for the Independent Review. [1921]

710. On 8 January 2019, Professor Gibson wrote to Dr Armstrong and Mr Redfern expressing concern about the safety of the environment in the Schiehallion Unit[1922]. Given that this email was sent just under two months before the start of the 'Water Incident' IMT the concerns expressed about use of prophylaxis, the use of portable HEPA filters, mould on walls is poignant; particularly the observation that "we are concerned we have moved to an even less safe environment.

Cryptococcus Neoformans Infections

711. On 18 December 2018[1923], a PAG took place following the identification of the second of two cases of Cryptococcus neoformans (CN) on 17 December 2018. An IMT was set up and met for the first time on 20 December 2018[1924].

712. In [redacted] 2018, a patient on Ward 6A died. Some witnesses at Glasgow I understood this death to be linked to a Cryptococcus infection[1925]. Witnesses at Glasgow I expressed an understanding that Cryptococcus could be linked to pigeon droppings (a link acknowledged in Ms Grant's letter dated 23 January 2019)[1926]. On 30 December 2018, Mrs Gallagher's son was admitted with a line infection (Staphylococcus Epidermidis)[1927]. Molly and John Cuddihy recall medical staff advising them that, although Molly had undergone major surgery, she would be safer recuperating at home than in Ward 6A[1928].

713. Dr Sastry explained that Cryptococcus is an invasive fungus transmitted through the inhalation of spores which causes Cryptococcosis, an infection

[1921] Dr Peters witness statement para 189-191
[1922] Bundle 14, Volume 2, Document 104, Page 286
[1923] Bundle 2, Document 45, Page 118
[1924] Bundle 1, Document 55, Page 245
[1925] See, for example, the witness statement of Professor John Cuddihy at para. 117; the witness statement of Charmaine Lacock at para. 94.
[1926] Letter attached to the witness statement of Colette Gough at CG/04.
[1927] Witness statement of Denise Gallagher at para. 40.
[1928] Witness statement of Professor John Cuddihy at paras. 129 to 131; transcript of evidence (26 October 2021 (pm)) at p.38.

commonly associated with immuno-suppressed individuals. The fungus is usually found in soil contaminated by bird droppings, decaying wood, and in tree hollows. It is a rare infection in humans and extremely rare in children. The Ward 6A Cryptococcus infection was the first time he had seen it in his 28 years of experience in the UK[1929].

714. Professor Jones considered the hypothesis of airborne spread via of Cryptococcus derived from pigeon guano via the ventilation system to be improbable. In his view, if Cryptococcus was being spread in this way, then one would have expected to see many more cases[1930].

715. Professor Steele gave evidence that all the Air Handling Units were sealed and the only air that comes into them is from outside. In relation to the one-inch hole in the AHU input damper, Professor Steele noted that this is an aperture. Within the hole there's a spindle to open and shut it. That chamber is sealed before it goes into ductwork. In respect of HPV cleaning in the ductwork, he had spoken to Mr Hoffmann about using HPV, and he suggested that it would not be appropriate.

716. Darryl Conner had never heard of Cryptococcus neoformans and nor had Karen Connelly under whose remit pest control lay. Mr Connor was asked to do a survey of level 12 plantrooms for signs of pigeon droppings. Mr MacMillan commented in his evidence "I didn't have any concern; it was just a dead pigeon". This apparent lack of concern about dead pigeons found in the QEUH/RHC suggests there was a degree of complacency amongst Estates staff about the contamination threat posed by pigeon infestation, and certainly no awareness of the link between pigeons and microorganisms such as Cryptococcus[1931].

717. As stated, an IMT was established on 20 December 2018[1932]. Mr Purdon found dealing with the pigeons very challenging as they had a lot of roosting

[1929] Dr Jairam Sastry, Witness Statement, page 1 (Witness Bundle page 539)
[1930] Professor Brian Jones, Witness Statement, page 33 (Witness Bundle page 599)
[1931] Melville MacMillan, Transcript, pages 180 and 181
[1932] Bundle 1, p 245.

points and many ways into the hospital buildings and roof spaces[1933]. He conceded that the hospital had a widespread pigeon issue[1934] and accepted there was no record system in place to flag that there was a wider pigeon problem[1935]. He further conceded that with the benefit of hindsight the number of pest control call-outs should have been pulled together[1936].While Karen Connelly explained the systems in place and accepted the issue was clearly long-standing, she also accepted that neither system nor individual scrutiny was in place to have an overview of pigeon infestation activity and its consequences.[1937] When pest control consultants talked of a health and safety risk, that was a reference to the risk of slipping.

718. In Mr Brattey's view, pigeons were everywhere at the QEUH/RHC. He acknowledged in evidence that he understood they presented an infection risk and recalled colleagues notifying him there were pigeon droppings in the plant rooms, and that he had to regularly get the pest company out to deal with them. He remarked that there were horrendous pigeon droppings on the roof of the RHC where the extract ventilation systems were located[1938]. Affected plant rooms contained air handling units, water pumps, distribution pipework and electrical cables[1939]. It was conceded by Mr Brattey that he did not mention the pigeon issues to Infection Control, because he assumed that everyone on the QEUH/RHC site knew about the pigeon issues[1940]. Professor Dancer recalled in her evidence that during her visit on 14 February 2019, the plant room she visited was littered with debris and there was evidence of pests[1941].

719. Professor Steele was not aware of birds roosting in plant rooms. In connection with the twelfth floor, he was not aware of pigeons and detritus in those plant rooms at the time and had only seen pictures for first time as part of the

[1933] Colin Purdon, Transcript, page 85 (page 165 PDF)
[1934] Colin Purdon, Transcript, page 88 (page 171 PDF)
[1935] Colin Purdon, Transcript, page 90 (page 176 PDF)
[1936] Colin Purdon, Transcript, Page 89
[1937] Karen Connelly, Transcript, pp 34 etc
[1938] David Brattey, Transcript, Pages 101-102
[1939] David Brattey, Transcript, Page 103
[1940] David Brattey, Transcript, Page 113
[1941] Prof Stephanie Dancer, Transcript, Page 56

Inquiry.

720. Professor Steele explained that NHS GGC used a third-party supplier to clean the plant rooms, and that those suppliers took images to corroborate their work as part of their report. It was put to Professor Steele that the Inquiry had heard evidence from people, including Dr Inkster, that they didn't know there was problem with pigeons on the site and hadn't been in the plant rooms. He stated that he hadn't heard of Cryptococcus until 2018, but that Pigeons are endemic in the environment.

721. Dr Inkster felt she was not being given all the information in relation to pigeon infestation and pigeon droppings in the plantrooms. She had a report from GP Environmental with a detailed description of pigeon guano in the plantrooms, but with no photographs, which she considered odd. She considered that she was not being given all the available information by colleagues in Estates. As she put it ""I found it really difficult to believe there were no photos available of what was described as an infestation and that took 11 men to clean up." It was explained by Dr Inkster that the presence of the ventilation system in the air handling units is a route to both of the Cryptococcus patients, by which there may have been a significant dose or bolus of Cryptococcus in the ventilation system. There were a lot of pigeons around the hospital site and no building is completely sealed. In addition, the plantrooms were dark like a loft and Cryptococcus will proliferate in that sort of environment with pigeon guano.[1942]

722. The IMT considered a number of hypotheses. The working hypothesis in early 2019 was that the infections were likely contracted while the patients were in hospital, even if the precise mode of that transmission was not known. One early hypothesis was that the fungus could have entered the building as a result of pigeon droppings. Dormancy of the infections within the patients was considered by the IMT. At that stage it appears to have been considered very unlikely[1943].

723. As Professor Gibson noted in her evidence, air sampling within the QEUH

[1942] Dr Inkster, Day 1 Transcript, Pages 45-53
[1943] Bundle 1, p.250 at p.252.

campus, and then on Ward 6A, identified the presence of Cryptococcus albidus, but not Cryptococcus neoformans[1944]. Cryptococcus albidus was also associated with pigeons and was considered to pose a risk to immunocompromised patients[1945].An interesting comment was made by Dr Mathers. He said[1946], having met Dr Inkster, "She was anxious about the infection control situation, which was quite understandable. She was not alone in this. "

724. Dr Peters had not encountered Cryptococcus being acquired in a hospital. She had been involved in treating two or three cases and had a good knowledge base of the organism and its link to pigeon guano. She concluded that one case was consistent with an HAI, and when another arose that rang alarm bells. She thought, "Must be pigeons somewhere."[1947] There had been four more recent cases, and she hoped someone was monitoring them. [1948] Dr Balfour considered the pigeon infestation in the plant systems and boxes delivered to clinical areas that were contaminated by pigeon faeces to be unsatisfactory[1949].

The Cryptococcus Expert Advisory Sub Group

725. Investigation of the hypothesis was eventually delegated to a dedicated expert advisory sub-group.[1950]

726. Dr Inkster suggested the set up of a sub-group to work through the possible hypotheses to make sure there was a protective environment in place for patients. She was not a member of the subgroup; it was said because of her workload. In January 2019, Dr Inkster recounted being called by the Dr Armstrong and being told it was important that she remained independent from the expert subgroup. In Dr Inkster's view there were no experts on the subgroup, despite its name, as very few people in the UK are experts on

[1944] Professor Brenda Gibson, Transcript, Page 146
[1945] Bundle 1, p.261.
[1946] Dr Alan Mathers, Witness Statement, Page 37
[1947] Dr Peters, Day 2 Transcript, Page 96
[1948] Professor Gibson Witness Statement para 158
[1949] Dr Alison Balfour, Witness Statement, page 500 (Witness Bundle)
[1950] Minutes are in Bundle 9

Cryptococcus. The people in the subgroup had ventilation expertise but not on Cryptococcus. It was conceded by Dr Inkster that pigeons are not the only source of Cryptococcus, and other possible sources are vegetation and soil. She also accepted that the source of these infections will never be known, but that was not the aim of the Subgroup. Its aim was to make sure these infections did not happen again, that all possibilities were covered, and make sure vulnerable patients were protected from any further risk of Cryptococcus.[1951]

727. Dr Armstrong recalled that at the end of January 2019 the BICC was discussing Cryptococcus.[1952] She recollected that as they were talking about the cases, Dr Seaton said that the two cases could be sporadic reactivation. The meeting agreed as a committee to set up an expert group Dr Seaton as infectious diseases consultant.[1953] Examination of the minute discloses that at that meeting Dr Inkster reported on the investigations into the two Cryptococcus cases and it was in the discussion on her report that Dr Seaton did raise that issue. In her evidence Dr Armstrong felt the group was more about technical air flow.[1954] Regarding whether she had a concerns about having immunocompromised patients in non-HEPA filtered rooms, Dr Armstrong thought that was a difficult question. There was a debate as to what level you need and what groups of patients should be in certain environments.[1955] It was put to Dr Armstrong that SHTM-03-01 contains a specification for a neutropenic ward. Dr Armstrong had never heard of the term neutropenic wards.[1956]

728. The subgroup comprised a number of members, which included Annette Rankin, Susie Dodd and Ian Storrar[1957] from NSS, Dr Hood (Chair), Dr Seaton, Ms Devine and representatives from estates and facilities. The subgroup's investigation continued for a number of years. However, the subgroup was unable to agree on the terms of a final report. Some members

[1951] Dr Inkster, Day 2 Transcript, Pages 60-68
[1952] Bundle 27, Volume 18, Document 8, Page 47
[1953] Dr Armstrong, Transcript, Page 120 to 122
[1954] Dr Armstrong, Transcript, Page 120 to 122
[1955] Dr Armstrong, Transcript, Page 122 and 123
[1956] Dr Armstrong, Transcript, Page 123 and 124
[1957] Unfortunately, Ian Storrar was not available to the Inquiry.

could not support the findings. Ms Rankin recalled that it was a very frustrating to be part of this expert sub-group as there were a lot of hypotheses being explored and there were issues with the literature findings[1958]. Her NSS colleagues Susie Dodd and Ian Storrar were also members of the subgroup. She was of the view there was no difficulty in having the subgroup report back to the chair of an IMT that was now closed[1959].

729. Evidence was heard from Ms Rankin that the NSS members of the expert sub-group collectively couldn't find a methodology for the literature review for the article selected[1960]. In relation to methodology, this is a search strategy so there will be exclusions, inclusions, specific dates, type of article, peer reviewed or not etc. In other words, setting the terms for the databases[1961]. They reached the view there was some selection bias to try and disprove the hypothesis of an HAI link and there was a lack of openness and transparency. She recalled that they offered to do a literature review and eventually a review was undertaken[1962]. Her recollection on the selection bias point was that it was unclear which articles had been selected and which articles had been excluded. It was not clear she recalled what the selection criteria and exclusion criteria were for the articles[1963]. It was stressed by Ms Rankin that comments were provided by the NSS members of the expert sub-group but there was no clarity on whether the comments would be included, or the report would be changed. She recalled finding the meetings quite confusing[1964]. The report was ultimately NHS GGC's report, and no consensus report was provided. This was because the NSS comments were not being taken onboard and no rationale was given for why these comments were not addressed[1965].

730. Responding to an allegation that she had told Dr Inkster – who might have been thought to have relevant knowledge – not to speak to John Hood about

[1958] Annette Rankin, Transcript, Page 113
[1959] Annette Rankin, Transcript, Page 112
[1960] Annette Rankin, Transcript, Page 113
[1961] Annette Rankin, Transcript, page 116
[1962] Annette Rankin, Transcript, page 114
[1963] Annette Rankin, Transcript, page 115
[1964] Annette Rankin, Transcript, page 118
[1965] Annette Rankin, Transcript, page 121

this, Sandra Devine maintained that what she had been saying, was 'let the process run its course in terms of basing it on his findings, ……, just let that run, and it will be what it will be, and we'll deal with it when it comes back'. [1966] The distinction that Ms Devine was seeking to make is undoubtedly subtle, if not elusive.

731. Mr Hoffman was a member of the Group but regarded himself as being there only in an advisory capacity. He did not visit the site. He had offered some initial thoughts on investigations.[1967]In oral evidence he added little to the views which were recorded in the subgroup Minutes. Air sampling was of limited value. On the basis of what was reported to him by Estates he did not change his view about access from the plant room. Outside air was a possible source if HEPA filtration was not in place. He had no expertise in reactivation. Overall,[1968]that 'definitive conclusions were missing is perhaps a realistic reflection of abilities to establish what precisely occurred in each case of patient acquisition of Cryptococcus." He would not expect to hear phrases like 'conclusively ruled out'.

732. As set out above, NHS NSS disagreed with the findings of the subgroup[1969]. Ms Dodd explained that NHS NSS representatives (Ms Rankin, Ms Dodd, and Mr Ian Storrar) submitted comments and feedback on the sub-group's report to the chair, Dr Hood and the whole group. A response was eventually received which had a table with a response to each NSS comment. It was not clear from the table whether they would act on the NSS comment or not. The main concern was the lack of clarity in the responses. No explanation was ever provided to NSS, as to why their offer to carry out an evidence review using a robust methodology was not accepted initially. Ms Dodd was surprised it took two years to produce the report.[1970]

733. Ms Dodd observed that she often felt very confused at the Sub-Group meetings and found it difficult to follow. There was a lot of thinking through

[1966] Sandra Devine, Transcript, Page 125
[1967] Bundle 14, Vol 2 p 167
[1968] Peter Hoffman, Witness Statement, Answer 28
[1969] Eddie McLaughlin, Transcript, Page 80
[1970] Susan Todd, Transcript, Page 103-105

theories and going down rabbit holes. The meetings weren't chaired or structured terribly well by Dr Hood and the discussions were not structured. Ms Dodd could not recall any updates being provided by the Sub-Group to Dr Inkster. Ultimately, NSS did not agree to the conclusions of the report because as Ms Dodd asserted, they did not feel assured about where information had come from to inform the final views on each of the hypotheses. She further elaborated that NSS did not feel they had sight of all the information that was going into that group.[1971]

734. In a subgroup meeting on 26 November 2020, there was a Teams call that Ms Dodd was on, but fell off halfway through. At the beginning of the call, Dr Hood had said there were a couple of other patients to consider but it had not been discussed before Ms Dodd fell off the call.[1972] These are the three patients (one child and two adults) listed in the minute of the meeting of 26 November 2020 at item 2.[1973] Ms Dodd explained that after the subgroup call, she contacted Sandra Devine and enquired who the patients were. She was told by Ms Devine that they were historical cases. Ms Dodd queried what Ms Devine meant by "historical" and was told that she thought they dated back to 2010, and that Dr Hood was looking into them. She did not discuss the cases with Dr Hood.[1974]

735. The notion that sources had been 'conclusively ruled out' was not supported, and the Report was biased to a particular result. Mr McLaughlan's view was that the most likely source was outside air reaching patients whose air supply was not adequately filtered.[1975]

736. Professor Steele was glowing in his praise of Dr Hood's report. Professor Steele noted that his role in the meetings was to delegate resources or get outside help. He described how Dr Hood allowed a free flow of opinion from those who had expertise. Dr Hood and Mr Hoffmann had a good relationship. Professor Steele's feeling was that the series of meetings were conducted

[1971] Susan Dodd, Transcript, Page 113-115
[1972] Susan Dodd, Transcript, Page 107
[1973] Bundle 9, Document 33, Page 286
[1974] Susan Dodd, Transcript, Page 107
[1975] Mr McLaughlan, Transcript, Pages 80-83

robustly in a collaborative manner.[1976]

737. Professor Steele confirmed that he was aware that NSS said the report was not robust and did not endorse it. He said that they were entitled to their conclusion, but claimed those from NSS who had technical expertise would support, and did support, the hypothesis and the process of evaluating the hypothesis.[1977]

738. Professor Steele was taken to a letter from Dr Hood to Marian Bain after the board meeting on 25 February 2020[1978]. This was a letter from the chair of the expert group complaining that the update paper to the meeting described that the hypothesis that air from the plant rooms had been categorically ruled out. It was also noted that the minute describes Professor Steele as providing an overview of the work carried out, that he had ruled out six hypotheses, and that it concluded that spores came in from the air, which is not what the group found. Professor Steele said that this was the minute of the finance and performance committee. He had been asked to give an update on the litigation and the work done to date. The section referenced was to a board meeting in February 2020 that he didn't attend. The update was given by Ms Grant. He stated that by the time Dr Hood sent his letter a further hypothesis regarding risers had developed. Matters had been exhaustively discussed, and that the minutes confirm that the hypotheses had been considered and analysed. Professor Steele anticipates that Dr Hood was thinking that the sub-group was not at the end of the process and that he had not done his final wrap up.[1979]

739. Dr Armstrong was also referred to the letter from Dr Hood to Marian Bain[1980]. It was put to Dr Armstrong that at that point he was taking issues with board papers that suggested certain things had been ruled in or out. Dr Armstrong accepted that the report was not available until 2022, and that in February

[1976] Professor Steele, Transcript, Page 62
[1977] Professor Steele, Transcript, page 63
[1978] Bundle 14, vol 2, page. 456.
[1979] Professor Steele, Transcript, Page 64 to 69
[1980] See Bundle 14, Volume 2, page 455.

2020 Dr Hood had not reached any key conclusions.[1981]

740. It was also put to Dr Armstrong that NSS did not associate itself with the terms of Dr Hood's report. She said that she was not close to the group. She did not attend it, nor meet with Dr Hood.[1982]

741. It was put to Dr Armstrong that the Inquiry had heard evidence of a debate about whether the infection in 2020 was a Cryptococcus case. Dr Armstrong did not know if there had been any other Cryptococcus cases of patients who spent time in the hospital since the report in 2022.[1983]

742. It was suggested to Dr Armstrong that there might be an issue regarding how unusual infections were reported. Dr Armstrong was asked how she would find out about unusual infections as medical director. Dr Armstrong explained that an unusual infection would appear when a microbiologist looked at it and determined it. They would either investigate with the clinical team or alert the IPC team. They can determine if they need to hold a PAG, and it might come up that way. She wouldn't know about it until it got to the IMT or major public health implications.[1984]

743. It was put to Dr Armstrong that if it requires both microbiologists to notice and the IPC team to trigger a PAG for an unusual infection to become widely known, did that not create a gap that unusual infections might fall through. Dr Armstrong stated that she did not know the answer. What she would do is get some microbiologists, epidemiologists and national surveillance to look at it. How often is this happening. How do we design a system. She could not give an answer about that today.[1985]

744. Eventually the report was issued by NHS GGC itself. The final version of the report is dated 5 April 2022.

745. IMT minutes in December and January 2019 indicate a high degree of

[1981] Dr Armstrong, Transcript, Page 130 to 132
[1982] Dr Armstrong, Transcript, Page 132
[1983] Dr Armstrong, Transcript, Page 132 and 133
[1984] Dr Armstrong, Transcript, Page 133
[1985] Dr Armstrong, Transcript, Page 133 and 134

concern about the risk posed to immunocompromised patients. Steps were taken to clean an air handling plant room where pigeon faeces were discovered. Air sampling of Wards 6A, 4C and the PICU was commenced[1986]. In their response to Counsel to the Inquiry's Closing Statement in respect of Glasgow II, the parents and representatives of those who were, or are still being, treated on the children cancer ward, on adult wards and in the neo-natal unit, indicate their understanding that from December 2018 air sampling also took place in Ward 4A, and that such air sampling carried on in Wards 4A and 4C throughout 2019. Samples of pigeon faeces were taken and sent for testing. Dr Peters notes that there was a" serious infestation" which an Estates colleague had told her required a team of eleven to clean up. [1987]

746. At the outset of the incident, at the request of Dr Inkster, Dr Peters had contacted Peter Hoffman for advice regarding Cryptococcus. She also visited the plant room and noted there were still signs of pigeons despite the clean-up. She concluded that Estates did not know which air handling unit was which. She also saw water cascading down the roof into the plant room, and thought this could be a potential route for contamination. Colin Purdon opined that the pigeons had got in by crawling under the cladding on the ground floor. Dr Peters considered there were a number of plausible routes; however, Estates and Public Health challenged her views[1988].

747. In December 2018, it was agreed that haemato-oncology patients would receive an anti-fungal prophylaxis, AmBisome, a policy which continued into 2019. Preventative medications continued to be prescribed to children from an early stage on Ward 6A[1989]. AmBisome was prescribed to both inpatients and some outpatients[1990]. Some patients had a reaction to AmBisome; the alternative was a medication from the "-azole" family (such as Posaconazole)[1991]. Witnesses at Glasgow I gave evidence of receiving a

[1986] Bundle 1, p.245 *et seq.*
[1987] Dr Peters, Witness Statement, Para 177
[1988] Dr Peters, Witness Statement, Para 182
[1989] Charmaine Lacock, Witness Statement, Para 177
[1990] Bundle 1, Page 256
[1991] Professor Brenda Gibson, Transcript, Page 150

leaflet about preventive medications (Posaconazole)[1992].

748. Portable HEPA filters were supplied to Ward 6A. The points at which this occurred are not clear, and various references to the ordering and arrival of HEPA filters are to be found within IMTs over this period. Mrs Gallagher recalled a HEPA (high-efficiency particulate absorbing) filter being placed in her son's room on around 4 December 2018 after he became unwell. Dr Armstrong stated that the week before, she had looked at the IMT minute on 7 January and was anxious about a couple of things. Dr Armstrong asked Professor Steele about HEPA filters. Dr Armstrong convened a meeting on 9 January 2019 and made sure that infection control people were there. She thought they should deploy HEPA filters.[1993] Dr Armstrong attended the IMT on 18 January 2019 to report that they had done that. She thought that she needed to make an intervention.[1994] Witnesses at Glasgow 1 provided evidence of seeing HEPA filters on the ward throughout January 2019[1995]. Ms Rodgers recalled that a first batch of portable HEPA filters were installed in Ward 6A on 10 January 2019, followed by additional units on 30 January[1996]. Ward 6A has no specialist ventilation; it was hoped that the portable HEPA filters would improve air quality.

749. In an email to Dr Armstrong dated 8 January 2019[1997], Professor Gibson escalated the concerns of consultants that issues relating to the safety of the hospital environment remained unresolved (see below) and that there remained a requirement for additional prophylaxis as a result.

750. To revert to Cryptococcus, Dr Inkster's opinion was that there was a strong probability of a link between the ventilation system and the Cryptococcus infections that the two patients had when they died. Whilst she acknowledged that the two patients could have had reactivation of Cryptococcus, at the same time, there was an epidemiological link in time, place, and person linked to a

[1992] David Campbell, Witness Statement, Para. 82
[1993] Dr Armstrong, Transcript, Pages 117 to 119
[1994] Dr Armstrong, Transcript, Pages 119 and 120
[1995] Annemarie Kirkpatrick Witness Statement, Para 97; and Colette Gough Witness Statement Para 134
[1996] Jennifer Rodgers, Transcript, Page 101
[1997] Bundle 6, Page 43

building where there is evidence of pigeon guano in a plantroom. Patients were not in a HEPA-filtered environment and were not on appropriate prophylaxis.[1998]

High particle counts on Ward 6A.

751. The concern about Cryptococcus dovetailed with another concern which emerged in January 2019. Air sampling on Ward 6A revealed the presence of higher-than-expected fungal counts, even with portable HEPA filters in place[1999]. Dr Balfour recalled taking air samples with Dr Inkster on 17 January 2019 which were then sent to Glasgow Royal Infirmary and the results then provided to Dr Inkster since she was chair of the Cryptococcal IMTs[2000].

752. A hypothesis emerged following a report by Senior Charge Nurse, Angela Howatt, that the seal between the wall and floor in some ensuite shower rooms was breached. An IMT from the time appears to confirm that it was nursing staff who detected this issue[2001]. The issue was reported to Estates and then to an IPC nurse who also escalated it to Estates.

753. Estates had difficulty accessing the patient room to resolve the issue. Ms Howatt escalated the issue direct to the IPC doctor when she came to carry out air sampling[2002]. This prompted investigations which revealed the presence of mould in around 80% of ensuite bathrooms on Ward 6A[2003]. The IMT's hypothesis was that the presence of mould accounted for the concerning air sampling results.

754. Substantial remedial works were required to resolve the problems with the ensuite shower rooms. A full HPV clean of the ward was also planned. At an IMT on 18 January 2019, it was agreed that the extent and duration of the works indicated that patients should be decanted from Ward 6A[2004]

[1998] Dr Inkster, Day 2 Transcript, Pages 62-64
[1999] Bundle 1, Page 266
[2000] Dr Alison Balfour, Witness Statement, Page 487 (Witness Bundle)
[2001] IMT minute dated 18 January 2019, Bundle 1, Document 61, Page 274
[2002] Angela Howatt, Transcript, Page 51
[2003] James Redfern, Transcript, Page 148
[2004] IMT minute dated 21 January 2018, Bundle 1, p.279.

755. After the IMT on 18 January 2019 a meeting took place. It may have been in Ward 6A. The Chief Executive, Ms Grant, Mr Hill, Dr Armstrong, Professor Steele, Mr Redfern, Ms Rodgers, Mr Walsh, Ms Devine and Dr Inkster were present. Professor Steele explained that he was involved in those discussions but was not at the IMT. He thought that it was an over-reaction to move patients again, and that the potential harm would be greater to move the patients. He considered the work to be minor repairs, not major works.

756. Dr Inkster considered that at the meeting she came under pressure to reverse the decant decision, but Mr Best and Dr Armstrong backed her.[2005] Professor Steele considered that the work required to Ward 6A could be done whilst patients were on the ward and an HAI Scribe had been drafted. The short term decant to the CDU went ahead.[2006]

757. Dr Armstrong remembered that the CEO quite properly wanted to walk the patch. She wanted to understand what was happening. Dr Armstrong did not remember all of the debate. She thought it was a reasonable meeting. She thought that she supported Dr Inkster in her view.[2007]

758. The arrangements for the decant were complex[2008]. BMT patients could remain on Ward 4B. Ward 6A inpatients would be decanted to the Clinical Decisions Unit ("CDU") within the RHC. This displaced CDU patients who were relocated to Ward 2A, which was at that time empty; significant works had not yet commenced. Space on CDU was insufficient to house day care patients, who were relocated to Ward 1B, the day surgery unit, also within the RHC. Ward 1B had enough space to house their own patients in addition to the decanted day care patients. Schiehallion patients were at this time split over three locations[2009]. The decant lasted from 22 January to 8 February 2019, when patients returned to Ward 6A[2010].

759. Professor Gibson recalled that a return to the RHC was the only viable option

[2005] Dr Inkster, Witness Statement, Paras 710-714
[2006] Professor Steele, Transcript, Page 55 to 60
[2007] Dr Armstrong, Transcript, Page 116 and 117
[2008] See, for example, the evidence of Emma Sommerville and Angela Howatt.
[2009] Angela Howatt, Transcript, Page 54; Emma Sommerville, Transcript, Page 69
[2010] Professor Brenda Gibson, Transcript, Page 163

at the time despite the fact it was previously considered to be an unsafe environment. Professor Gibson's understanding was that IPC took steps to make the environment as safe as possible[2011].

760. During this period witnesses recalled press coverage in relation to the death of the patient who had contracted Cryptococcus[2012]. However, communication from NHS GGC did not come until 23 January 2019 when a letter was issued by the Chief Executive, to parents[2013]. Mrs Gough recalled that this was the first "formal" letter to be issued to parents on NHS GGC headed paper. The letter begins by acknowledging that parents would already have seen press coverage about "two isolated cases of an unusual infection…and about the ongoing control measures which have resulted in no further cases". Ms Grant apologised for "any anxiety this may have caused". The letter explains that the incident was being actively managed and that the "likely source [was] detected and dealt with immediately". It stated that (unspecified) "additional control measures" had proven effective because there had been no other cases. The letter continues that "During our detailed investigations into these isolated cases, a separate issue was identified regarding shower room sealants issues [sic] that are now being urgently repaired. Whilst this is being repaired some patients have been moved to another ward area".[2014]

Water damage in Ward 4D

761. It does appear that the issue around shower room sealants referred to by Ms Grant in her letter to Mrs Gough of 23 January 2019 was more widespread. An email of 20 July 2019 from Lynn Pritchard, then lead ICN in the QEUH, addresses water damage in Ward 4B.[2015] She described a building wide issue which resulted in calls from wards to report water ingress around the coving at the bottom of walls in showers, where the seal in the joint of the flooring and they would split and the integrity of the floor was breached.[2016]

[2011] Professor Brenda Gibson, Transcript, Page 168
[2012] Charmaine Lacock, Witness Statement, Paras 98 and 104,
[2013] Letter is attached to the witness statement of Colette Gough at CG/04.
[2014] Colette Gough, Witness Statement, Para 134
[2015] Bundle 14, Volume 1, Document 60, Pages 631 and 632
[2016] Lynn Pritchard, Transcript, pages 141 to 142

Dr Inkster under pressure

762. Dr Inkster explained that by January 2019 she was under real pressure and was effectively working full time as Lead ICD. In her evidence (corroborated by Mr Walsh), she explained that various attempts were made to find additional sessions for ICDs, but eventually by email dated 5 February 2019, Dr Armstrong agreed that there was a need to stabilise the ICD service.[2017] It was agreed to appoint a locum ICD and Dr Jones contacted Professor Stephanie Dancer, then at NHS Lanarkshire and Napier University, to see if she could provide support on the QEUH site. Professor Dancer agreed to help and came to visit the QEUH where she met staff before being told by Professor Jones that her services were no longer required.[2018] Whilst Professor Dancer clearly had views on why she was not needed the Inquiry does not need to explore this area to achieve its remit and, in any event, we could not ask Professor Jones for his version of events.

763. At the start of February 2019, Dr Armstrong offered Dr Inkster mentoring support and proposed Dr Stewart. Dr Inkster reported three meetings with Dr Stewart. She considered them to have been inappropriate and did not, in her eyes, appear to be about supporting or mentoring her. The focus seemed more on establishing who was Whistleblowing at the time rather than dealing with the issues she had raised. She accused Dr Stewart of raising questions about journalists and questions about people's mortgages and had they been paid off because people were in danger of losing their jobs.[2019]

764. Dr Stewart rejected Dr Inkster's characterisation of these meetings, He explained he had mentor training and had mentored people many times in his clinical and managerial jobs[2020]. Dr Armstrong told him that Dr Inkster was struggling with parts of her role and that having a mentor would strengthen her in her role[2021]. He recalled asking Dr Armstrong if Dr Inkster had happily

[2017] Bundle 14, Volume 1, Page 779
[2018] Dr Inkster, Witness Statement, Para 776, Dr Inkster, Transcript, Day 2, from page 70
[2019] Dr Inkster, Witness Statement, Para 746-745
[2020] Dr David Stewart, Transcript, Page 73
[2021] Dr David Stewart, Transcript, Page 79

signed up to be mentored by him and he was assured she had[2022]. He recollected being very clear with Dr Inkster at their first mentoring meeting that it was entirely voluntary and if she was unhappy with him as a mentor then that was absolutely fine. He told the Inquiry she could ask for another mentor without suffering any detriment and that she should set the agenda; it was not a coaching session or an appraisal. His recollection of the meetings was encouraging her to reflect on how she was coping with the job and what she thought her development opportunities were. He could recall that she had issues with workload, found the role quite stressful and was having difficulty dealing with the demands that were placed upon her[2023]. Dr Stewart insisted that the allegations made by Dr Inkster relating to him talking about Whistleblowing and mortgages was, in Dr Stewart's opinion, completely untrue and an absolute fabrication. He said he was astonished and angered to read her witness statement making these allegations[2024].

Tensions between Dr Inkster and Professor Steele

765. Following on from the meeting of 10 December 2018 it seems that relations between Dr Inkster and Professor Steele had deteriorated. The events around the plant rooms, pigeons and Cryptococcus cannot have helped.

766. Dr Armstrong asked Dr de Caestecker to chair a meeting on 14 March 2019 with Dr Inkster and Professor Steele. They were aware that there was a difficult relationship between Dr Inkster and Professor Steele and, as they were the key people in the management of the water incident and were working on the IMT, she and Dr Armstrong wanted to understand the problems and what they could do to help. Dr Inkster and Professor Steele were asked to have weekly meetings to make sure the issues raised at the IMT were acted on.[2025] There was a lot of evidence about this meeting and tensions were clearly high. The important point from the point of view of the Inquiry is that the issue which eventually caused Dr Armstrong to accuse Dr Inkster of a 'lack of respect' – that is "accusing another member of staff of telling her not to

[2022] Dr David Stewart, Transcript, Page 75
[2023] Dr David Stewart, Transcript, Pages 75 and 76
[2024] Dr David Stewart, Transcript, pages 75
[2025] Dr De Caestecker Transcript, page 51 and 54

put anything in writing"[2026] seems to have been resolved to a great extent in Dr Inkster's favour by Professor Steele's qualified admission in evidence that he did say to Dr Inkster on 10 December 2018 that he didn't want things in email because that meant they are out there albeit it "was a quick remark and said in a jocular manner.[2027]

767. It was put to Dr Armstrong that in her witness statement[2028] she said that on 31 January 2019, Anne Gow phoned her to alert her to a serious concern that Dr Inkster had accused another member of staff of telling her not to put anything in writing. It was put to Dr Armstrong that Professor Steele had given evidence that he may have said something regarding not putting things in e-mails, but that it may have been a joke. Dr Armstrong heard his evidence.[2029]

768. Dr Armstrong explained that context and tone was everything. She said that Professor Steele was a great colleague. If you see something as a joke and you go to the GMC that's quite serious.[2030] Dr Armstrong expected Dr Inkster to go through the policies the board has about how you raise matters if you have an issue with a colleague. It is better to go through the process rather than go out before raising it internally.[2031] Dr Armstrong thought that staff should be able to mention what they like. But there is a fairness. If it goes straight into the inspector's report, ends up in the papers, and debated in parliament, that causes a lot of anxiety. Dr Armstrong accepted you should tell the truth to an inspector.[2032] Dr Armstrong stated that she wished Dr Inkster felt she could engage with HR or Sandra Devine to alert her to her concerns. It would have been better to deal with it informally or through a formal process. There is a wider staff issue there. Professor Steele had used those words, but it was vital to know the context.[2033]

769. It was put to Dr Armstrong that it may be, from Professor Steele's perspective,

[2026] Dr Armstrong, Statement, Question 442, Hearing Bundle page 102
[2027] Professor Steele, Transcript, Page 32
[2028] Dr Armstrong, Witness Statement, Page 302, Question 442
[2029] Transcript, Dr Armstrong, page 183 and 184
[2030] Transcript, Dr Armstrong, page 186 and 187
[2031] Transcript, Dr Armstrong, page 187 to 189
[2032] Transcript, Dr Armstrong, page 189 and 190
[2033] Transcript, Dr Armstrong, page 190 and 191

that Dr Inkster misinterpreted what he said, but he said do not put things in writing. She was asked if that's a slightly different version than accusing another member of staff of serious concerns. Dr Armstrong explained that there was a formalised process with HIS that if something comes up, they must alert board. She was simply setting out what she was told by Anne Gow. Dr Inkster did not think it was a joke, but that is not the point. Dr Inkster told the HPS inspector, and he alerted the director of nursing of HIS. They then have an alert system where they must raise concerns with Dr Armstrong.[2034]

770. It was put to Dr Armstrong that, whilst one may never know if Professor Steele's jocular remark was delivered in a jocular tone, or if Dr Inkster was right or wrong, the fact remains to some extent that she was reporting something accurately. Dr Armstrong explained that context and tone was everything. She said that Professor Steele was a great colleague. If you see something as a joke and you go to the GMC, that's quite serious.[2035]

771. It was put to Dr Armstrong that the way Dr Inkster describes her relationships including with Professor Steele, and over the four years back to her appointment as regional ICD in 2015, was of people not telling her things. It was also put to Dr Armstrong that the culture in the IPC team was seen different by her, Professor Steele and Dr Inkster. Dr Inkster saw it as a threat. It did not mean she was maliciously reporting Professor Steele. Dr Armstrong did not see that because if Dr Inkster had seen it that way, then she would have expected Dr Inkster to go through the process for raising matters if you have an issue with a colleague. You do that because you want it to be investigated. If someone is behaving inappropriately, then it should be dealt with. It also gives the person the chance of a response. People are free to raise things. However, it is better to go through that process rather than go out before raising it internally.[2036]

772. It was put to Dr Armstrong that Dr Inkster said she did not seek out the inspector. Dr Armstrong thought that staff should be able to mention what they

[2034] Transcript, Dr Armstrong, page 184 to 186
[2035] Transcript, Dr Armstrong, page 186 and 187
[2036] Transcript, Dr Armstrong, page 187 to 189

like. But there is a fairness. If it goes straight into the inspector's report, ends up in the papers, and debated in parliament, that causes a lot of anxiety. Dr Armstrong stated that Dr Inkster did not go to the press. HAI published a report. Dr Armstrong accepted that you should tell the truth to an inspector.[2037]

773. It was put to Dr Armstrong that it was appreciated that there was a process. Dr Inkster told her understanding of events to the inspector. Dr Armstrong arranged a meeting with Dr Inkster and Professor Steele. Professor Steele had not at that point said it was a joke. It was not until four years later that he said it to the Inquiry in his evidence. Dr Armstrong was asked if she gave no credit for Dr Inkster being right about the facts. Dr Armstrong stated that she wished Dr Inkster felt she could engage with HR or Sandra Devine to alert her to her concerns. She did believe that inspectors need to come in and get an absolute picture of what was going on. It was a different matter when replaying a meeting. She considered that it would have been better to deal with that informally or through a formal process. There was a wider staff issue there. Professor Steele had used those words, but it was vital to know the context.[2038]

774. Dr Armstrong has changed her position between her witness statement[2039] and her evidence. The statement did not contain a concern about tone, but an assertion that Dr Inkster had accused a senior colleague of telling her not to put anything in writing. Once she had head Professor Steele's qualified admission, she changed her position to a concern about process and tone. It seems reasonable to assume the acceptance by Professor Steele that he had said something of that sort, albeit in a 'jocular' manner was a surprise to her and rather undermines her concerns.

Dr Mathers SBAR -1 March 2019

775. It has not been possible to fully explore the detail of the events that followed Dr Mathers SBAR of 1 March 2019[2040] Dr Inkster said that in early 2019 she

[2037] Transcript, Dr Armstrong, page 189 and 190
[2038] Transcript, Dr Armstrong, page 190 and 191
[2039] Witness Statement, Dr Armstrong, page 302, Question 442
[2040] Bundle 4, Document 36, Page 151

and others had a concern that a duty of candour issue had arisen in respect of the 2017 Stenotrophomonas cases and that there had been other children who had acquired infections from the water system. A meeting was held between her, Dr Armstrong, Dr Mathers and Professor Gibson on 1 March 2019 and the SBAR followed the meeting. Dr Inkster considered that NHS GGC have not fully followed up on these concerns[2041]. Part of the result of this line of work was a review of historical cases by Dr Chaudhury, Consultant Haematologist.[2042] Whilst Dr Chaudhury's email of 27 July 2019 is fully redacted, Dr Inkster is correct when she notes that she had identified three deaths with one which she requested should have an independent review; a child from 2017 who had Stenotrophomonas bacteraemia infection and died.

776. Dr Armstrong said that Dr Mather's SBAR[2043] and Professor Jones' Report[2044] were connected to the Stenotrophomonas cases in ward 2A in 2017. She thought that Dr Mathers' and Professor Jones' reports resolved at all the issues.[2045]

Water System Management

777. In late 2018, Phyllis Urquhart, the QEUH's Estates compliance manager, instructed the 2019 DMA Canyon L8 risk assessment.[2046] The Inquiry heard evidence from Mr Clarkson that he became aware of the 2017 DMA Canyon L8 risk assessment in late 2018 when he was in a meeting with Colin Purdon and Melville MacMillan discussing what was to be the 2019 DMA Canyon L8 risk assessment. Colin Purdon and Andy Wilson had asked Melville MacMillan to focus on the actions in the 2017 DMA Canyon L8 Risk Assessment. Mr Clarkson assisted Mr MacMillan with this risk assessment.[2047] In his evidence Mr Clarkson explained that he was then concerned that a large number of issues were still not resolved from the 2015 DMA Canyon L8 Risk Assessment. The actions in that report should have been completed before

[2041] Dr Inkster, Statement, Paras 554-557 and Transcript, Day 2, Pages 82-86
[2042] Bundle 8, Document 19, Page 112
[2043] Bundle 4, Document 36, Page 151
[2044] Bundle 19, Document 55, Page 1371
[2045] Transcript, Dr Armstrong, page 137 to 141
[2046] Bundle 24, Document 11, Page 379
[2047] Kerr Clarkson, Transcript, Page 17-18

handover and they were still not completed in 2018.[2048]

778. According to Dr Peters, Dr Inkster was given a copy of the DMA Canyon report in June 2018, but Jane Grant had seen it in March 2018, at which point the water incident IMT was ongoing. Dr Peters had requested the legionella risk assessment reports from Tom Walsh in 2015 but was not given them. [2049]

779. Th 2019 DMA Canyon L8 risk assessment described how the number of dead legs had been reduced and those remaining were being flushed. Most of the bib taps had been removed. Compared to the 2017 DMA Canyon L8 risk assessment, the report was more in-depth and dealt specifically with the location of each dead leg. However, the heat gain was still noted in pipework and David Watson's view was that this was due to low use of the water system.[2050] Professor Dancer recalled meeting Mary Anne Kane from Estates on during her visit on 14 February 2019. She was told by Ms Kane that there had been concerns during the building phase about the pipework. She was told by Ms Kane that pipework was inappropriate for the hospital plumbing and both pipework, fabrics and furnishings were left out on the building site in the mud and rain during the build phase[2051]. During her tour of the QEUH/RHC, Professor Dancer was appalled at what was floating in the water tanks[2052].

780. Mr Watson explained that over the course of 2018 and 2019, there were quite significant changes in the water system. DMA had fitted Point of Use Filters in Ward 2A and other high-risk areas in early 2018. There had been Chlorine Dioxide fitted to the water system and a third filter in filtration system in the basement plan rooms.[2053] His view was that compared to what had been found in the earlier DMA Canyon L8 risk assessments the domestic water system was improving in 2019 but not compliant with L8.[2054]

[2048] Kerr Clarkson Statement, Page 105 and Kerr Clarkson, Transcript, Pages 21-23
[2049] Dr Peters witness statement para 192
[2050] David Watson, Transcript, Page 112-114
[2051] Prof Stephanie Dancer, Transcript, pages 18 and 19
[2052] Prof Stephanie Dancer, Transcript, page 56
[2053] David Watson, Transcript, Page 136
[2054] David Watson, Transcript, Page 151

781. In 2019, DMA Canyon were fitting and managing Point of Use Filters (POUFs), microbiological sampling, tank cleaning, a register of dead legs and related flushing regime.[2055] In relation to sampling, DMA Canyon would generate a method statement (based on industry guidance) which is passed to QEUH's Estates team who pass it on to the infection control team and a microbiologist to check the method statement is acceptable.[2056]

782. Mr Kelly did not carry out a water audit in 2019, but his evidence around his 2020 audit does indicate that it was difficult for him to tell the extent to which flaws were present within the water system in 2019. On reviewing records for that period, he repeatedly ran into an issue whereby there were simply insufficient records for him to tell whether the water system was under control in terms of temperature, because few records had been kept to indicate what temperatures were at any time; to tell whether dead leg removal had been undertaken, because records were not kept; and to tell whether other tasks had been undertaken, for the same reason.[2057] He accepted that at that time there was not in place a review process such that 'missed' points would automatically be followed up with the Estates manager and the Compliance Manager; in subsequent years that arrangement was put into place.[2058]

783. Despite this an AE Audit was not carried out in 2019. Phyllis Urquhart felt responsible, but attributed the omission to how busy things were at the time, although on being prompted she did recall that she had in fact reported the omission upwards at the time, either to Mark Riddell or to Alan Gallacher.[2059]

784. Dr Tom Makin also provided evidence on the effectiveness of the chlorine dioxide treatment programme. He spoke to the necessity of combining such treatment with action to address the underlying engineering problems. He also spoke to its being essential that the treatment be combined with a flushing regime in order to draw the biocide into the area of the outlets, that being a

[2055] David Watson, Transcript, Page 117
[20562056] David Watson, Transcript, Page 118-120
[2057] Dennis Kelly, transcript pages 184-190
[2058] Dennis Kelly, transcript page 191
[2059] Phyllis Urquhart transcript page 93-94

locus of contamination for organisms such as Cupriavidus.[2060] Chlorine dioxide was not an appropriate treatment for renal wards or neo-natal wards.[2061] For such areas it was preferable to have a dedicated cold water supply.[2062] Tim Wafer also emphasised the need to ensure an extremely pure water supply to renal wards, with an alarm system in place in case chlorine dioxide should get through.[2063] Both Dr Makin and Mr Wafer emphasised that the process by which chlorine dioxide treatment worked was by necessity a slow one, in the absence of shock dosing, which was considered to be impractical; Mr Wafer also mentioned that a shock dose which removed everything would be a successful outcome, but that there was a risk that partial removal only would allow exposure to pathogens below the surface.[2064] While higher doses were possible, usage above 0.5ppm risked harm and would hence have to be accompanied by precautionary measures such as prohibiting use as drinking water. If the appropriate measures were taken, then Dr Makin's view was that a 0.5ppm dosage would usually suffice.[2065]

785. Mr Wafer went so far as to emphasise that it might take a period of 6 months to as long as five years before chlorine dioxide would fully permeate a system, with the extent of biofilm as an unknown variable impacting upon that timescale.[2066]

786. While Dr Makin's contact with the hospital became intermittent after his initial involvement in 2018, he was aware of WTG minutes from 26 April 2019 and 22 April 2021 which indicated initially a 'significant improvement' and later 'excellent water quality'.[2067]

787. Mr Wafer also emphasised the difficulty posed by deadlegs. While practice was improving, they appeared to be an inevitable feature of water systems and had been identifiable at QEUH from the time it was built. This posed a

[2060] Tom Makin transcript page 34
[2061] Tom Makin transcript page 99
[2062] Tom Makin statement page 25
[2063] Tim Wafer transcript page 148
[2064] Tom Makin transcript page 100-101; Tim Wafer transcript page 151
[2065] Tom Makin transcript page 98
[2066] Tim Wafer transcript page 154
[2067] Witness statement of Tom Makin at pages 26-27.

particular problem for the circulation of chlorine dioxide, with flushing being essential to draw it into all areas of the system.[2068] He also spoke to a particular problem around Crimp Joints, certain of which had been opened to reveal areas of stagnant water; while the opened joints could be remedied, it was not in practice possible to reopen the whole system to identify all possible examples of this.[2069] Finally, he expressed concern over delays in putting in place proper training for the operation of the chlorine dioxide system, but emphasised his view that sufficient external monitoring measures were in place to mitigate any risk posed thereby.[2070]

788. Separately, Mr Wafer gave some evidence around some work he had been asked to do examining point-of-use filters, which were broadly satisfactory although he expressed concern about the risk of contamination on the outside of the membrane.[2071]

Ventilation in the PICU

789. Dr Peters notes that in July 2019 there was confusion as to ventilation in the PICU and NICU, as neither had been validated. Neither Dr Valyraki nor Dr Hood wished to take responsibility for an HAI SCRIBE[2072]

790. Furthermore, on 10 July she noted that the PICU HAI SCRIBE purported to be signed off by Dr Inkster at a time when she was on leave- the second time this had occurred. [2073]

791. Professor Steele explained that PICU is on Level 1. He was aware of the evidence of Dr Peters that the PICU ventilation was not safe and that she had written a SBAR.[2074] He stated that her concern was that the unit had not been validated, which it had not been. Professor Steele considered that Dr Peters was concerned that the pressure cascade within the unit and air change was not confirmed at 10 and 10. He thought that the air changes were 10, but the

[2068] Tim Wafer transcript page 137
[2069] Tim Wafer transcript page 164
[2070] Tim Wafer transcript page 162
[2071] Tim Wafer transcript at page 143
[2072] Dr Peters, witness statement para 203
[2073] Dr Peters witness statement para 204
[2074] Bundle 4, Document 40, Page 161

pressure regime was in neutral. He stated that he met with Dr Inkster and other IPC colleagues. He noted that it was the subject of a review by HSE as well. [2075]

792. Professor Steele met with the clinical director and lead clinicians in PICU to try to understand the operating parameters and what the perceived issues were. He noted that the lead clinician was unaware of any issues regarding increased infection prevalence. Professor Steele stated that the PICU is very large in comparison with other sites. He involved the authorised engineer to get his view. Professor Steele noted a desire to have a highly positive and highly negative series of environments including HEPA filtered environments. He considered that the clinical team feared that having different environments could cause error.[2076]

793. Professor Steele was then taken to Dr Peters SBAR.[2077] He stated that the PICU delivered this by design. The other clinician who attended the meeting in 2019 was involved in the design of the hospital, and he came to the meeting with the plans he'd been involved with which showed the clinical involvement in the design of the wards. Professor Steele noted that PICU's are set up differently depending on where you are in world. There was a broadly normal cascade in PICU. The clinician had been in touch with colleagues in Singapore who had a negative pressure environment in PICU, probably because of SARS. He wanted to look at how to protect all the occupants of PICU. They went through a process to get a verified facility that offers 10 and 10 and offers flexibility.[2078]

794. Professor Steele noted that within the confines of SHTM one is required to verify critical air systems. He stated that they had done that on selected wards. Levels 4, 5, 6 and 7. He noted that he thought the guidance in 2014-2015 didn't stipulate that verification had to happen.[2079]

[2075] Transcript, Professor Steele, page 70 and 71
[2076] Transcript, Professor Steele, page 71 and 72
[2077] Bundle 4, page 161.
[2078] Transcript, Professor Steele, page 73 and 74
[2079] Transcript, Professor Steele, page 74

795. Professor Steele noted the contractual requirement to validate but felt that the guidance they were working to in the contract was not explicit. It was a client requirement to validate not contractor requirement. He stated that it was a requirement of the board in SHTM-03-01.[2080]

796. It was put to Dr Armstrong that one of the things that seems to have happened is there were highly immunocompromised patients in un-HEPA filtered rooms and they could not get prophylactic anti-bacterial medication. Regarding whether she had a concern about having such patients in non-HEPA filtered rooms, Dr Armstrong thought that was a difficult question. She thought there were groups of patients that needed HEPA filtered rooms. She knew there was a debate as to what level you need and what groups of patients should be in certain environments.[2081]

797. It was put to Dr Armstrong that SHTM-03-01 contains a specification for a neutropenic ward. It was also put to Dr Armstrong that, had neutropenic ward been interpreted as the whole ward, there was a viewpoint that the patients would have been more protected. Dr Armstrong had never heard of the term neutropenic wards. Clinical practice was changing. She noted that adult haemato-oncologists were discussing doing outpatient bone marrow transplants because anti-fungals were so good. It was a debate that needed to be had, and she was not expert enough to give evidence on the risks and where the clinical practice was going.[2082]

798. Dr Armstrong was asked if it would have helped if outside Ward 2A there had been a formal risk assessment of that issue of where the practice was going and if it was necessary to have whole ward at these high standards or not. Dr Armstrong said it should be assessed. She thought that they had to engage and there had to be a balance. There needed to be a balance of risk.[2083]

[2080] Transcript, Professor Steele, page 78
[2081] Transcript, Dr Armstrong, page 122 and 123
[2082] Transcript, Dr Armstrong, page 123 and 124
[2083] Transcript, Dr Armstrong, page 125 and 126

Gram-negative infections on Ward 6A

799. The consistent evidence of clinicians is that they had a concern about a pattern of gram-negative infections which began around June 2019 and continued into the Autumn. That concern was shared by IPC: an IMT was established on 19 June 2019 and continued until 14 November 2019[2084]. Dr Inkster gave evidence that it was during these IMTs that the practice developed of having pre-meetings - some individuals were uncomfortable with Dr Inkster presenting results at the IMT that they had not seen in advance. This put pressure on her and the laboratories to get results in time for the pre-meetings. The people attending the pre-meetings included Sandra Devine, Tom Steele, Chris Deighan, Scott Davidson, Kevin Hill and maybe Jamie Redfern. Dr Inkster's view was that the IMT was a working meeting, and she would take the opportunity to deal with results as they arose. There appeared to be a desire to have control. As Dr Inkster put it:

> "It put pressure on me and the laboratories to get results in time so that we could go there, talk through the results, and come up with a plan on how the IMT was going to progress and the route that the IMT was going to go down before we'd actually had the IMT. So, it may have helped certain individuals in the room have, I think, a level of control over the situation. It didn't particularly help me or the laboratory staff; it put additional pressure on us."[2085]

800. Dr Inkster felt that some of the executives attending IMTs struggled with the concept of an IMT as a multidisciplinary team because they were, unlike clinicians, not accustomed to multidisciplinary team meetings. They were much more accustomed to more business-type style meetings, more corporate style meetings, where pre-meetings did occur.[2086] As this IMT developed, Dr Inkster reached the view that that the challenge to her hypothesis and use of epidemiology was more about the reputation of the organisation rather than trying to get to the root of the problem.[2087]

801. The lead ICN for the RHC, Susan Dodd, explained that in June 2019 there

[2084] Bundle 1, Documents 72 to 88.
[2085] Dr Inkster, Transcript, Day 2, Pages 95-98
[2086] Dr Inkster, Transcript, Day 2, Page 99
[2087] Dr Inkster, Transcript, Day 2, Page 100

was a feeling of dread when these infections occurred; “here we go again”. In June 2019, there were controls and sampling in place for water which showed no gram-negative bacteria outside the POUFs. In addition, there were controls in the drains by the use of Hysan and chlorine dioxide dosing of the water supply had been in place for six months.[2088]

IMT 19 June 2019

802. Following a PAG on 3 June 2019[2089] at the IMT on 19 June 2019[2090] five new Gram-negative bacteraemia were discussed along with a new case of Mycobacterium Chelonae and the 2018 Mycobacterium Chelonae case. Mycobacterium Chelonae had been isolated from recent water sampling on Ward 6A. Contact with unfiltered water was the hypothesised source. This was the first time that Susan Dodd had heard of it. She noted it was not on the alert organism list so it would have required a microbiologist to consider the organism to be unusual and flag it.[2091]

803. The IMT minute of 19 June 2019 does not identify a clear hypothesis in relation to the gram-negative infections but reports a marked reduction in Gram-negative bacteria in water samples, but Mycobacterium Chelonae found inside the POUFs. The minutes does appear to describe a situation where Mycobacterium Chelonae as the primary concern[2092]. The minute also indicates that samples taken from “patients” and from water were sent for whole genome sequencing to establish if there was a match. Dr Inkster confirmed in evidence that CD would not necessarily inhibit Mycobacterium Chelonae.[2093]

804. Dr Inkster explained[2094] that “of the five Gram-negatives, one patient had links to another hospital having attended day care there. One other had an infection thought to be from a gut origin rather than the environment. Of the remaining

[2088] Susan Dodd, Transcript, Pages 55-57
[2089] Bundle 2, Document 50, Page 130
[2090] Bundle 1, p.320.
[2091] Susan Dodd, Transcript, Page 66
[2092] Bundle 1, p.323.
[2093] Dr Inkster, Transcript, Day 2, Pages 125-126
[2094] Dr Inkster, Statement, Para 795

three, one had been an inpatient on Ward 6A and the other two had attended the day unit on that ward. With the epidemiological links to Ward 6A, this warranted an IMT investigation even though different organisms were involved (Stenotrophomonas, Enterobacter and Pantoea). In my view, having several organisms together can indicate an environmental issue, particularly where there is biofilm which has a complex community of bacteria involved".

805. Mr Bisset's daughter attended Ward 6A as an outpatient for two days on 10 and 11 June 2019. She was admitted to the Royal Hospital for Sick Children in Edinburgh with an infection (Putida Pseudomonas) on 12 June 2019[2095]. Mr Bisset's daughter went on to develop two life threatening infections, Adenovirus and Aspergillus, while she was a bone marrow transplant patient in Ward 4B. She was admitted to the PICU for a number of weeks.

Meeting between Dr Inkster, Dr Armstrong and Ms Devine - 24 June 2019

806. Dr Inkster gave evidence that she had a meeting in June 2019 with Ms Armstrong and Ms Devine where they told her they did not want the matters investigated as an outbreak. Ms Armstrong told her she was a 'lone voice' and 'out on a limb'. She was told that she had not asked for expert evidence early enough and was asked a lot of questions about the epidemiology.[2096] It should be pointed out that Dr Armstrong denied saying anything of the sort[2097], but when Ms Devine was asked about this meeting, she gave a long and complex answer that did not actually confirm or deny what Dr Inkster had said.[2098]

807. It was put to Dr Armstrong that Dr Inkster said Dr Armstrong was concerned with the epidemiology of gram-negative bacteria in Ward 6A, and that there was a background rate Dr Armstrong thought was acceptable. Dr Inkster said that Dr Armstrong said that she was a lone voice. Dr Armstrong did not think this was something that she would have said.[2099] Dr Armstrong explained that there had been four investigations. The Cryptococcus sub-group and the

[2095] Witness statement of Mark Bisset at para. 103.
[2096] Dr Inkster, Statement, Para 801 and Transcript, Day 2, Pages 106-108
[2097] Dr Armstrong, Transcript, Page 142-144
[2098] Ms Devine, Transcript, Pages 125-127
[2099] Transcript, Dr Armstrong, page 142 and 143

water groups she thought had agreed with Dr Inkster. Dr Armstrong didn't feel Dr Inkster was a lone voice.[2100]

808. Regarding what Dr Armstrong thought the epidemiology was indicating at the time, she referenced an e-mail of 19 June 2019[2101] which noted that it may represent the normal background rates for gram-negative bacteraemia. It was about the Mycobacterium Chelonae cases. As such, she was of course going to ask about the background rates.[2102] Dr Armstrong explained that Dr Inkster did not reject the possibility that these were background rates.[2103]

IMT 25 June 2019

809. At the IMT of 25 June 2019 an environmental source for Mycobacterium Chelonae was hypothesised in some detail[2104]. This was the first IMT that Dr Deighan attended at the request to Dr Armstrong. There is an action point that he and Kevin Hill will find out whether other hospitals sample their drains, but he cannot remember taking that forward.[2105]

810. At other times, the hypothesis was said to be unexplained[2106]. IPC recorded that, despite dosing of the system, clinical wash hand basins in parts of the hospital had a thick biofilm present. This was not present in Ward 6A, possibly as a result of drain cleaning. Sampling of unfiltered water revealed the growth of fungi growth and other organisms[2107].

811. Dr Armstrong was referred to the minutes of the IMT on 25 June 2019 IMT[2108]. She was not at this IMT. It was put to Dr Armstrong that water was still a subject at the IMT. She was asked if she took this forward to inform executive management. Dr Armstrong explained that she followed up on it, but that it was done by the ICM.[2109]

[2100] Transcript, Dr Armstrong, page 144
[2101] See Bundle 27, Volume 8, page 135.
[2102] Transcript, Dr Armstrong, page 144 to 146
[2103] Transcript, Dr Armstrong, page 146
[2104] Bundle 1, p.328.
[2105] Dr Deighan, Transcript, Page 88
[2106] Bundle 1, p.336.
[2107] See also, IMT minute dated 25 June 2018, Bundle 1, p.327.
[2108] See Bundle 1, page 325.
[2109] Transcript, Dr Armstrong, page 146 to 148

Meeting at the Golden Jubilee Hospital

812. Following evidence from Dr Inkster[2110], Dr Armstrong described a meeting at the Golden Jubilee in July 2019. The Chief Nursing Officer had written to the ICMs, and HAI executive leads, and invited them to a meeting. Dr Inkster was not at the meeting and only found about the rest of the senior IPC staff attending a meeting because she was at the Golden Jubilee for a personal reason. Dr Armstrong was asked why she did not tell Dr Inkster about the meeting. Dr Armstrong explained that it wasn't about Glasgow, but about learning from the different boards.[2111] Dr Armstrong did not know Dr Inkster had found out or was upset about it.[2112] It was pointed out at end that they should do another with ICDs.[2113] It is difficult not to see this meeting and the failure to even tell the then Lead ICD of NHS GGC who was in the middle of what was the largest and most complex IMT in Scotland at the time as evidence of a loss of trust or support from Dr Armstrong and other senior managers in Dr Inkster at that time.

IMT of 1 August 2019

813. There was a further outbreak of infections in August 2019. Ms Ferguson recalled a meeting being called to discuss these[2114]. She also recalled being provided with a letter indicating there were two different infections on Ward 6A but that they were not linked to the environment[2115].

814. The pattern of infections was unexplained with one of each of Chryseomnas and Elizabethkingia mirocala infections being reported. There were no further Mycobacterium Chelonae cases. The IMT had not identified a solution. The minutes begin to show a focus on the chilled beams and additional prophylaxis designed to protect against gram-negative infections (Ciprofloxacin) was reinstated during this period[2116].

[2110] Dr Inkster, Transcript, Day 2, Pages 15-18
[2111] Transcript, Dr Armstrong, page 148 and 150
[2112] Transcript, Dr Armstrong, page 150 and 151
[2113] Transcript, Dr Armstrong, page 151 and 152
[2114] Witness statement of Sharon Ferguson at para. 87.
[2115] Witness statement of Sharon Ferguson at para. 124.
[2116] Witness statement of Dr Shahzya Chaudhury, paras. 153-154.

815. Patients were diverted to other centres, including Aberdeen and Edinburgh[2117]. Some were sent further afield[2118]. The Minutes of the IMT of 1 August 2019 imply that a decision was previously to close Ward 6A to new admissions and patients requiring higher risk chemotherapy[2119]. The possibility of new haemato-oncology cases going to Edinburgh was mentioned in the previous IMT minute of 3 July 2019, but no IMT records an IMT decision to close the ward to new admissions.[2120] Dr Inkster does not discuss this decision in her statement.

816. Unlike the decision to decant from Ward 2A to 6A the previous year it appears no executive level approval was given for the decision to close the ward to admissions, however Sandra Devine (then ICM) explained in her statement that she considered that the senior members of the board were well aware and were closely monitoring the situation, as it was an extremely serious situation.[2121] Dr Armstrong expressed concerned about the decision in her statement[2122], but then resiled from that position in evidence and maintained that she was not criticising the decision to close the ward to new admissions at that point.[2123]

817. Dr Armstrong was referred to the minutes of the IMT on 1 August 2019 IMT[2124]. It was put to Dr Armstrong that her statement at paragraph 318 notes that there was one case of Mycobacterium Chelonae reported via HAIRT, and this was not an 'outbreak'. It might well not be categorised as an outbreak, but it should have been as there were two cases within 18 months in the same cohort. Dr Armstrong stated that her understanding of it was that the first case had been diagnosed in 2018 and the second was in 2019. When they looked back, they found the first case and Dr Inkster did DNA sampling. It came back that one case was linked to the water supply. They had filters in the ward. In 2019, there was a case where they thought it was directly linked to water. The

[2117] Witness statement of James Redfern, para. 118.
[2118] For example, to Newcastle. Witness statement of Dr Jairam Sastry, para. 127.
[2119] Bunde 1, Document 75, at page 337.
[2120] Bundle 1, Document 74, at page 333
[2121] Sandra Devine, Statement, Para 412
[2122] Dr Armstrong, Statement, Hearing Bundle Page 257
[2123] Dr Armstrong, Transcript, Page 161
[2124] See Bundle 1, page 334.

2018 case was not linked to water, so that case was excluded.[2125]

818. Dr Armstrong was asked, if there was subsequent evidence that Dr Inkster found Mycobacterium Chelonae in water pipes in Ward 2A, would that change it to an outbreak. Dr Armstrong said it had to go through a strict process. There were two cases. Both were sent to the same lab. One was said to be linked to the water and the other was not. Water testing was done in Ward 2A in 2019. In 2018, there had not been water testing done at the time when there was a case on the ward. That was agreed between Dr Inkster and HPS. She thought the reason was because they didn't want to take off the POU filters to test.[2126]

819. Dr Armstrong was referred to the National Infection Prevention and Control Manual[2127]. Paragraph 3.1 contains a definition of a healthcare associated infection outbreak. It was put to Dr Armstrong that she was saying because the 2018 case was not linked to the water in Ward 2A it was not an outbreak. Dr Armstrong explained that DNA testing showed one case was linked to 2019 and the other was not. The other case was excluded.[2128]

820. It was put to Dr Armstrong that Dr Mumford had discovered a third case of Mycobacterium Chelonae in 2016. Dr Armstrong was only aware of it in terms of the information given to the Inquiry regarding that case.[2129]

821. It was put to Dr Armstrong that if the 2016 case had been considered in a PAG a step might have been taken to prevent the 2018 or 2019 cases. Dr Armstrong thought that was making a supposition that there was a causative agent from the environment. Chlorine dioxide does not attack Mycobacterium Chelonae. They need to develop a system that enables them to pick these up more clearly. For armed is forewarned.[2130]

822. Dr Armstrong was asked if she did not feel, as HAI Executive lead, it was her

[2125] Transcript, Dr Armstrong, page 153 to 155
[2126] Transcript, Dr Armstrong, page 155 and 156
[2127] See Bundle 27, Volume 4, Document 16, page 178.
[2128] Transcript, Dr Armstrong, page 156 and 157
[2129] Transcript, Dr Armstrong, page 157
[2130] Transcript, Dr Armstrong, page 158

job to ensure that a system existed in 2016 that would have caught it. Dr Armstrong explained that they do have a system in Scotland. They report everything via the manual and add infections to the alert system. She was suggesting the need to make things more systematic in the NHS because either people don't act, or they overreact.[2131]

IMT of 8 August 2019 and Chilled Beams

823. As of 8 August, the number of what were thought to be unusual gram-negative infections had increased again, bringing the total to 10. Stenotrophomonas, Enterobacter, Pseudomonas, Rhodococcus and a fungal infection are mentioned in the unredacted minutes). [2132] Exposure to water leaking or dripping from chilled beams or exposure to unfiltered water were the hypotheses[2133].

824. There is some evidence of a widespread incident with condensation on chilled beams on or about 22 July 2019 potentially related to very high temperatures. Wards had to close rooms.[2134] Dr Peters notes reports of leaking chilled beams on 3 June 2019 in 6 rooms. There were drips in 6 rooms, and some of the beams were visibly dirty, with one room having a raised fungal count.

825. Dr Inkster gave evidence that it was around this time that there was a report of a leak from a chilled beam reported from a family. The child's sock was wet, and the mother noticed that, and they noticed water. She asked Dr Peters to investigate, and she took photographs showing a drip from a pipe. From the condensation on the pipe and floor below they grew an unusual organism called Pseudomonas oleovorans, which tends to be found in cooling agents and lubricants. Dr Inkster considered this fairly conclusive that it was leaking cold pipework and not, as Professor Steele then insisted, leaks from the hot circuit.[2135] In respect of infection link Dr Inkster conceded there was no evidence of bacteria being found in the chilled water circuit and in samples

[2131] Transcript, Dr Armstrong, page 158 and 159
[2132] Bundle 1, p.334.
[2133] Bundle 1, p.341.
[2134] Bundle 12, Document 153 page 126 and Lynn Pritchard, Transcript, Page 162-164
[2135] Dr Inkster, Transcript, Day 2, Pages 143-145

from patients, but pointed out if one organism is found then the environment might be conducive to other organisms.[2136]

826. The Inquiry heard evidence from Ms Rankin that in 2019 she considered chilled beams to be the most likely hypothesis for the water infections given there were reports of them leaking onto a patient's bed and there had been positive microbiology[2137]. She refuted the suggestion there were comparable rates of infection in Edinburgh or Aberdeen, as she was not getting any reports from those hospitals of similar levels of infection[2138]. She also refuted the suggestion that the actions taken in relation to the water system such as chlorine dioxide and POUFs has solved the problem because significant concern was being reported by clinical staff who were expressing concern over the number of patients with bloodstream infections[2139].

827. Professor Steele confirmed that he had investigated Dr Peters' suggestion that CLO2 could be added to the chilled beam water. Though, she had said this was not likely sustainable in a closed system. Professor Steele also noted that NHS GGC have a maintenance contract on the closed system to sample the system and add biocide, which started in short order after.[2140]

Meeting between Professor Cuddihy, Dr Inkster and Mr Redfern

828. On 8 August 2019 a meeting took place between Professor Cuddihy, Dr Inkster and Mr Redfern. This was the subject of detailed evidence in Glasgow I and Glasgow II, and the substance is set out in paragraphs 437 to 459 of the Closing Submissions from Counsel to the Inquiry after Glasgow II. The evidence as it then stood is set out in summary form in paragraph 438 and will not be repeated her for reasons of space. In essence, the Inquiry Team considered that it needed to hear the evidence of Dr Inkster about the meeting of 8 August 2019 to resolve any doubt about what she may have said to Mr Redfern at that meeting and why. The topic is returned to in summary form in

[2136] Dr Inkster, Transcript, Day 2, Page 145
[2137] Annette Rankin, Transcript, page 125
[2138] Annette Rankin, Transcript, page 137 to page 139
[2139] Annette Rankin, Transcript, page 139
[2140] Transcript, Professor Steele, page 80 to 82

the discussion of duty of candour in the Communications Chapter.

829. Dr Inkster set out her position in her statement[2141] and was asked about these events on the second day of her evidence.[2142] In essence her evidence was that on 26 June 2019 after the planned meeting between her, Dr Gibson and the family of the 2019 patient she was told of a phone conversation in which Mr Hill had told Mr Redfern that they were not to contact the Cuddihy family. No reason was given. At the next IMT on 3 July 2019, Mr Hill said that the NHS GGC Chairman, Mr Brown, had spoken to Professor Cuddihy. This is recorded in the IMT Minute.[2143] It became clear at the 8 August 2019 meeting that Mr Brown had not told Professor Cuddihy about the 2019 case and Dr Inkster's evidence was that Mr Redfern had been explaining to Professor Cuddihy why they hadn't contacted him on the basis that, first of all, he had been on holiday and then he changed his reasons and then he said that it was agreed at the IMT. As neither of these were true Dr Inkster then said, "Tell Professor Cuddihy the truth, Jamie." Dr Inkster was clear that she had never been told at any point not to tell the truth and as discussed below denied telling the version of events that is recorded in Dr Deighan's report to Dr Armstrong in May 2021[2144] in the Appendix that purports to record she told Dr Green and Mr Gardiner on 6 January 2020.[2145]

830. This would appear to be sufficient evidence to enable the Inquiry to reach a conclusion into what has become known as the 'duty of candour incident'.

831. Point of use filters were reported as being fitted in all areas of the campus where Ward 6A patients might have contact with unfiltered water[2146]. Increased dosing of Chlorine Dioxide was considered. Drains were cleaned in theatres and CDU (both areas in the Ward 6A patient pathway). Water samples were to be taken from chilled beams. The programme for cleaning chilled beams was

[2141] Dr Inkster, Statement, Paras 826-829 and 1164 to 1188.
[2142] Dr Inkster, Transcript, Day 2, Pages 128-136
[2143] Bundle 1, Document 74 at Page 333 under 'Duty of Candour'
[2144] Bundle 27, Volume 6, Document 6, Page 91
[2145] Bundle 27, Volume 6, Document 6 at page 103
[2146] IMT minute dated 23 July 2019, Bundle 1, p.332.

stepped up from every 3 months to every 6 weeks[2147].

832. On being asked if she recalled discussions with families about it being safer to be treated at home, Professor Gibson indicated that she had a recollection of the discussion(s) to which reference was being made. While not expressly indicating agreement with the proposition, she did say, as regards some families who lived outwith Glasgow and who could have care locally, that she (and colleagues) "*thought it might be better that that's what happened*"[2148].

833. Among clinicians, concern grew about the absence of an explanation for the observed pattern of gram-negative infections[2149]. Professor Gibson recalled that she and her colleagues had a concern about the pattern and nature of infections rather than only the number of infections. The infections were caused by rare, environmental organisms.[2150] Dr Chaudhury had a similar recollection. Concern arose from a combination of the amount, nature and clustering of gram- negative infections[2151]. Clinicians were in little doubt that they were seeing something unusual that called for investigation of the source. Given the events of the previous 18 months, the suspicion was of a link to the environment; there was no evidence to indicate otherwise[2152].

The IMT of Wednesday 14 August 2019

834. The 14 August 2019 IMT[2153] was a difficult meeting attended by a number of witnesses who were able to speak about the meeting including Dr Inkster (Chair), Sandra Devine, Annette Rankin, Dr Sastry, Dr Peters, Jamie Redfern, Jennifer Rodgers, Professor Steele, Dr Deighan, and Kathleen Harvey Wood.

835. Dr Inkster explained that she had asked Dr Peters and Kathleen Harvey-Wood to come to the IMT as she felt that her views were being challenged by Professor Steele, and she wanted microbiology support.[2154] When this was

[2147] IMT minute dated 1 August 2019, Bundle 1, p.334.
[2148] Transcript of evidence of Professor Brenda Gibson, p.174.
[2149] IMT minute dated 1 August 2019, Bundle 1, p.334.
[2150] Transcript of evidence of Professor Brenda Gibson, pp.91-92; Bundle 6, p.1416.
[2151] Transcript of evidence of Dr Shahzya Chaudhury, p.46.
[2152] Transcript of evidence of Dr Shahzya Chaudhury, p.47.
[2153] Minute, Bundle 1, Document 77, Page 343
[2154] Dr Inkster, Transcript Day 2, Page 149; Dr Peters, Statement, Para 209.

put Dr de Caestecker, she accepted that this was a reasonable step for her to take.[2155]

836. Dr Peters described how the meeting did not start well because Professor Steele said that Jane Grant wanted minutes corrected to show that the decant decision from Ward 2A to ward 6A was Dr Inkster's not hers. That did not make sense to Dr Peters because a move of that kind potentially involving other hospitals taking patients would have to be made at a high level. They were also accused of 'overreacting', which she disputed. Professor Steele seemed to challenge what was said about leaking chilled beams, but Dr Peters' response was that she had the photographs.[2156]

837. Dr Peter's evidence about tensions around the meeting is directly corroborated by Ms Rankin in her statement[2157] and her more detailed explanation that prior to this meeting the Deputy Medical Director agreed to discuss with the Medical Director to identify any possible area that could house the patients in Ward 6A: it was noted however that the IMT could make recommendations regarding decant, but the final decision would be endorsed by the chief executive. [2158]

838. Professor Steele stated that he understood that there had had been issues attributed to condensation and potentially leaks from the chilled beams, but that they had been conflated because of not knowing the source. He confirmed that in 2019 they begun to understand the difference.[2159]

839. It was put to Professor Steele that the Inquiry had heard evidence that in March 2020 there was a serious failure of the chilled beam system. Professor Steele was aware of pipes corroding. He noted that it was conceivable the corrosion would cause more liquid to come out, but they were not gathering data at the time.[2160]

[2155] Dr de Caestecker Transcript, page 66 and 67
[2156] Dr Peters, Transcript, Day 2, Pages 110-115
[2157] Mr Rankin, Statement Page 37
[2158] Ms Ritchie, Statement, Page 36 of the Statement
[2159] Professor Steele, Transcript, page 79
[2160] Transcript, page 86

840. Professor Steele explained that the failure of the chilled beams in 2019 was associated with the heating side of the system. If thermal control was lost, then there was the potential for the flexible connection to move. Whether the connection was poorly fitted, he did not know. When the heating was restored, the fitting effectively re-sealed itself. He stated that there would have been the potential for fluid to be released from the hot side. He believed that any fluid from the cold side would've been from corrosion.[2161]

841. Professor Steele noted that they had developed a revised cleaning schedule for the chilled beams to mitigate risks. Leaks happened in terms of the dew point. They had resolved that matter. Regarding thermal loss to the beam, they had data that they had lost circulatory control. He noted that the response was to replace all the connections.[2162]

842. Professor Steele explained that given the scale of leaks, 150 rooms were affected, it would have been unlikely that there would be 150 leaks from the chilled water system. He stated that the water emanating was from condensation as opposed to leaks. Professor Steele thought there had been three dew point events in close time. He considered it unlikely that there would be leaks regarding the dew point incidents.[2163]

843. He noted that there had been a discussion after the 14 August meeting because it was a challenging meeting. The language used in the meeting was inflammatory. He stated that "when we went into meetings, there would be other – seemed to me to be always another very rare thing we had found"[2164]. In the room (on 14 August) it was said that they had found a new microorganism, which was only ever found in the space station. It was discussed afterwards how they were still in that position. Professor Steele stated that he was asked about GOSH, and Dr Peters leaned across to Professor Steele and said there had been '0' infections in GOSH. Professor

[2161] Transcript, page 87 and 88
[2162] Transcript, page 89
[2163] Transcript, Professor Steele, page 83 and 84
[2164] Transcript, Professor Steele, page 92

Steele believed that was not exactly right.[2165]

844. Ms Harvey Wood commented that at one of the meetings in which corporate management and HPS attended, Drs Inkster and Peters said the organisms were environmental in nature. Dr Kennedy said that the organisms were normal and there was no increase in microbiology issues or bacteraemia[2166]. She disagreed with that[2167].

845. Dr Deighan maintained that he was just asking questions of Dr Inkster about whether there had been an increase in the number of bacteraemia's and sought to minimise any sense of confrontation, but he did accept that his question was built on his reading of a paper by Dr Kennedy, that was attached to the minute of the previous meeting, which he had not attended.[2168] Ms Rodgers explained in her statement from Glasgow II that there "were some difficult conversations and challenge around views" and that "people were undertaking mitigations but simultaneously struggling to understand the problem". She appears (without naming her) to think that Dr Peters "had a more confrontational approach" and that two unnamed senior charge nurses from Wards 2A and 2B had told her they had found the meeting difficult and unhelpful.[2169] It was Dr de Caestecker's evidence that Dr McGuire had told her that nurses who were at the IMT had spoken to her about the IMT and confirmed that Emma Sommerville, Ms Rodgers and Sandra Devine were the only nurses at the IMT.[2170]

846. Dr Sastry explains that there certainly were leaks or condensation from chilled beams as an issue at the time.[2171]

847. Although not certainly related only to IMTs attended by Ms Dodd (the last being 25 June 2019[2172]) it is striking that she explained in her statement[2173]

[2165] Transcript, Professor Steele, page 92 to 94
[2166] Kathleen Harvey Wood, Witness Statement, page 126
[2167] Kathleen Harvey Wood, Transcript, page 87
[2168] Dr Deighan, Transcrpt, Pages 97-101
[2169] Jennifer Rodgers, Statement, Paras 336-337
[2170] Dr de Caestecker Transcript, page 58
[2171] Dr Sastry Glasgow II statement, Paras. 226-230
[2172] Bundle 1, Document 73, Page 325
[2173] Susan Dodd, Statement 1, Paras 103-104, Hearing bundle page 253

that:

> 103. There was also a lot of tension and at times frustration conveyed at IMTs by some senior management staff in particular. I recall Kevin Hill and Tom Steele being very frustrated at points throughout the incidents. Frustrations appeared to be directed at Dr Inkster. Dr Inkster often had to ask for reports or results on multiple occasions which were necessary to allow the IMT to fully explore the hypotheses. However, these were not always made available.
>
> 104. The content of previous minutes would be debated for a long time and IMTs often extended well beyond the allotted one-hour meeting time. I recall there being a change in practice at one point in NHS GGC regarding minute taking. These were to be changed to action notes instead. Often the action notes did not capture all the necessary detail, or some members would not be content with the context of the notes. The notes would then be updated following discussion, but I don't think there was a clear system for circulating final notes for each IMT. I didn't look forward to attending IMTs because I felt that it wasn't a supportive environment. It was also evident that supplementary discussions were taking place outside of IMTs and over time I no longer felt fully informed before or after an IMT. There were pre meetings before many of the IMTs attended by the SMT. I wasn't clear on the governance or decision-making taking place outside of IMTs. In terms of anything I was reporting at the lead IPCN meeting each week and at the AICC, I am not clear on what happened to those reports or what action was being taken.

848. Ms Dodd's evidence is not consistent with the understanding later presented at the meeting of 20 August 2019 about the nature of the problem with the IMTs but is consistent with the Dr Inkster's evidence about IMTs that summer and Dr Peters and Ms Harvey-Wood's evidence[2174] about the IMT of 14 August 2019.

849. Professor Steele noted that the IMTs were increasingly difficult in terms of determining where the environmental source was emanating from. Given all the work they had done to the water in terms of chlorine, drains, chilled beams, point of use filters, the next thing Professor Steele asked the estates team to do was to look above the ceilings. He stated that people were

[2174] Ms Harvey-Wood, Transcript, Pages 83-95

frustrated that they couldn't find an answer despite the work done. Professor Steele considered that they had mitigated and improved where they could.[2175]

850. Professor Steele said that he did not recall speaking to Dr Kennedy at the end of the meeting on 14 August 2019, nor that he referenced a possible change to the IMT chair. He denied saying to anyone that the IMT chair should be changed.

851. Dr Armstrong gave evidence about how some IMT members raised concerns about the IMT in early August 2019. Some unease had been raised with her by Professor Steele, Kevin Hill, and Sandra Devine. She could not recall all the names.[2176]

Dr Peters' Whistleblow to HPS

852. On Friday 16 August 2019, Ms Imrie at HPS was contacted by Dr Peters raising her concerns about the hospital. She asked Dr Peters to put her concerns in writing which she did.[2177] The concerns were then shared on an anonymous basis with the Whistleblowing executive within NSS and the Scottish Government.[2178]

853. The main points of the Whistleblow to HPS, were that Dr Inkster was unable to do her job in protecting patients from infections due to the culture and organisational failings, citing lack of support from management, that critical information had been denied to her; or false accounts given by high level managers and that microbiology/clinical judgement regarding the fact that there is a real issue with unusual environmental pathogens in Haematology paediatric patients is being continuously questioned.[2179] Laura Imrie emailed Jason Birch of NHS GGC.[2180] This Whistleblow was investigated by Dr de Caestecker along with a colleague from NHS Fife. They reported in December 2019[2181] The report was about how the IMT was operating and the support for

[2175] Transcript, Professor Steele, page 90 to 91
[2176] Transcript, Dr Armstrong, page 162
[2177] Bundle 27, Volume 4, Document 17, Page 209
[2178] Laura Imrie, Transcript, Pages 77-78
[2179] Bundle 27, Volume 5, Document 7, Page 24
[2180] Bundle 27, Volume 5, Documents 7, page 24
[2181] Bundle 27, Volume 7, Document 49, Page 536

the chair.[2182]

Meeting of Tuesday 20 August 2019

854. Dr de Caestecker explained that she first heard about changing the IMT chair after the meeting on 14 August 2019. She had been told there had been feedback to Dr McGuire, Dr Armstrong, and to Sandra Devine, that it had been a difficult meeting. She did not receive feedback directly. Dr Armstrong spoke to her to ask what could be done. She noted that the guidelines said that if the IMT is not working well then, the Director of Public Health can intervene. She agreed to chair the meeting on the 20th of August at the request of Dr Armstrong.[2183]

855. The Inquiry has an email sent on behalf of Dr de Caestecker on Friday 16 August inviting a range of senior NHS GGC staff to a meeting of 20th August 2019.[2184] From its minute[2185] the meeting appears to have decided to remove Dr Inkster as chair of the IMT. Questions were asked of a number of those present: Dr de Caestecker, Dr Armstrong, Dr Deighan, Professor Steele, Dr Kennedy, Sandra Devine, Dr Mathers and Ms Rodgers. Mr Redfern was present but was not asked about this meeting in Glasgow II.[2186]

856. Dr de Caestecker was asked about the invitation to the meeting on the 20th of August.[2187] She confirmed that the meeting was to discuss the working of the IMT, and that Dr Armstrong drafted the invitation, and she then agreed it. She maintained that everyone invited knew what it was about, and that the invitation might have been deliberately vague to not presuppose the outcome. Dr de Caestecker did not consider the outcome of the meeting to be inevitable. She did not know why Professor Gibson was not invited. They did not consider inviting clinicians. It was Dr de Caestecker's position that the meeting was not asking if Dr Inkster was a good or bad chair, but rather about

[2182] Transcript, page 86 and 87
[2183] Dr de Caestecker Transcript, page 54 to 58
[2184] Bundle 14, Vol 2 p 568
[2185] Bundle 6, Document 22, Page 70.
[2186] Jamie Redfern, Statement, Para 119
[2187] See Bundle 14, Vol 2 page 568

making the IMT work well.[2188] Somewhat remarkably, Dr de Caestecker also argued that it was not Dr Inkster's behaviour at the IMT of 14 August 2019 that was at issue, but Dr Peters'.[2189]

857. Dr Inkster recalled Sandra Devine speaking to her on Monday 19 August 2019. She was told by Sandra that she would need to give up the chair of the IMT, as the meeting was terrible and there was no team working. She said Scott Davidson would be taking up the chair.[2190]

858. Turning to the meeting, the Inquiry has the minute[2191]. Dr de Caestecker's evidence that she stated that they would not have changed the chair unless they had spoken to Dr Inkster and the IMT is simply inconsistent with the first action point which reports that the decision to change the chair was made at the meeting.[2192]

859. In contrast to the position taken by Dr Armstrong[2193], Dr de Caestecker agreed that there is nothing in the minutes to describe a substantive reason to change the chair. There was a lot of discussion about the behaviour and management of the chair. She confirmed that there is nothing saying the IMT chair was going down the wrong evidential route.[2194] Somewhat strangely, Dr de Caestecker would not accept that the meeting only obtained a partial perspective that looked at one side of the argument. Her response to that was that what she wanted to do was to ensure that a crucial IMT was working well and the feedback that she had received was that it was not.[2195] She did later explain that it was presented to her as if some of these tensions were getting greater, probably because things were going on for a long time and there was concern that, "Are things still not solved?" So, I can understand why tensions and emotions might be higher as the process went on.[2196]'

[2188] Dr de Caestecker Transcript, page 59 and 60
[2189] Dr de Caestecker Transcript, page 78
[2190] Dr Inkster, Transcript, Day 2, Page 158
[2191] Bundle 6, Document 22, Page 70
[2192] Dr de Caestecker Transcript, page 61 to 63
[2193] Dr Armstrong Statement, Question 416, Hearing bundle page 291
[2194] Dr de Caestecker transcript, page 65 and 66
[2195] Dr de Caestecker transcript, page 67 and 68
[2196] Dr de Caestecker, transcript, page 72 to 75

860. Dr Deighan claimed not to remember receiving the email, but accepted that he would have read it as an invitation to a meeting to discuss a number of issues regarding the haemato-oncology unit at the hospital[2197] and accepted that the subject of the meeting was not indicated from the invitation.[2198] He could not remember specifics of the meeting, but accepted that the chair of the IMT was not being consulted .Had the meeting being about something he was doing and he had not been present he would not have been very happy. When it was put to him that it was not proper for a group of doctors and nurses to hold a meeting to discuss the then-lead ICD's conduct of her meetings without giving her notice and in her absence, he initially suggested that this would be better directed at the chair of the meeting. When pressed about his own responsibility he responded that he did not recall the email and did not recall the context in which the meeting was called. Dr Deighan was not aware of whether anyone in this meeting had taken the soundings of the members of the IMT who weren't present at this meeting.[2199]

861. Dr Mathers was asked about the invite he received to the meeting of 20th August 2019.[2200] He agreed that it said nothing about the handling of IMTs or the chairing of IMTs. He accepted that if something similar had happened to him in his absence he would not be very happy about it.[2201] Asked about the nature of IMT discussions, he repeated his view that there were robust challenges but in general terms, things were conducted in a reasonable way.

862. A similar response was extracted from Sandra Devine,[2202]' if it had been her, she would have been off complaining immediately'. She claimed to have treated the meeting at which a decision was made to remove Dr Inkster as IMT chair as a positive for Dr Inkster. Asked if she had not thought it inappropriate to do this when Dr Inkster was not there, she accepted that on reflection perhaps she should have raised that (and blamed her inexperience).

[2197] Dr Deighan, transcript, Pages 102-104
[2198] Dr Deighan, transcript, Page 107
[2199] Dr Deighan, Transcript, Page 107-116
[2200] Bundle 14, Vol 2 p 568
[2201] Transcript of Dr Alan Mathers p63
[2202] Transcript of Sandra Devine p135

She regretted how it all played out.[2203] More difficult to understand is one of her subsequent emails.[2204] NSS had recorded the removal of the IMT chair by NHS GGC. Sandra Devine then challenged that. She suggested the chair had agreed to be replaced. That was plainly not correct. In Sandra Devine's own words, 'I overstated her position, and I regret it.'[2205] Even that statement is not correct. It is not clear why it was done. When Dr Inkster emailed seeking a written explanation[2206], Sandra Devine did not reply.

863. Professor Steele confirmed that he knew what the meeting on 20 August 2019 was to be about. He confirmed that Dr Inkster was not present, and that the reason for the meeting was to discuss the IMT and relationships. Professor Steele confirmed at the meeting they decided to replace the chair.

864. In her statement, Ms Rodgers described the meeting of 20 August 2019 as "an open discussion" with "people speaking openly", but was not asked about the meeting in Glasgow II.[2207] Given Dr Inkster's absence from the meeting of 20th August there is an argument that the Inquiry should have recalled Ms Rodgers in Glasgow III, but perhaps the practical approach is simply to assume that, in the absence of the subject of their discussions, those present on 20 August felt able to discuss what measures to take. Dr Kennedy accepted that while Dr Inkster did not know the agenda for the meeting, he knew about the 20 August 2019 meeting, having had earlier discussions with Dr de Caestecker that it concerned IMT performance[2208]. He conceded that it would have been appropriate to provide more information in the invite email sent on 16 August 2019[2209].

865. Dr Armstrong was referred to the e-mail of 16 August 2019[2210]. This was the invitation to the meeting on 20 August 2019 sent by Dr de Caestecker's assistant. Dr Armstrong wrote the e-mail. She wanted to say that the

[2203] Transcript of Sandra Devine p142
[2204] Transcript of Sandra Devine p135
[2205] Transcript of Sandra Devine p143
[2206] See Bundle 14, Volume 2, page 570
[2207] Jennifer Rodgers, Statement, Para 337-338
[2208] Dr Iain Kennedy, Transcript, page 84
[2209] Dr Iain Kennedy, Transcript, page 88
[2210] See Bundle 14, Volume 2, Document 144, page 568.

children's ward was closed, and they had a debate around the cause. There was extreme stress for staff and patients. When that was going on, she had to step in as medical director. She had to put things back on track. There was a high clinical risk. There was a lack of understanding about what the hypothesis was. She had tried to write it carefully. She was not setting out that the meeting was to come and discuss the IMT chair. It was about the functioning of the IMT.[2211]

866. It was put to Dr Armstrong that she did not mention the IMT or the chair at all. Dr Armstrong said that she could have. She was trying to write an e-mail that didn't pre-judge anything. She was looking at a risk, and that the IMT was not functioning.[2212]

867. Dr Armstrong was asked what steps she had taken to consult the clinicians treating the patients. Dr Armstrong explained that they were under extreme stress. They were delivering care to children. The Board needed to make sure the IMT was working.[2213]

868. It was put to Dr Armstrong that she did not even contact any of the clinicians to check in with them. Dr Armstrong explained that was correct, but not in the way the inference was coming across. The Board needed to step in. She was not presupposing what was going to come out of it.[2214]

869. Dr Armstrong was taken to the minute of the meeting on 20 August 2019[2215]. Dr Armstrong did not recall when she asked Dr de Caestecker to chair the meeting. Dr Armstrong did not know why Dr Kennedy was at the meeting.[2216]

870. It was put to Dr Armstrong that some people at the meeting meet the definition of an executive to make a decision. If Dr Kennedy was there, why not others. Dr Armstrong was asked if she would accept that the process was carried out in such a way as to create an enhanced sense of suspicion in Dr Inkster by

[2211] Transcript, Dr Armstrong, page 162 and 163
[2212] Transcript, Dr Armstrong, page 163 and 164
[2213] Transcript, Dr Armstrong, page 164 and 165
[2214] Transcript, Dr Armstrong, page 165
[2215] See Bundle 6, Volume 2, page 70.
[2216] Transcript, Dr Armstrong, page 166

the end of the process. Dr Armstrong regretted that Dr Inkster was hurt. She was invited to the meeting. Dr Armstrong wanted it to be a meeting where they could come to a decision with Dr Inkster. It could have been handled a lot better. It was their responsibility as a board to put the IMT back on track. They did achieve that. The children went back to Ward 6A, and they have low infection rates.[2217]

871. It was put to Dr Armstrong that the opening background doesn't mention that the balance of risk was calling for action. Dr Armstrong was asked why it was that after the meeting, the minute doesn't discuss that they needed to act because of the risk, but rather that they needed to act because of behaviour. Dr Armstrong explained that the meeting was called because people said they had concerns about the meeting on 14 August. She had concerns about what happened. The reason they were acting was because of the concerns, but also because they were concerned about where the IMT was going. It was not making progress.[2218]

872. It was put to Dr Armstrong that there was an alternative perspective that there were people who didn't like the IMT. They were executive staff who were challenging microbiologists. They came to her and said they wanted to change the chair. Dr Armstrong took issue with that. When an IMT became bigger and the consequences were significant, every health board would be looking at sending senior clinical people in there. Where she thought they did go wrong was that it needed to be clearer why they were there. They should have been testing the evidence. Dr Inkster said she would have decanted the children. People have to test the evidence of that decision. It is a balance of risk.[2219]

873. It was put to Dr Armstrong that this IMT came off the rails, but that she accepted that the other ones didn't. They worked fine. Dr Armstrong was asked what the difference was between the water incident, or decant, or Cryptococcus, and this one given that they had the same chair and the same

[2217] Transcript, Dr Armstrong, page 166 and 167
[2218] Transcript, Dr Armstrong, page 167 to 169
[2219] Transcript, Dr Armstrong, page 168 to 171

number of people. Dr Armstrong explained that, at the time, going through 2018, she wondered if there was enough questioning at the IMTs. She thought the decant did need to happen. They needed to build a new unit for those children. The unit had not been built right. They had done a lot of modification to it, but to restore confidence, it was the right thing to do. She said that, initially, Dr Kennedy was a lone voice in asking about what they were seeing and what was happening.[2220]

874. Regarding the interventions in 2018, Dr Armstrong said fitting filters was not the wrong thing to do. She said that actions needed to be taken. If one looks at the minutes in June 2019, she thought some actions in retrospect were not the right ones. For example, the drains. 8 June 2018, you see there were 9 Stenotrophomonas cases. Dr Inkster suggested there was not a link to the water. Dr Inkster noted that Meropenem prescribing was up in the first quarter of the year. That then disappears when you get to 13 June, and suddenly they become water cases. Dr Armstrong accepted she was not an expert in any of this. When one looks back you begin to see that because she was reporting it publicly in the HAIRT. If one looks at the drain issue, they all thought there was aerosolization. They were all anxious about the building. By 2019, what she thought was happening was if one asked questions that was being seen as a challenge. In her view no doctor was too big to be asked questions of.[2221] Dr Armstrong said that what needs to come together in the IMT is the expertise of everyone around the table. If you have one voice dominating, good things do not happen. Her view was that when you get Dr Crighton and her experience with chairing, you can allow other voices to come through.[2222]

875. It was put to Dr Armstrong that Professor Steele got quite cross that Dr Peters gestured zero with her hands when explaining that there were no gram-negative cases at GOSH. Dr Armstrong was asked if there was not a connection between Dr Stewart's report and this. Dr Armstrong said no. What needs to come together in the IMT is the expertise of everyone around the table. When you get Dr Crighton and her experience with chairing, you can

[2220] Transcript, Dr Armstrong, page 171 and 172
[2221] Transcript, Dr Armstrong, page 172 to 175
[2222] Transcript, Dr Armstrong, page 175 and 176

allow other voices to come through.[2223]

876. Dr Armstrong was asked if she subscribed to the view that it had become about proving themselves right and not focusing on the children. Dr Armstrong thought it became more about the debate. She had worked with Dr Inkster for a long period. Dr Inkster did a lot of good. Dr Armstrong thought it became more about the environmental focus than the patients. She thought people were focused on the patient but became over identified with certain hypotheses rather than looking in a much broader way.[2224]

877. Dr Armstrong was referred to her witness statement where she said that there was a view set out in external review more about proving themselves right than the children[2225]. Dr Armstrong was asked if she was saying that Dr Inkster's behaviour became more about proving herself right than the children, and if so, why. Dr Armstrong explained that she thought her view was that she became identified with the hypothesis of the environment. It drove the IMT away from other areas it should explore. It led to a loss of perspective. She wanted the evidence looked at because if it's normal background, you start to take more abnormal reactions that have a greater impact on children. She could not give a yes or no answer. The focus became about the environment and led to a lack of focus on the children. The actions taken led to a lack of focus on the children. Dr Armstrong thought the focus on the environment took the focus away from the children.[2226]

878. Dr Armstrong was asked if Dr Armstrong's duty as a doctor was to act in the best interests of patients. Dr Armstrong stated that her position was that the IMT focus degenerated. It was not looking at the broad issues. It became skewed to the environment.[2227]

879. Dr Armstrong was asked if the focus of Dr Inkster was the best interests of her patients. Dr Armstrong stated that she thought she believed that. She did not

[2223] Transcript, Dr Armstrong, page 175 and 176
[2224] Transcript, Dr Armstrong, page 176 to 178
[2225] Witness Statement, Dr Armstrong, page 293
[2226] Transcript, Dr Armstrong, page 225 to 227
[2227] Transcript, Dr Armstrong, page 227 and 228

think Dr Inkster's actions led to that. She would not go as far as to say she was not focused on the patients.[2228] It seems only fair to note that as discussed in Chapter 3 and Chapter 6 of the submission of the counsel to the inquiry is that this criticism is not objectively justified partly because there was considerable evidence that Dr Inkster was right to be concerned about infection rates in the summer of 2019 and the potential that chilled beams and residual risk from the water supply posed a risk to patients, but also because Dr Armstrong did not attend any of these IMTs herself, no IPC trained clinician or treating clinician was willing to back up her criticism and most profoundly of all Dr Armstrong and Dr de Caestecker were clear that no thought was given to getting the insight of Professor Gibson who might be well placed to assess the critique made by those people who Dr Armstrong did speak.

880. Regarding Dr Peters, Dr Armstrong was asked to what extent did that sentence refer to Dr Peters at IMTs. Dr Armstrong explained that one IMT, the 14 August 2019 IMT, focused on their hypothesis and on the environmental issue and not on the wider focus on children. The focus was on the argument. Dr Armstrong said you would need to ask Dr Peters if her primary focus was the interest of patients. The focus was on what she had been brought there to do. The IMT became dysfunctional. That was the way it appeared to Dr Armstrong. She was relying on years of experience in the NHS and in her job. She knew what was coming out of the IMT. The chair did not report that IMT to her. Professor Gibson did not report it to her. Dr Armstrong had a view that has solidified over time. Her sources were the reports that came through the meeting on 20 August 2019. She thought the IMT was going the wrong way. She was not sure she could say it was not focused on the children. It was focused on the arguments.[2229]

881. It was put to Dr Armstrong that the Inquiry heard evidence that Sandra Devine communicated with NSS about the principle of whether a public health doctor could chair. She was asked why she did not brief HPS and ARHAI in advance. Dr Armstrong explained that it was the NHS GGC director of nursing, Mags

[2228] Transcript, Dr Armstrong, page 228
[2229] Transcript, Dr Armstrong, page 228 to 233

Maguire, who texted Jacqui Riley to say they wanted to change the chair. Dr Armstrong accepted that the way it was handled was poor. She had told NSS about the meeting because she spoke to their medical director. She probably did not go into detail about the meeting. They should have done it better. NSS were not told they were going to replace the chair.[2230]

882. Dr Armstrong conceded that it was not being done in the most effective way possible. However, she was keen for the IMT going ahead. Sandra Devine had been trying to get in contact with Dr Inkster but was told not to contact her. It was handled badly. Moving the meeting to the Monday would have lost four or five days. They had a clinical risk.[2231]

883. Dr Armstrong was referred to an e-mail from Dr Crighton on 23 August 2019[2232]. Dr Armstrong was asked if she had been in contact with Dr Crighton before this e-mail. She said she had not. Dr Armstrong wanted Dr Crighton to be fresh. She did not brief her in advance. There was not time for that anyway. Dr Armstrong did not want to pre-empt anything.[2233]

884. Professor Steele did confirm that he knew what the meeting on 20 August was to be about. He noted that he probably found out what the meeting was about from discussing with Dr de Caestecker or Dr Inkster. [2234]

885. Professor Steele confirmed that Dr Inkster was not present, and that the reason for the meeting was to discuss the IMT and relationships. Professor Steele confirmed that at the meeting they decided to replace the chair. He confirmed that he would have felt aggrieved if he had been removed as chair without being at the meeting. He further stated that the meeting of 14 August would have made him think of a lack of control in the meeting. Professor Steele considered that a lot of thinking had gone into the impact that meeting had on colleagues. He noted that perhaps the process could have been done

[2230] Transcript, Dr Armstrong, page 178 and 179
[2231] Transcript, Dr Armstrong, page 179 and 180
[2232] See Bundle 27, Volume 8, page 147.
[2233] Transcript, Dr Armstrong, page 180 and 181
[2234] Transcript, page 92 to 94

more collaboratively with Dr Inkster.[2235]

886. Dr Inkster was adamant that no one contacted her between the meeting of Tuesday 20 August and the IMT of Friday 23 August to tell her what was going on.[2236] She recalled receiving the minutes of the 20 August meeting before the IMT of 23 August. She was very upset when she read them as she didn't recognise the reference to behaviour directed to her. Nobody had given her any feedback about her behaviour at IMTs.[2237] Dr Inkster felt that she did not really get sufficient feedback for her removal as chair of the IMT. She didn't feel there had been adequate discussion. She considered an appropriate approach would have been to discuss appointing a deputy chair with her. She did not consider the process of removing her as chair to have been fair because senior staff were discussing her behaviour with others.[2238]

887. It was put to Dr Armstrong that the Inquiry heard evidence that Sandra Devine communicated with NSS about the principle of whether a public health doctor could chair. She was asked why she did not brief HPS and ARHAI in advance. Dr Armstrong explained that they should have done it better. NSS were not told they were going to replace the chair.[2239]

888. Dr Armstrong conceded that it was not being done in the most effective way possible. Sandra Devine had been trying to get in contact with Dr Inkster but was told not to contact her. It was handled badly. Moving the meeting to the Monday would have lost four or five days. They had a clinical risk.[2240]

889. There was confusing evidence about whether, after the meeting of 20 August 2019, Dr de Caestecker and Ms Devine knew whether Dr Inkster was back at work and would attend the IMT. No other ICD would take on the chair.[2241]Slightly surreally it emerged in evidence that Dr de Caestecker had offered the chair of the IMT to Dr Crighton and Dr Kennedy as a choice between

[2235] Transcript. page 96 to 99
[2236] Dr Inkster, Transcript, Day 2, Page 158
[2237] Dr Inkster, Transcript, Day 2, Page 155-156
[2238] Dr Inkster, Transcript, Day 2, Page 160
[2239] Transcript, Dr Armstrong, page 178 and 179
[2240] Transcript, Dr Armstrong, page 179 and 180
[2241] Dr de Caestecker, Transcript Page 68

attending another meeting and chairing the IMT.[2242] Her e-mail to Dr Kennedy and to Dr Crighton on 22 August 2019[2243] said nothing in the e-mail about Dr Inkster being off sick or about the IMT needing a new, permanent chair.[2244] Somewhat surprisingly, Dr Crighton received no briefing before the meeting of 23 August 2019, but somehow she learned that Dr Inkster was on sick leave.[2245] It was Dr Armstrong's evidence that she did not brief Dr Crighton in advance.[2246]

890. It is difficult to see the actions of those who organised and attended the meeting of 20 August 2019 as being in 'good faith'. Only Dr Armstrong had an explanation for the gnomic nature of the invitation[2247] and no other witness gave that reason. The absence from the meeting of Professor Gibson as lead clinician for the patients who were the subjects of the IMT investigation is, once it is realised that no thought was given to invite her, a real sign that this was not an open meeting, but a deliberately secretive attempt to remove Dr Inkster because Professor Steele and others were not happy with her approach. Had this meeting been carried out in good faith then Professor Gibson would have been told and her views sought. As it is, the outcome of the meeting eventually comes as a complete surprise to Professor Gibson at the IMT of 23 August 2019.[2248] Had the change of chair really been about improving the conduct of the IMT, then more thought would have been given to who the new permanent chair might be, and one would expect Dr Crighton to be briefed beforehand. It was her evidence that she was not.

The IMT of 23 August 2019

891. Immediately before the IMT on 23rd August 2019 some members of the IMT had to wait outside whilst a "pre meet" was being held by "senior members of NHS GGC" [2249]. No treating clinicians were at the pre-meeting and Ms Rankin

[2242] Dr Crighton, Transcript, Page 6
[2243] Bundle 27, Volume 13, Document 8, Page 52
[2244] Dr de Caestecker, Transcript, Page 69
[2245] Dr Crighton, Transcript, Pages 7
[2246] Transcript, Dr Armstrong, page 180 and 181
[2247] Dr Armstrong, Transcript, Page 163
[2248] Professor Gibsons's Statement, para 223
[2249] Annette Rankin Statement, Answer to Question 51(b), hearing bundle, Page 40

from HPS/ARHAI was also waiting outside the room with Dr Inkster. It was recalled by Dr Kennedy that Sandra Devine, Dr Deighan and Dr Crichton were in this pre-meeting. He explained the purpose of the pre-meeting was to get Dr Crichton up to speed on the IMT[2250]. In his view, having a pre-meeting was within the bounds of IMT practice but did increase the strain of the IMT, because senior people were being made to wait outside and the pre-meeting ran on[2251]. Ms Rankin recalled waiting outside along with Dr Sastry, Professor Gibson, Dr Inkster, Ms Somerville, Mr Purdon, Mr Mallon, Dr Murphy, and Dr Ronghe. Her recollection was that Sandra Devine was inside along with Dr Crighton, Tom Steele, and Dr Deighan. She accepted that this was all the ICDs plus a couple of other people that were waiting outside the room while the pre-meeting was ongoing. She recalled this was the first pre-meeting she had come across, and that the pre-meeting was significantly over time to the extent that some of the clinicians were getting anxious because they had clinical commitments[2252].

892. The meeting opened considerably later than planned and was chaired by Dr Crighton who started with introductions. She had never met Dr Inkster before.[2253] The meeting did not start well.[2254] As introductions were underway, Ms Rankin and Professor Gibson discussed finding out why Dr Inkster was not in the chair and Ms Rankin then asked Dr Crighton why.[2255] Dr Inkster recalled informing the IMT that she had been told that the previous meeting had been dreadful, and everyone felt it was dreadful because of her own behaviour and the lack of team working. Nobody responded. Subsequently, after the meeting, she recalled Annette Rankin and Brenda Gibson telling her that she had not been a terrible chair, and she had chaired the meetings well. The meetings had been difficult and challenging because of other people and not because of her.[2256] Ms Joannadis had a different take on events. She described the meeting as a business-like and formal meeting. Somewhat

[2250] Dr Iain Kennedy, Transcript, page 94
[2251] Dr Iain Kennedy, Transcript, page 96
[2252] Annette Rankin, Transcript, pages 143 to 145
[2253] Dr Crighton, Transcript, Pages 17-18
[2254] Dr Crighton, Transcript, Pages 22-24 and Annette Rankin page 131
[2255] Annette Rankin Statement, Answer to Question 51(b), hearing bundle, Page 40, Dr Inkster Transcript, Day 2, Page 161
[2256] Dr Inkster, Transcript, Day 2, Page 164

surprisingly she maintained, contrary to the terms of the minutes, that it was not explained to her why the chair changed.[2257] Dr Kennedy's recollection of the meeting was that some people at the meeting were confused because they did not know what was going on with the replacement of Dr Inkster by Dr Crichton[2258].

893. As the minute notes, an explanation was given by Ms Devine, but Dr Inkster has a slightly different take on what took place.[2259] Professor Gibson was unaware of the change in Chair before the meeting and asked the reason. She recollected that Sandra Devine didn't give a clear answer.[2260] Ms Rankin recalled in evidence that during the IMT meeting, no explanation was given as to why there was a change of chair. Professor Gibson said, "Can I ask why there's a change in chair?" and Sandra Devine responded that she had a conversation with Dr Inkster and given complexities the chair was going to be changed. Ms Rankin recalled then interjecting and stated: "As long as due process is followed, and this is recorded in the minutes from a governance perspective." She commented further that she received a response that "We have discussed this with Professor Reilly". She recalled thinking it must have been extremely uncomfortable for Dr Inkster to sit through the IMT meeting[2261]. Professor Steele did not recall Ms Rankin having raised concerns about the way that the chair had been changed. He was not aware of what steps might have been taken to ensure that the treating clinicians would have been informed about the process[2262].

894. An unusual aspect of this meeting is that Ms Rankin's evidence was that Sandra Devine advised her, in the meeting, that the change of chair had been discussed and agreed with Professor Reilly, of HPS. Her evidence was that on checking with Professor Reilly after the meeting the question asked by NHS GGC Director of Nursing on 20th August 2019 was about whether it was acceptable for a CPHM to chair an IMT if it wasn't an ICD and not about the

[2257] Pamela Joannidis, Transcript, Pages 154-158
[2258] Dr Iain Kennedy, Transcript, page 90
[2259] Inkster, Transcript, Day 2, Page 162
[2260] Professor Gibson, Statement, Para 223
[2261] Annette Rankin, Transcript, pages 148 and 149.
[2262] Transcript, Professor Steele, page 98 and 99

specifics of this IMT.[2263]

895. The substance of the IMT as recorded in the minutes[2264] included a confirmation that the primary hypothesis was that the increase in Gram-Negative bacteraemia are the chilled beams either leaking or dripping condensation into patients and their surroundings. Dr Kennedy is recorded as talking about his epidemiology report noting that patterns were similar to the old Yorkhill hospital, and these infections had been seen there before. Dr Inkster was not re-assured as Yorkhill was a very old building with poor water quality.[2265] The minute of the IMT meeting also records agreement that a peer review in relation to Ward 6A ought to be carried out by someone external to NHS GGC who worked in a similar ward[2266].

896. Ms Imrie accepted that the exchanges between Ms Devine and Dr Inkster following the IMT of 23 August 2019 concerning the replacement of Dr Inkster as chair were unusual.[2267] She was surprised at the change because Dr Inkster had historical knowledge of the investigations and the IMT had been running for such a long time. This would result in Dr Inkster not getting access to all the information; only being able to see some microbiology results. Her view was that ARHAI should have been contacted by NHS GGC if they were thinking of replacing Dr Inkster, as the Scottish Government would have wanted to know of such a significant change.[2268] Ms Devine was asked about this email exchange. Her approach is difficult to understand.[2269] NSS had recorded the removal of the IMT chair by NHS GGC. Sandra Devine then challenged that. She suggested the chair had agreed to be replaced. That was plainly not correct. In Sandra Devine's own words, “I overstated her position, and I regret it.”[2270] Even that statement is not correct. It is not clear why it was done. When Dr Inkster emailed seeking a written explanation[2271],

[2263] Annette Rankin Statement, Answer to Question 51(b), hearing bundle, Page 40
[2264] Bundle 1, Document 78 at page 350
[2265] Dr Inkster, Statement, Para 902
[2266] Bundle 1, p.348 and p.353.
[2267] Recorded in an email sequence at Bundle 27, Volume 11, Document 20, Page 99
[2268] Laura Imrie, Transcript, Pages 78-82
[2269] Bundle 27, vol11, p101
[2270] Transcript of Sandra Devine p143.
[2271] Bundle 14 vol 2 p570

Sandra Devine did not reply.

897. It was explained by Dr Inkster that she considered she was replaced as IMT chair because organisational reputation took priority over patient safety. In her view, the IMT was leading towards potentially another decant, and she thought that would be unpalatable to the organisation. They didn't want her involved anymore. She considered the shift to organisational reputation to have taken when the Cryptococcus incident occurred in January 2019.[2272] Dr Kennedy suggested that there may been merit in Dr Inkster being replaced as IMT chair and gave an example of handwritten notes from the lab being brought late to an IMT. His view was that IMTs should be better prepared, looking at the results in advance and then considering the implications at the IMT[2273].

898. Dr Crighton accepted that the meeting of 23 August 2019 could have been handled better, and in an ideal world she would have had a discussion with Dr Inkster to have a clear handover before the meeting.[2274]

899. Reflecting on these meetings, it is the inescapable conclusion that the way that Dr Armstrong, Dr de Caestecker and Ms Devine handled the change of IMT chair was an unnecessary and cruel humiliation for Dr Inkster. In term of fairness, respect for colleagues and professionalism it was entirely unjustified and inexcusable. If the Executive Board of NHS GGC, the Medical Director or the ICM had a good reason to remove Dr Inkster as chair of the IMT (and it is far from clear that they did) then they could have done so in a manner that showed respect for a colleague and for the importance of this IMT. The fact that this shabby procedure was adopted does NHS GGC no service and, it is submitted, raises serious questions for Glasgow IV about whether NHS GGC's actions at this time were focused solely on the interests of their patients rather than the protection of its reputation.

[2272] Dr Inkster, Transcript, Day 2, Page 178-180
[2273] Dr Iain Kennedy, Transcript, pages 96 and 97
[2274] Dr Crighton, Transcript, Page 29

Changes to the IMT Meetings after 23 August 2019

900. Clinicians recalled that the change in the Chair of the IMT on 23 August 2019 signalled a change in the IMT's methodological approach. The consistent impression of the clinical witnesses was that the emphasis of the IMT's investigation switched. Prior to the change in Chair, the IMT had sought an explanation for the unusual pattern of infections. After the change in Chair, clinicians felt the emphasis was on disproving the validity of the underlying suspicion about infection; that an unusual pattern had to be positively proved before it could be investigated[2275]. Dr Crighton disagreed, but did see the investigation of what the normal expected background was as a key part of an investigation.[2276] Dr Kennedy remarked that there was a change in focus following the change of the Chair with objectives being set; it was no longer reactive and was returning to a "business as usual" position[2277].

901. Professor Leanord claimed not to be able to say whether there was a change of approach, not having been at previous IMTs. However, asked whether the emphasis after the change was on trying to show that infections were not connected to the hospital, his reply was "absolutely I think that's correct."[2278]

902. Ms Joannidis was pressed about what some witnesses have described as a change of approach in the IMT after Dr Inkster was removed as chair. Ms Joannidis rejected the idea that within the IMT there was a general acceptance that the infections being seen were normal and thus the IMT could be closed down. She described the approach as "We've done what we can and we are continuing to do-- put measures in place for the chilled beams and for the drains and for the water, but let's look wider."[2279]

903. The evidence suggested that in August and September 2019, clinicians felt under pressure to support lifting the re-opening of Ward 6A to new admissions. Not only did they feel that was not the responsibility of clinicians, but they

[2275] Transcript of evidence of Dr Murphy, p.82; transcript of evidence of Dr Chaudhury, p.53.
[2276] Dr Crighton, Transcript, Pages 41-42 and 49
[2277] Dr Iain Kennedy, Transcript, page 103
[2278] Transcript of evidence of Alistair Leanord p13.
[2279] Pamela Joannidis, Transcript, page 164.

remained unsatisfied about the safety of the ward[2280]. Dr Chaudhury recalled expressing her discomfort about being put in that position at IMT meetings.

904. On 30 August 2019, Professor Gibson and her clinician colleagues wrote to the Chief Executive, Jane Grant and board Medical Director, Jennifer Armstrong[2281]. They expressed their concerns about infection and environmental issues affecting immunocompromised patients for the preceding 18 months and the ongoing uncertainty about the safety of the environment. Clinicians sought a review from a recognised expert in paediatric infection control from outwith Scotland.

905. As the letter makes clear, the concern of clinicians had reached the stage that they had contacted their medial defence unions. Based on advice provided by their defence unions, clinicians emphasised to the board their understanding of the respective responsibilities for provision of medical treatment and for provision of a safe environment: clinicians had responsibility for treatment; NHS GGC led by the Chief Executive had responsibility for provision of a safe environment in which to provide treatment; IPC had responsibility for advising on the safety of the environment; the IMT had responsibility for acting on the advice given by IPC[2282].

906. This letter is understood to have been followed by meetings with Jonathan Best, the Chief Operating Officer and Dr Scott Davidson, Deputy Medical Director on 2 September 2019. The outcome of that meeting is not presently clear. In a written response to the clinicians dated 4 September 2019, Jane Grant and Jennifer Armstrong indicated that as a result of that meeting, efforts were underway to source an "*appropriate colleague to provide the external advice agreed at the IMT and suggested within your letter*…"[2283] and that a meeting would be arranged with clinicians in the near future. It is understood that clinicians met with Dr Jennifer Armstrong on 9 September 2019[2284]. Strikingly it was Dr Crighton's evidence that she was not given a copy of the

[2280] Witness statement of Dr Shahzya Chaudhury, para. 92.
[2281] Bundle 6, p.1416.
[2282] Bundle 6, p.1417.
[2283] Bundle 8, p.65.
[2284] Transcript of evidence of Jennifer Rodgers, p.115.

letter from the clinicians.[2285]

907. In her statement Ms Ritchie gave the HPS/ARHAI perspective:

> "… the IMT meetings for gram-negative Bacteraemia in 2019 inconsistencies and a lack of clarity between management and staff, along with insufficient transparency with HPS, undermined these efforts. Containment measures and monitoring appeared inconsistent, and the outbreak management approach often seemed fragmented, with pre-meetings excluding some NHS GG&C IMT members, fuelling distrust and defensiveness. These dynamics likely caused frustration, disengagement, and conflicts, complicating the outbreak response and delaying decision-making. Meeting minutes often failed to accurately reflect discussions or statements made. It was for these reasons that more than one representative from ARHAI attended these IMT meetings"[2286]

The SBAR of 25 August 2019

908. All consultant microbiologists at QEUH (including Dr Peters and Dr Inkster) produced an SBAR on 25 August 2019[2287]. It was sent to Dr Crighton by Dr Peters on 27 September 2019[2288]. Somewhat improbably Dr Crighton could not initially remember this SBAR and claimed not to know or not remember much of the history it narrated.[2289] She did recognise what appears to be the response document[2290] which she said was discussed at the IMT, but could not remember who wrote it.[2291] Despite the fact that the minute of the IMT of 6 September 2019[2292] said that a response would be sent it does not seem that Dr Peters and Dr Inkster received a response to the SBAR.

909. Dr Inkster was clear that at this point she had another decant in mind for the Schiehallion Unit.[2293]

[2285] Dr Crighton, Transcript, Pages 48-49
[2286] Ms Ritchie, Statement, Para 23, Hearing Bundle Page 8
[2287] Bundle 4, Documents 41 and 42 from page 165
[2288] Bundle 14, Volume 2, Document 149, Page 574
[2289] Dr Crighton, Transcript, Pages 121-124
[2290] Bundle 4, Document 42, Page 168
[2291] Dr Crighton, Transcript, Page 125-128
[2292] Bundle 1, Document 79 at page 356
[2293] Dr Inkster, Transcript, Day 2, Pages 192-194

Resignation of Dr Inkster as Lead ICD for NHS GGC

910. On 2 September 2019, Dr Inkster resigned as lead ICD. She emailed a letter to Dr Armstrong which contained detailed reasons[2294] and received a response[2295]. Dr Inkster summarised those reasons as: the IMTs being really difficult, that she felt undermined and challenged by colleagues, her views were disrespected (having to try and send published papers to back up her arguments), every day was a battle to be heard, not being listened to (particularly around the epidemiology), duty of candour concerns with regard to patients and communications to families, her health and issues around being paid. In addition, there were other items of concern such as payroll, sick leave and reporting structures. Asked if there was an underlying theme between this resignation and the withdrawn one in January 2018, Dr Inkster identified the culture in NHS GGC."[2296]

911. In a potentially remarkable codicil to her resignation, Dr Inkster reported that she was sent to see Occupational Health after her resignation and that the NHS GGC Occupational Health employee wanted to sign her off on sick leave for stress. She checked with her own doctor, was pronounced fit to work and continued to work.[2297]

912. It was put to Dr Armstrong that she stated in her witness statement that there was some surprise from the Chief of Medicine Diagnostics that Dr Inkster had applied for the additional role of Training Programme Director in March 2019[2298]. It was put to her that the Inquiry understood Dr Inkster had been training programme director since 2014. Dr Armstrong explained that she knew that Dr Inkster had a training programme director role. She stated that if it was a repackaged role then she apologised.[2299]

913. It was put to Dr Armstrong that when Dr Inkster offered to resign in March 2018, she mentioned it as one of her reasons. Dr Armstrong agreed. She

[2294] Bundle 14, Volume 2, Document 151, Page 579
[2295] Bundle 14, Volume 2, Page 581
[2296] Dr Inkster, Transcript, Day 2, Pages 174-176
[2297] Dr Inkster, Transcript, Day 2, Pages 188-189
[2298] Witness Statement, Dr Armstrong, page 302
[2299] Transcript, Dr Armstrong, page 182 and 183

withdrew that it was an additional role.[2300]

IMT of 6 September 2019

914. The IMT on 6 September 2019[2301] , was attended by Ms Harvey-Wood at the request of Dr Inkster and she explains that she took a note.[2302] Dr Inkster did not attend. Given Ms Harvey-Wood took a note at the time, which the Inquiry has. There seems little reason not to prefer her record that Professor Steele was then maintaining that he did not believe there was a leak from the chilled water circuit, that if there was a leak it would have come from the hot water which would evaporate. Given Dr Peter's earlier evidence that photographs of leaks existed and that subsequently the chilled water system failed and is subject to litigation between NHS GGC and its suppliers it does seem the case that at this point the chilled water system that served the chilled beams was leaking onto patients.

915. Daryl Connor spoke of the steps being taken in the context of chilled beams [2303]. Leaks had started early in the hospital's occupation with challenges over the physical connections leaking and having to be replaced. That was found throughout the hospital[2304] The time he became involved some work had been done on finding a solution to condensation because of the absence of dew-point controls. That work was continued [2305]and a solution found with the aid of the specialists, Schneider. Mr Purdon recalled that during periods of high humidity, there were instances where condensation would form on the cooling coils of the chilled beam which would lead to droplets of water entering the patients' rooms[2306].

916. As far as clinicians were aware there was no fully independent external review[2307]. Clinicians were led to understand that a suitable expert could not

[2300] Transcript, Dr Armstrong, page 183
[2301] Minute Bundle 1, Document 79, page 354 (A36591637)
[2302] Statement, Kathleen Harvey-Wood, Paragraph 185
[2303] Transcript of Darryl Connor p 26 on
[2304] Transcript of Darryl Connor at 32.
[2305] Transcript of Darryl Connor at 31
[2306] Colin Purdon, Witness Statement, page 23
[2307] Transcript of evidence of Professor Gibson, p.180.

be identified, or that at least none was willing to assist[2308]. Ms Rodgers had a slightly different recollection; that it was for the haemato-oncology consultants to identify an expert together with the Deputy Medical Director, and that they were unable to do so[2309]. Dr Crighton was of the view that an external review would have been helpful to understand if there was any deviation in practice or differences to other units elsewhere in the UK that could explain the phenomena observed and whether any other haemato-oncology units in the UK had similar rates of infections or different rates of infections. She seemed to be saying that when the option of an HPS review came up this in some way replaced such an external review.[2310]

IMT of 13 September 2019

917. At an IMT meeting on 13 September 2019, Professors Jones and Leanord are recorded as having said that Ward 6A was "*microbiologically safe*"[2311](Interestingly Professor Leanord confirmed that it was to Drs Inkster and Dr Peters that he turned for support on arrival in post)[2312]. Professor Jones' explanation for reaching this view was that no link between the isolates and the environment had been demonstrated[2313]. The minute of the IMT meeting of 18 September 2019, recorded that not everyone was in agreement with that statement[2314]. Dr Chaudhury recalled another push for the ward to be re-opened. She objected to the proposed green HIIAT score and the recommendation that the ward be re-opened[2315].

918. Ms Rankin accepted in evidence that she was dissenting, together with Dr Ritchie, from the majority view of the IMT that Ward 6A was microbiologically safe. Her recollection is that they did not feel all hypotheses had been explored and closed. They did not have the evidence to confirm Ward 6A was safe. It was accepted by Ms Rankin that around this time, HPS started to

[2308] Transcript of evidence of Dr Dermot Murphy, p.83.
[2309] Transcript of evidence of Jennifer Rodgers, p.116.
[2310] Dr Crighton, Transcript, Page 51
[2311] Bundle 1, p.360 at p.362.
[2312] Transcript of evidence of Alistair Leanord p9/10
[2313] Professor Brian Jones, Witness Statement, page 39 (Witness Bundle page 605)
[2314] Bundle 1, p.365 at p.367.
[2315] Transcript of evidence of Dr Shahzya Chaudhury, p.60.

attend NHS GGC meetings in pairs because the meeting minutes were not an accurate representation. The rationale for this decision was to ensure that HPS' views were recorded accurately[2316]. Ms Ritchie explained that in addition to inaccurate meeting minutes, other reasons why more than one representative from HPS attended IMT meetings, were a lack of transparency with HPS, lack of clarity between management and staff, fragmented outbreak management approach, and pre-meetings excluding some IMT members fuelling distrust and defensiveness[2317].

919. Dr Chaudhury felt that she was in a difficult position. She was the only consultant treating clinician present and knew that her concerns about the safety of the ward were shared by her colleagues. Dr Chaudhury requested a meeting with the whole consultant group before a decision was taken about reopening the ward.[2318]

920. Dr Crighton was able to explain what HPS reports she had seen in the autumn of 2019 and explained[2319] that on 13 September 2019 she received an HPS SBAR entitled "**To support NHS GGC IMT Mycobacterium chelonae cases and the Incidence of gram-negative bacteraemia in the paediatric haemato-oncology**"[2320]. She explained that she never saw the two October/November HPS Reviews[2321] or the Appendix 4 to the **HPS Situational Assessment RHC Wards 2A 2B** Draft – 5 June 2019[2322]. Dr Crighton accepted that the SPC charts in this SBAR cannot be used for a comparison between rates in Ward 6A and Yorkhill[2323] and do not show the background rate for bacteraemia.[2324]

921. On 14 September 2019 Dr Crighton sent an email[2325] to, amongst others, Ms Grant and Dr Armstrong in which she reported "The analysis report carried out

[2316] Annette Rankin, Transcript, pages 154 and 155
[2317] Lisa Ritchie, Witness Statement, page 8
[2318] Witness statement of Dr Shahzya Chaudhury, para. 107.
[2319] Dr Crighton, Transcript, Page 51
[2320] Bundle 3, Document 16, Page 127
[2321] Bundle 7, Document 6, Page 214 and Bundle 7, Document 7, Page 250
[2322] Bundle 7, Document 5, Page 205
[2323] Dr Crighton, Transcript, Page 73
[2324] Dr Crighton, Transcript, Page 76
[2325] Bundle 27, Volume 8, Document 43, Page 149

by HPS at the request of IMT and received late Friday 13/09/19 concluded that following the move in September 2018 the rates of positive blood cultures for both gram-negative and environmental bacteria in Glasgow Unit are no different compared to the rates of the combined Lothian & Aberdeen Units. This provides additional independent evidence that confirms and strengthens the recommendation of the IMT**."** Dr Crighton was adamant that this SBAR was in fact comparing a specific cohort of individuals no matter where they were.[2326] As discussed elsewhere there is real doubt that the HPS report actually says what she reported to Dr Armstong and Ms Grant. The email also explained that the IMT heard about risks associated with sending away patients to other units and the thread contains an email from Mr Hill to Dr Armstrong about an options paper regarding the decant of the paediatric haemato-oncology service.

922. Dr Armstrong was referred to the minutes of the meeting of 14 September 2019[2327]. Dr Armstrong was asked what epidemiology information was given to the consultants. Dr Armstrong explained that Professor Jones presented the epidemiology.[2328] Dr Armstrong was then referred to a presentation on 20 September 2019[2329]. Dr Armstrong said this was from the CNO meeting at Atlantic Quay. Dr Armstrong said this was not used by the board to reopen the ward to new admissions. She thought the CNO said to them that she would commission HPS to do a review with Strathclyde University on the epidemiology.[2330]

923. Dr Armstrong was taken to the epidemiology report by HPS published in November 2019[2331]. It was in draft in October 2019. Dr Armstrong noted that the first draft did not say to re-open the ward. The November report said there was no reason to keep the ward closed.[2332] Dr Armstrong explained that the CNO made the decision around 15 or 16 November. The Cabinet Secretary said she wanted to make the decision. Then there was an announcement in

[2326] Dr Crighton, Transcript, Page 94
[2327] See Bundle 27, Volume 8, Document 43, page 149.
[2328] Transcript, Dr Armstrong, page 197 to 200
[2329] See Bundle 27, Volume 13, Document 13, page 77.
[2330] Transcript, Dr Armstrong, page 201 to 203
[2331] See Bundle 7, page 250.
[2332] Transcript, Dr Armstrong, page 203 and 204

parliament. The November report was the last word.[2333]

924. It was put to Dr Armstrong that there was a simple point that when the infection rates drop away is when the new ward was built. Dr Armstrong was not sure you could say that shows causality. A lot of work was done, and the infections came down. There will be infections from the environment. That happens in every hospital.[2334]

925. Dr Armstrong was asked why she put a lot of weight on the root cause analysis. Dr Armstrong explained that when you have a single voice determining an infection comes from a source, you don't get a rounded view.[2335] Dr Armstrong was asked if that was not what the CNR did. Dr Armstrong explained that she did not believe so. There were issues with the CNR and how they reached their conclusions. She was not clear how they reached their conclusions. They did not have a comparator hospital. She saw an uncertain methodology and not comparing like for like.[2336]

IMT of 18 September 2019[2337]

926. Ms Imrie and Ms Rankin gave evidence that following this IMT on 19 September 2019 the level of tension at IMTs was such that Annette Rankin and Lisa Ritchie would go to the meetings on behalf of HPS/ARHAI together rather than on their own.[2338]

927. As for the concerns expressed by Dr Chaudhury on behalf of her clinician colleagues, she recalls that a meeting did take place with consultants and that the ward remained closed due to their concern about its safety[2339]. Dr Crighton confirmed this as taking place on 19 September 2019.[2340] For completeness, Dr Chaudhury did not accept that the HPS SBAR referred to in

[2333] Transcript, Dr Armstrong, page 204 and 205
[2334] Transcript, Dr Armstrong, page 208 to 210
[2335] Transcript, Dr Armstrong, page 210 and 211
[2336] Transcript, Dr Armstrong, page 211 to 213
[2337] Minute: Bundle 1, Document 81, Page 365
[2338] Laura Imrie, Transcript, Page 72
[2339] Dr Shahzya Chaudhury, Witness Statement, paras. 92 to 107.
[2340] Dr Crighton, Transcript, Page 56

the IMT minute of 18 September 2019 had been discussed at the meeting[2341].

Teleconference with HPS 20 Sept

928. On 20 September 2019 there was a teleconference at which it was agreed that the IMT would recommend reopening Ward 6A to new admissions[2342]. Those present at the teleconference do not appear to have included a representative of the consultant group[2343]. The meeting decided to recommend that Ward 6A be opened to new admissions and the Inquiry now has the presentation slides made by Dr Kennedy and Ms Rodgers[2344]. It should be noted that late production of the slides means that they could not be discussed with Ms Rodgers in Glasgow II and that Dr Kennedy had to discuss them without having them on screen.

929. Also, in September 2019 Dr Peters notes that there was a leaking tap in the kitchen of 6A, where patient food was prepared; it therefore posed a significant risk to patient safety. It was a long-standing leak, and she also noted the presence of a dead leg, which increased the risk of legionella developing. She wrote an SBAR on the subject.[2345]

Mr Gardiner's Meeting of 29 September 2019

930. A meeting for consultant microbiologists took place on 29 September 2019 chaired by Mr Gardiner, General Manager (Diagnostics). Notes from the meeting were circulated afterwards.[2346] In her witness statement[2347], Dr Peters had said, "There was unanimous Consultant Microbiology opinion that there were real risks posed by the built environment to patients" and 'the working culture was so unacceptable, no one felt able to act as Infection Control doctor." Others at the meeting had referred to feeling unsupported, coming under undue pressure and a lack of confidence. One consultant

[2341] Dr Shahzya Chaudhury, Witness Statement, para. 109.
[2342] Bundle 1, Document 82, Page 370.
[2343] Witness statement of Jennifer Rodgers, paras. 299-300.
[2344] Bundle 27, Volume 13, Document 13, Page 77
[2345] Dr Peters witness statement para 230: Bundle 4 Document 43 page 176
[2346] Bundle 27, Vol 4 p354
[2347] Witness statement para 227-228

described it as,' a complete nightmare'.[2348] What is striking is that the notes record widespread concerns of lack of support for infection control work, concerns about being asked to sign off work for which they do not have expertise, lack of confidence in the Infection Control system and lack of role definition.

SBAR of 7 October 2019[2349]

931. This SBAR was produced by Dr Inkster and Dr Peters in order highlight their concerns with the situation on Ward 6A and may have been stimulated by Dr Kennedy's 2019 Epidemiology report. Dr Inkster explained that a key point they wanted to make was that the outbreak was polymicrobial and that looking for a single source was the wrong approach.[2350] The SBAR points out that:

> "For an environmental source where biofilm may be implicated classic outbreak definitions such as 2 cases of the same organism over a 2-week period may not be met. This is due to the diversity of biofilm and range of bacteria found within them. Therefore, an environmental outbreak may be comprised of a diverse range of bacteria and not just a single pathogen.
>
> It is clear that the predominant bacteria are environmental in nature and typical of biofilms and this requires investigation."

932. The SBAR contained within it a recommendation that the infections in paediatric haemato-oncology patients who attend for frequent line flushes or therapy should be considered HAI as per haemodialysis patients in SAB surveillance, due to frequent attendance with interventions.[2351] This would turn out to be an issue at the IMT on the following day.

933. It is striking that the graphs within this SBAR[2352] show to a reduction of infections in Ward 6A in the first three quarters of 2019 compared to 2017 and 2018, but do not show a reduction to levels seen in Ward 2A/2B in 2015 and 2016. The SBAR argued that the proportion of environmental gram-negative

[2348] Dr Peters Transcript, Day 2, Pages 117-
[2349] Bundle 4, Document 44, Page 180
[2350] Dr Inkster, Transcript, Day 2, from page 194
[2351] Bundle 4, Document 44 at page 188
[2352] Particularly Graph 2 (page 184) and graphs on pages 185

organisms in blood cultures had increased since April 2016 and this was particularly noticeable from July to September 2019. Of note is a graph[2353] showing a sustained increase in Enterobacter blood stream infections.[2354]

934. In her evidence Dr Inkster had earlier discussed Figure 9 of the HPS October 2019 report and Dr Kennedy's comments that there was a distinct change between 2A/2B organisms in summer 2018 and organisms in 6A/4B in 2019. Dr Inkster explained that more typical organisms would be found in the actual water coming out the outlets and POUFs were in place. She further commented there was more Enterobacter because of issues with the drainage. She also considered that the term point source had been misinterpreted in the HPS October 2019 report to mean one single source of infection, but Dr Inkster considered that term to be one single outlet. Whereas the QEUH had multiple outlets and very complex systems.[2355]

IMT Meeting of 8 October 2019

935. The minute of the IMT meeting of 8 October 2019[2356] records that there were possibly three additional cases by this stage; and that a decision to reopen the ward had been postponed following the CEO's agreement to pursue a peer review of microbiological data. That is followed by a note that HPS had been commissioned to undertake an "independent review".

936. The IMT Minute records that Dr Crighton raised the 7 October 2019 SBAR from Dr Peters and Dr Inkster. Somewhat strangely, Dr Deighan is recorded as having problems with the SBAR solely for the reason discussed in its final paragraph where it was suggested that that infections in patients attending for line flushes be considered to be HAIs in line with arrangements for dialysis patients. He explained that his concern was that changing the definition negates the ability to compare your rates with rates elsewhere.[2357] The effect of this intervention seems to have been to shut down discussion of the SBAR

[2353] Bundle 4, Document 44, page 187
[2354] Quantitative Report, Para 9.37, Bundle 21, Document 4 at page 146
[2354] Bundle 4, Document 44, Page 180
[2355] Dr Inkster, Transcript, Day 2, Page 182-184
[2356] Bundle 1, p.373.
[2357] Dr Deighan, Transcript, page 119

and the many other substantive points Dr Peters and Dr Inkster were making.

937. The IMT minute records Professor Leanord as having indicated that the infection situation on Ward 6A was "*not a typical outbreak and in his opinion was like a pseudo-outbreak – possibly the first described in the world*". He was asked about the use of that phrase. He explained that he accepted that this was not the normal use of the phrase, but he used it deliberately to try to engage the physicians with his view that the definition was too wide.[2358] When discussing the concept of an outbreak, Professor Dancer noted that if an organism is found in the water and an organism found in a sterile place within a patient, for example, a blood culture, then if a genotype matches then there is a problem with the water[2359].

938. Dr Murphy harboured doubts about the pseudo-outbreak explanation. In his view, there would have to be a great deal of certainty, including exclusion of all other possibilities, before arriving at a hypothesis described as the first in the world[2360]. Witnesses also recalled the IMT being provided with a presentation about the use of whole genome sequencing to exclude links between a certain group of infections[2361].

939. Whilst accepting the limitations of their expertise, clinicians were not satisfied that this testing excluded a link between infections and the environment (rather than each other) or that it was generalisable[2362].

940. Noting that debate, this may be the appropriate place in the narrative to record the work and the views of Professor Leanord, given the substantial reliance placed on those views by NHS GGC. In essence, these views cover two topics. Firstly, he argued that what had been thought to be increased infections could be due to the use of broad-spectrum antibiotics (particularly) While he referred to other antibiotics, he focussed on Meropenem).[2363] He maintained that two-fold increase in use of that antibiotic correlated with a

[2358] Transcript of the evidence of Alistair Leanord, page 76
[2359] Prof Stephanie Dancer, Transcript, page 45
[2360] Transcript of evidence of Dr Dermot Murphy, p92.
[2361] See, for example, witness statement of Jennifer Rodgers, para. 310.
[2362] See, for example, the transcript of evidence of Dr Dermot Murphy, p99
[2363] Alistair Leanord, Transcript, Page 17.

peak of infections in autumn 2017 and spring 2018. That antibiotic was capable of changing the microbiome and selecting out resistant strains particularly Stenotrophomonas.[2364] He used that argument to counter the proposition, that if his theory that infections were coming from patient gut was correct, one would have expected to find it happening all the time unless there was a very unusual cohort of patients. He accepted that the antibiotic point was not the whole cause. The issue was multifactorial.[2365] His view was disputed by Dr Peters in a short supplementary statement[2366] and by other witnesses.

941. Professor Dancer explained in her evidence that there are certain types of antibiotics that encourage particular types of organisms. Antibiotics affect not just the patient but the patient's immediate environment and in some cases for the long term. She cited a study paper by Dominique Monnet of the European Centre for Disease Prevention and Control ("ECDC") that found carbapenem (a very strong broad-spectrum antibiotic) consumed by microbes will likely result in a patient infection with Stenotrophomonas two to three weeks later in the unit because it is naturally resistant to this particular type of antibiotic and the other microbes are killed off. She noted that this is also one of the causes of Clostridium difficile[2367].

942. The main area where the views of Professor Leanord are relied upon is in the use of Whole Genome Sequencing ("WGS"). In particular the question is whether the failure to obtain a precise sequencing match between environmental samples and the sample from the patient, excludes the environment as a possible cause of the infection. He appeared to argue that it did. Dr Kennedy was of the view that WGS allows greater granularity and depending on the SNIP differences then will count one organism as linked to another organism; in other words, it is considered the same organism[2368]. He mused that if there were 5 different isolates which were all typed as unique then is it a dozen different strains seeded into the taps and biofilm or is it a

[2364] Alistair Leanord, Transcript, p50
[2365] Alistair Leanord, Transcript, Page 49
[2366] Witness Bundle Volume 12, page 23.
[2367] Prof Stephanie Dancer, Transcript, pages 35 and 36
[2368] Dr Iain Kennedy, Transcript, page 206

smaller number of organisms that have mutated and have different sequences? In other words, whether it is a bunch of related bacteria or multiple sources of bacteria of the same species[2369]. In Dr Kennedy's view, it was more likely small number of organisms mutated but accepted this was just logic and he had no evidence to support this view. It was accepted in evidence by Dr Kennedy that where a possible environmental organism is not matched by WGS then you keep going until you identify it[2370].

943. Professor Dancer explained in her evidence that just because the genotypes found in the waterborne organism and the organism found in patient are different does not mean there is no risk. She elaborated that if there were a number of different organisms found in a water system such as Pseudomonas and Cupriavidus, then even if the organisms are not the same species, this should raise suspicions and sampling should be continued. An example was given by Professor Dancer that in her current hospital's ICU, five or six patients were infected with Pseudomonas (one of whom died) which resulted in the sinks being replaced as an intervention. Hundreds of different types of Pseudomonas were found but when sent away for genotyping they matched the sample from the deceased patient[2371].

944. Where environmental samples are taken, but no direct link is found with infected patients then in Professor Dancer's view, the environmental link should not be excluded, and the investigation should continue. In other words, sampling and precautionary steps do not stop until the link is found. She stressed in her evidence that: "You don't give up until you find where that's coming from[2372]". She clarified that just because there is not a very close connection between the genes of the samples, does not mean that the conclusion reached is possible link but rather that sampling continues until the link is established. An example was given by Professor Dancer of a Bacillus outbreak in a London teaching hospital where she was working as a junior doctor. She kept sampling until eventually she found the organism was

[2369] Dr Iain Kennedy, Transcript, pages 207 and 208
[2370] Dr Iain Kennedy, Transcript, page 212
[2371] Prof Stephanie Dancer, Transcript, pages 45 and 46
[2372] Prof Stephanie Dancer, Transcript, page 47

identical between patients and the environmental source. In this case, the identical Bacillus flagella type was found in the building site sample, the patient sample and the laundry sheets sample[2373]. Professor Dancer explained that while genotyping is the gold standard, it would be possible to visually identify that organisms are identical, if, say, three isolates have identical zones around the antibiotic disc on the plate. In this scenario, it could be considered there is an outbreak without genotyping[2374].

945. Professor Leanord was also at odds, to some extent, with the view that what had been found at the QEUH were very unusual organisms. He accepted that that might be the view of clinicians. However, he argued that a microbiologist with access to much larger quantities of data would see these from time to time. So when clinicians of enormous combined experience said that they had never seen these, that was not wrong, it was just that someone somewhere in another hospital might have encountered them.[2375] Challenged over the fact that many highly respected people seemed to have a view that what they were encountering was outwith their extensive experience, and asked if he was saying they were wrong, his response was.' I'm not saying they're wrong. What I'm saying is that the data doesn't support an evidential link of direct transmission from the hospital environment to the patient.'[2376] He didn't discount the built environment as an issue. This was multifactorial. He had no data on some of the less frequent organisms. He was also asked whether clinicians would not have recognised a burst of endogenously originated infections. He accepted they would so 'one of the conundrums about this occurrence is that we may never know what the sources or source was.' Professor Dancer would keep looking but Professor Leanord said you might never find it.

946. Professor Leanord's Report[2377] (on which Mr Derek Brown did most of the work) sequenced 3 organisms (which they had not sequenced before). Pausing to look at that process, isolates were collected from three main

[2373] Prof Stephanie Dancer, Transcript, pages 53 and 54
[2374] Prof Stephanie Dancer, Transcript, pages 49 and 50
[2375] Prof Stephanie Dancer, Transcript, page 75 p75
[2376] Prof Alistair Leanord, Transcript, Page 121
[2377] Bundle 6, Document 39, Page 1195

sources: patients, the water system and the environment. All available stores of three organisms (Cupriavidus, Enterobacter and Stenotrophomonas) from the Glasgow Royal Infirmary environmental laboratory and the QEUH Microbiology Department were received as culture on Agar plates. A single colony was taken from the Agar plate and inoculated into a Brain-Heart Infusion for DNA extraction[2378]. The Enterobacter organisms were collected from departmental freezers. The DNA libraries were prepared using the Illumina DNA Prep(M) library protocol. The pooled library was denatured and diluted for sequencing using the Illumina MiSeq system with PhiX as a sequencing control. The process took 57 hours to complete.

947. To complete the description, FASTQ Generation analysis was undertaken on the raw sequencing data. Speciation was done using the kmerID tool to determine the bacterial species of the sample and compare with a list of references. An assembly was run by the use of Spades to determine serotype genes. The sequence was submitted to pubMLST for further analysis to extract ST and finetype antigens.

948. In fairness to Professor Leanord (and Mr Brown), a series of limitations on the Report were acknowledged[2379] and many were confirmed in Professor Leanord's oral evidence. They are not all listed here. However, they include that most saved water isolates were after March 2018, there were few isolates from environmental swabs, and sequencing could not infer direction of transmission (such as patient to drain or drain to patient). Not all samples were saved. The WGS work was inevitably being done 'after the fact'. It had not been peer reviewed.

949. Professor Leanord's argument of exclusion of the environment as an infection source, appeared to be that the absence of a 'perfect match' meant there was no evidence of transmission.[2380] Professor Leanord focused on Enterobacter. There, the organisms were not in a close family but were all different. Had the organisms been a close family, with no specific match, the environment could

[2378] Bundle 6, Document 40, Page 1198
[2379] Bundle 6, Document 40 at page 1230
[2380] Professor Alastair Leanord, Transcript page 102.

not be excluded as a source of infection. He summarised his argument as, firstly, not seeing the kind of parameters that one would expect to see, and secondly not seeing causality. Colleagues who thought there was an environmental source were making an erroneous assumption that because the organisms existed in the environment, and were found in the patient, then the organisms were the same. The patient's own bowel was the most likely source.[2381]

950. Professor Leanord maintained that a single colony was enough for this technique to work[2382]. That view is disputed by others.[2383] Professor Leanord said he had never heard the 30 picks theory before the Inquiry. He set out an example designed to show it was incorrect. [2384]He also said,' …if you need more picks this is very expensive…. It becomes very costly and difficult to do. Lastly, every whole genome sequencing study I know has always taken one pick. If you need more than one pick it invalidates almost a whole literature base.' Asked if six environmental isolates were enough to say there was something representative, he agreed that was not enough as he had acknowledged in the report. Asked directly whether a negative result allows you to exclude environmental sources, he accepted that 'you don't know much' (albeit, in fairness, in the midst of a very long answer).[2385] However, he said that' you can exclude the environment if you don't see those kinds of parameters that you might expect to see, as well as not seeing causality.' Professor Jones adopted a similar view and was dismissive of the idea that a theory holds true because it cannot be disproved. In his view, the approach taken by Dr Inkster makes a mockery of scientific method[2386].

951. It may, however, in the interests of understanding where the argument landed (possibly more nuanced than black and white), be best to quote directly from overall explanations by Professor Leanord given at the hearing. He said in

[2381] Professor Alastair Leanord, Witness Statement para 324
[2382] Prof Alistair Leanord, Transcript page 97
[2383] See for example the evidence of Professor Wilcox discussed in Chapter 3 and Dr Mumford discussed in Chapter 7.4
[2384] Prof Alistair Leanord, Transcript page 97
[2385] Professor Alastair Leanord, Transcript, Page 102
[2386] Professor Brian Jones, Witness Statement, pages 42 and 43 (Witness Bundle pages 608 and 609)

evidence,

> "The sequencing work does not confirm that there is evidence of direct transmission from the environment to the patient, and that's as far as you can take the sequence. I wouldn't say that there was nothing going on. We know that if you take the antibiotic stewardship proposal, something's going on, because we are selecting out, by use of antibiotics, these organisms. …There is no direct evidence that these organisms are coming from the environment except for they are in the environment and the assumption that has been made is that because they're in the environment and they're in the patient, they are the same organisms."[2387]

952. He went on to say,' I wouldn't say that there's nothing going on, all I'm saying is that the data shows that there's no evidence of direct transmission between the environment and the patient.' [2388] That only related to the three organisms sequenced.

953. Professor Leanord was asked about issues which might impact on the value of the work. He accepted that the type of biofilm which might arise in a complex system not properly looked after for years would be different from what one might get in a single tap. Even with a tap different organisms might emerge. One of the challenges of sampling was how much you captured.' So, if you swab the desk-- So, if there's 1,000 bacteria in your area that you swab, you'll pick up 100 in your swab, and then you take that swab and you put it onto your agar plate, you'll get 10. It's a rule of thumb called Noble's Rule of Tenths.'[2389]You can only sequence what is stored. Many swabs were discarded. Only one of the colonies grown on the plate will be retained.

954. There is material on the views of Dr Leanord's approach to WGS in the summaries of the evidence of Professor Wilcox, Professor Stevens, Dr Peters, Dr Inkster, Dr Redding and Professor Dancer in Chapter 3.

[2387] Professor Alastair Leanord, Transcript Pages 110-111
[2388] Professor Alastair Leanord, Transcript, Page 112
[2389] Professor Alastair Leanord, Transcript, Page 116

SBAR of 10 October 2019

955. This SBAR[2390] was produced to support the recommendation to/of the IMT of 13 September 2019 to re-open the ward for new admissions.

956. In the Summary within the Background section the authors reference Dr Kennedy's review of data and then state that what must be a reference to the Appendix 4 to the ***HPS Situational Assessment RHC Wards 2A 2B*** *Draft – 5 June 2019*[2391] which is said to conclude that "following the move in September 2018 the rates of positive blood cultures for both gram-negative and environmental bacteria in Glasgow Unit were no different when compared to the rates of the combined Lothian & Aberdeen units. This provides additional independent evidence (Appendix 4)." [2392]

957. The problem with this statement is that it is simply incorrect. None of the four HPS reviews or SBARs contain a comparison between paediatric haemato-oncology units. The SBAR that Dr Crighton saw on 13 September 2019[2393] does produce this conclusion for the period since September 2018[2394], but the comparison is between "the overall rate over 5 years at the RCH/YH" with a rate combined Aberdeen and Edinburgh children's hospitals over the past five years. This is the same piece of work as is set out in the draft and final October/November HPS Reviews[2395] and the Appendix 4 to the **HPS Situational Assessment RHC Wards 2A 2B** Draft – 5 June 2019[2396]. To this extent the SBAR is at best misleading.

958. It was acknowledged by Ms Rankin in the course of her oral evidence that she was critical of Dr Kennedy's epidemiology report because it was not representative of the unusual organisms that had been identified[2397]. In addition given that the SBAR placed particular reliance on the idea that there

[2390] Bundle 4, Document 46, Page 193
[2391] Bundle 7, Document 5, Page 205
[2392] Bundle 4, Document 46 at Page 196
[2393] To support NHS GGC
Mycobacterium chelonae cases and the Incidence of gram-negative bacteraemia in the paediatric haemato-oncology, Bundle 3, Document 16, Page 127
[2394] Bundle 3, Document 16 at Page 230
[2395] Bundle 7, Document 6, Page 214 and Bundle 7, Document 7, Page 250
[2396] Bundle 7, Document 5, Page 205
[2397] Annette Rankin, Transcript, page 134

was a background rate of infections it is of significance that of the organisms considered in Dr Kennedy's two reports (and listed in the Appendix to his 2019 report[2398]) Dr Inkster considered there was no background rate for the following organisms there listed: Achromobacter, all the Acinetobacters, Brevundimonas, Burkholderia cepacia (except in cystic fibrosis patients), Cedecea lapagei, Chryseobacterium indologenes, Commamonas testosterone, Cupriavidus gilardii, Cupriavidus pauculus, Delftia acidovorans, Elizabethkingia meningospetica, Pantoea agglomerans, Paracoccus sp, Pseudomonas chlororaphis, Pseudomonas fluorescens, Pseudomonas oryzihabitans, Pseudomonas putida, Pseudoxanthomonas Mexicana, Ralstonia picketii, Rhizobium radiobacter, Serratia fonticola, Shewanella puterfaciens, Sphingomonas species and Stenotrophomonas maltophilia. She explained that there may be a background rate for Enterobacter cloacae, Klebsiella pnuemoniae, but these are also opportunistic premise plumbing pathogens ("OPPPS"), and one might expect an environmental source. Morganella morganii might have a background rate. A background rate being the rate one would normally expect to see in a population in light of their vulnerability to infection. [2399] This list was put to Dr Mumford and Ms Dempster and their evidence is discussed in Chapter 7.4.

IMT of 11 October 2019

959. At the IMT on 11 October 2019[2400] Ms Joannisids presented a 'root cause analysis'[2401] of a number of the cases then faced by the IMT. In preparing for Glasgow III the Inquiry Team had understood that the 'root cause analysis' was produced in the form of an SBAR that had been included in Bundle 4 well before Glasgow II[2402] but it has become clear that there is a larger document that lies behind the SBAR that is the actual analysis. This was not produced by Ms Devine when she produced her statement[2403], or Dr Crighton[2404] or by NHS GGC although the Root Cause Analysis was referred to in the April 2023

[2398] Bundle 6, Document 28 at page 121
[2399] Dr Inkster, Transcript, Day 2, Page 112-115
[2400] Bundle 1, document 84, Page 382 –discussed at Item 4, page 383.
[2401] Pamela Joannidis, Statement, Question 20, Hearing Bundle, Page 450
[2402] Bundle 4, Document 45, Page 190
[2403] Sandra Devine, Statement para 460, hearing bundle, page 512
[2404] Dr Crighton referred to the Root Cause Analysis in oral evidence, Transcript, Pages 45-47

NHS GGC positioning paper.[2405] It was directly referred to by Professor Leonord in evidence towards the end of Glasgow III, on 9 October 2024 long after Ms Joannidis and other members of the IMT had given evidence.[2406] The Inquiry Team recovered the document from NHS GGC after the end of the hearing.[2407] The Counsel Team have concluded that it cannot now be used in evidence in the Inquiry because the opportunity to put it to witnesses of fact has passed along with the opportunity to obtain the opinions of Dr Mumford and Ms Dempster. Had NHS GGC felt it was sufficiently important for the Inquiry to consider the document itself it had ample time to produce it. To consider this document now would be unfair on other witnesses and Core Participants and would likely require further hearing days which would have a substantial cost which is not warranted.

960. In Ms Imrie's recollection of events, the reported cases reduced significantly in October 2019 and Ward 6A was reopened. She could not recall any clusters of cases after that.[2408] She described a complex situation where unusual infections kept popping up in ward 6A patients even though the water system was being dosed with chlorine dioxide and POUFs were fitted.[2409]

Ward 6A Kitchen Water Leak Discovered

961. An issue with the kitchen was identified. It is first recorded in an IMT Minute at the 8 October 2019 meeting and more detail is reported to the 25 October 2019 IMT.[2410] A long-term leak was discovered in the staff kitchen which caused a significant build- up of mould. Dr Peters, Ms Dodd Mr Clarkson[2411], Ms Imrie[2412] and others gave evidence about this leak and were shown photographs. It seems that a hot water boiler on the wall had leaked over a long period of time behind the kitchen units in ward 6A. The photographs

[2405] Bundle 25, Document 10 at page 152
[2406] Professor Leonord, Transcrpt, Pages 61-62
[2407] A 37-page document entitled "Report on the findings of a review of 99 patient cases from the QEUH and RHC. [Draft 8]" (A51028524)
[2408] Laura Imrie, Transcript, Page 84
[2409] Laura Imrie, Transcript, Page 87
[2410] Bundle 1, Document 83 at page 339
[2411] Kerr Clarkson, Transcript, Pages 97-100
[2412] Laura Imrie, Transcript, Page 94-96

clearly show staining and damage from water.

962. Ms Imrie from HPS considered this issue important as, in her view, having learned of work done by Dr Hood investigating the Cryptococcus incident, if the front doors of the ward opened and pressures changed then air containing spores or organisms in peripheral rooms would be sucked out into the corridor from kitchens and other rooms. Children were playing in the corridor of ward 6A. She considers this to be an alternative hypothesis to the drains and chilled beams especially as, in her view, once the leak was repaired infection rates went down.[2413] The IMT Minute of 11 October 2019 records that Ms Imrie asked the Ward 6A Kitchen should be included as a hypothesis.[2414]

IMT of 25 October 2019

963. On 25 October 2019 Dr Inkster emailed Dr Crighton seeking amendments to the IMT Minutes of 8 October 2019[2415] and the email was acknowledged.[2416] Dr Crighton could not explain why the changes were not made, but more relevantly to the issues she claimed not to know why she had not sought to speak to Dr Inkster at this point outside the IMT to get some history and background.[2417]

IMT of 5 November 2019

964. The reopening of the ward was recommended by an SBAR dated 10 October 2019[2418]. The IMT of 5 November 2019 indicated that it would be the Chief Nursing Officer ("CNO") who would have ultimate responsibility for this question[2419]. At a meeting of 11 November 2019[2420], Dr Murphy pressed for acknowledgement that there had been an infection control problem on the ward. Dr Murphy also requested that confirmation be sought from HPS on the

[2413] Laura Imrie, Transcript, Page 95-96
[2414] Bundle 1, Document 87 at page 339
[2415] Bundle 14, Volume 2, Document 154, Page 599
[2416] Bundle 14, Volume 2, Document 163, page 621
[2417] Dr Crighton, Transcript, Page 127
[2418] Bundle 4, p.193.
[2419] Bundle 1, p.392 at p.393.
[2420] Bundle 4, p.209, at p.210.

question of lifting the restrictions on Ward 6A[2421].

IMT of 11 November 2019

965. This meeting contains the important record[2422] that the case definition has been to include any patient with a bloodstream infection from an organism where the source is water or soil i.e. environmental organisms. Ms Rankin challenged the decision at a previous IMT on 5th November 2019 to exclude the Enterobacter cloacae cases as endogenous, based on the outcome of Professor Leanord's work. This must be his WGS conclusions. Mr Rankin raised her concerns about removing an entire organism from the case definition and Professor Leanord stated that new Enterobacter cases would have to be considered as they occur and would not be automatically excluded. Given the CNR Expert Panel view that 7 out of 25 Enterobacter cases they looked at were 'most likely' to be linked to the Environment[2423] and the concerns that many witnesses have on WGS, this seems a significant and potentially unjustified exclusion.

IMT of 14 November 2019

966. On 12 November 2019, a letter from Kevin Hill to parents was published on the Closed Facebook Group[2424]. This indicated that environmental test results from Ward 6A were "satisfactory" and that the water supply was "safe and effective".

967. The IMT on 14 November 2019 noted[2425] that a final report from HPS was now available, and that it concluded that there was no evidence from available data to support continuation of the restrictions. Dr Murphy continued to express his concerns that an explanation for the infections had not been found. On the same date, Mr Redfern prepared an SBAR recommending that restrictions be lifted[2426]. The IMT of 14 November 2019 was the last one that

[2421] Bundle 4, p.212.
[2422] Bundle 1, Document 87, Page 397
[2423] Overview Report, Table 5.4: Bundle 6, Document 38, Page 1044
[2424] Contained at Appendix 2 of Mark Bisset's witness statement at p.55A.
[2425] Bundle 1, p.402 at p.403.
[2426] SBAR dated 14 November 2019, Bundle 4, p.202 at p.204; transcript of evidence of Mr Redfern, p.237.

Dr Crighton chaired as this was the end of the incident itself.[2427]

968. Mr Redfern's SBAR set out the rationale for his recommendation. The SBAR indicated that there was no hypothesis which linked the series of infections to the environment. Works had been done by Estates to improve the environment, the water supply had been assessed as "*pristine*", and infection control on the ward was exemplary. The SBAR also noted the pressure being put on other centres by the closure[2428].

969. With the input of the clinical team, a "re-opening bundle" had been prepared which put in place measures to provide additional assurance about infections[2429]. In particular, real time root cause analysis ("RCA") would be implemented[2430]. A clinical management group would be established to review infections and other matters. At a meeting among parents, hospital management and GGC representatives, parents were informed that the hospital water supply was "wholesome"[2431]. This explanation did not satisfy some parents who questioned why their children were still on preventative medications[2432]. Karen Stirrat recalled being informed by her son's consultant that, although the tap water was safe, environmental concerns remained.

970. Although Mr Redfern's SBAR records clinicians' agreement with the proposal to reopen 6A, the evidence of clinicians was that their concern about infection and the safety of the environment remained. Evidence was heard at Glasgow I of a further serious fungal issue on Ward 6A[2433]. In November 2019, Molly Cuddihy developed a type of fungal pneumonia (PCP pneumonia) which Ms Cuddihy's consultant suspected she developed because she was not on the antifungal prophylaxis being prescribed to other patients[2434]. On 18 November 2019, Ms Ferguson was informed that her son had contracted

[2427] Dr Crighton, Transcript, Page 33
[2428] SBAR dated 14 November 2019, Bundle 4, p.202 at p.204; transcript of evidence of Mr Redfern, p.237.
[2429] Bundle 4, p.206.
[2430] Witness statement of Dr Shahzya Chaudhury, para. 110; transcript of evidence, p.51.
[2431] See, for example, the evidence of Karen Stirrat, Alfie Rawson and Colette Gough.
[2432] Witness statement of Karen Stirrat at paras. 129 – 132.
[2433] Witness statement of Professor John Cuddihy at paras. 176 and 248; transcript of evidence (26 October 2021 (pm)) at p.41.
[2434] Witness statement of Molly Cuddihy at para. 136.

Acinetobacter[2435]. Clinicians remained anxious that infection concerns would return. As Dr Murphy explained, clinicians had, through the various IMTs, received repeated assurances about the safety of the environment and the effectiveness of mitigations. Dr Murphy did not doubt the good intention of those assurances, but, as he saw it, they had proved unfounded at least insofar as infections continued[2436].

971. Clinician agreement to re-opening was based on a number of competing factors. Clinicians were conscious, in particular, of distress caused to families who were being displaced. Children were being deprived of the expert treatment they could receive on the Schiehallion Unit. Balancing that against the assurances provided and the provisions of the "re-opening bundle" clinicians were content to reopen[2437]. Following a decision by the CNO, the ward re-opened on 21 November 2019.

972. As Chair of the IMT Dr Crighton summarised her understanding of the reasons the Ward 6A could be re-opened to new admissions as follows:

> 26. The epidemiological data presented did not support the existence of an outbreak and there was a need to establish the norm of the expected rate of infections using both historical data and comparative data to units in Scotland or UK if possible; the analysis was commissioned from Health Protection Scotland. The analysis showed the local infection rates to be similar to those seen in other Scottish Units. As NHS GGC did not have an excess of infections compared to other Scottish units the existence of an outbreak was discounted.
>
> 27. Utilising the Glasgow laboratories capability to carry out whole genome sequencing Professor Leanord carried out the whole genome sequencing of the most common type of infection present - Enterobacter. The result showed the infections in different patients were not related to a common source or one another – meaning there was no outbreak, and the most likely source of these infections was endogenous - the patient's own gut flora.

[2435] Witness statement of Sharon Ferguson at para. 125.
[2436] Transcript of evidence of Dr Dermot Murphy, p.101.
[2437] Witness statement of Jennifer Rodgers, paras. 311-324.

28. The root cause analysis (RCA) carried out to identify the reservoir of bacteria and the route of transmission highlighted the complex patient pathways as patients spent time outside NHS GGC environment as well. The RCA could not identify a common reservoir.

29. The combined findings from Health Protection Scotland report; Root Case Analysis; hand hygiene audits; water testing results and the implementation of estates work enabled the IMT to recommend the lifting of Ward 6A restrictions to treating new admissions on 14th November 2019. The epidemiological evidence would have allowed the reopening to admissions after the first meeting I chaired as I communicated to the Medical Director.[2438]

973. This appears to be the position that was briefed to the Cabinet Secretary and the Chief Nursing Officer.[2439] In her evidence Dr Crighton did accept to some extent that there might have been different sources of infection.[2440]

974. The routine use of additional Ciprofloxacin prophylaxis was stopped in November 2019[2441]. A decision was made to use TauroLock which is a physical antimicrobial prophylaxis placed in the patient's central line; it is not a medication given to patients[2442]. As far as environmental organisms are concerned, antimicrobial prophylaxis is used to prevent either the organisms within us or the, usually low, pathogenic risk organisms in the environment causing infection[2443].

975. In respect of ventilation placement placing Professor Leanord was asked why an SOP for patient placement was still outstanding in November 2019. He claimed that this was due to all of the issues with ventilation in various rooms. He agreed, however, that this should have been available at the opening of the hospital.

976. Given the general line adopted by NHS GGC in this Inquiry, a suitable footnote to this part of the chronological narrative comes from the evidence of

[2438] Dr Crighton, Statement, Para 26-29
[2439] Dr Crighton, Statement, Paras 34 and 35
[2440] Dr Crighton, Transcript, Pages 86-90
[2441] IMT minute dated 5 November 2019, Bundle 1, p.392.
[2442] Witness statement of Dr Dermot Murphy, para. 298.
[2443] Witness statement of Dr Alastair Hart, para. 29.

Dr Mathers.[2444]Asked if anyone was arguing that 'nothing unusual' was happening, he said that would have been 'breathtakingly naïve'.

977. However, Sandra Devine had 'authored' i.e. gathered the information for, the Summary of Patient Safety Indicators attached to the NHS GGC Positioning Paper.[2445] It appears from her evidence that mostly the infection data was obtained from the Point Prevalence Survey end related to infections such as c-diff. Much of the material related to the whole Board rather than being the QEUH. Asked by the Chair what the purpose was, Ms Devine said it was to try to demonstrate,' that our focus is on healthcare infections generally, and that we were successful to a certain extent in some of these indicators.' [2446] It was clear from her evidence that she felt NHS GGC had not been treated fairly.[2447]

978. In December 2019 Dr Peters wrote to Lesley Shepherd and Professor Bain to highlight her concerns about Pseudomonas in the light of a recent cluster of 3 fatal cases across the site – including one child. Prior to this there had only been 8 Pseudomonas bacteraemia in the 4.5 years since the QEUH opened. [2448]

979. She received a response that the Board disputed whether this was an HAI as the child had had Xray changes upon admission. This was not the case, and she believes "the culture continued to be one of resistance to acknowledging any infection control concerns" 2449 This led to a further meeting with Ms Bain with both Dr Peters and Dr Inkster at which they reiterated their concerns that they were "being bullied for trying to secure patient safety"

980. The evidence of Glasgow 2 witnesses was consistent: they had never before experienced a situation like that seen between March 2018 and November 2019. They described a period of 18 months in which intense waves of safety-related concerns emerged and, following IPC intervention, seemingly abated. Reprieve from concern was, however, short-lived. Every time a concern re-

[2444] Evidence of Dr Alan Mathers p 83
[2445] Bundle 25, Document 10 at page 364
[2446] Transcript of evidence of Sandra Devine p 168
[2447] Transcript of evidence of Sandra Devine p78
[2448] Dr Peters witness statement para 241
[2449] Dr Peters Witness Statement para 241

emerged, faith in the environment, and the ability of GGC to control it, diminished[2450].

981. Although Glasgow 2 witnesses were careful to recognise that patients and families experienced the most significant impacts, the evidence indicates that the impact on clinical and nursing staff should not be overlooked. Professor Gibson had never seen anything like the toll taken on nursing staff; the strain was huge[2451].

Workload

982. As was recognised by a number of Glasgow 2 witnesses, the events of 2018 and 2019 increased, and altered, the workload of GGC staff. Nursing, domestic and auxiliary staff were on the frontline of implementing IPC measures and dealing with operational matters on the wards. Senior nurses were involved in the operational planning of each ward move[2452].

983. Senior nurses and consultants were required to attend frequent and increasingly lengthy IMT meetings. IMTs had not been a regular feature of staff workloads prior to March 2018[2453]. During periods of concern, these meetings occurred every two or three days. Latterly, attendee numbers grew to between twenty and thirty individuals. Meetings could last for two to three hours at a time. Consultants and nurses were taken away from their core duties: patient treatment and care.

Use of prophylactic medication

984. A matter of concern to some of the Glasgow 1 families was the use of prophylactic medication in response to the events of 2018 and 2019. A recurrent concern in their evidence was the provision of preventative medications (understood to be preventative antibiotics and anti-fungals). While the evidence suggested that prophylactic medication can sometimes be a feature of standard chemotherapy protocols, a consistent body of evidence

[2450] See, for example, the Witness statement of Professor Brenda Gibson, at para. 191.
[2451] Transcript of evidence of Professor Brenda Gibson, p.189.
[2452] See, for example, the witness statement of Emma Sommerville, para. 161.
[2453] See, for example, the transcript of evidence of Emma Sommerville, p.33.

indicates that, in the RHC and QEUH, patients were provided with preventative medications to protect them from perceived potential risks associated with the hospital environment[2454]. The medications most frequently mentioned in this respect were Ciprofloxacin and Posaconazole. Others were also mentioned[2455], but in some cases witnesses were not certain whether these medications formed part of existing treatment plans.

985. A number of witnesses suspected that these medications had physical side effects although most acknowledged that their suspicions had not yet been confirmed. Gastrointestinal concerns were most frequently reported[2456]. Ms Ferguson perceived that her son suffered significant hearing loss[2457]. Parents were concerned about the possibility of long-term side effects from what they understood to be powerful drugs.

986. The evidence of the Glasgow 2 witnesses leaves no room for doubt about two things regarding the use of prophylactic medication: (i) at numerous times during 2018 and 2019, additional prophylactic medication was prescribed to paediatric haemato-oncology patients; (ii) the rationale for its use was that the environment posed a risk of infection to those patients[2458]. Support for these propositions is found in the IMT minutes and communication documents.

987. As explained in chapter 3, the use of anti-fungal and anti-bacterial prophylactic medication is an inherent part of the treatment of paediatric haemato-oncology patients. It is used as part of standard treatment protocols and on an *ad hoc* basis in response to infection risks. Clinicians were consistent in their evidence: microbiologists/IPC make policy recommendations about prophylactic use in response to environmental risks; clinicians take those recommendations and apply them in a clinical context on a patient-by-patient basis[2459].

[2454] See, for example, the evidence of Professor John Cuddihy, Sharon Ferguson, Denise Gallagher, Karen Stirrat and Leann Young, all of whom recalled discussions with consultants about the use of medications to protect patients against the risk of infection from the environment.
[2455] For example, Ambisome, Caspofungin and Septrin.
[2456] See, for example, the evidence of Aneeka Sohrab and Leann Young.
[2457] Transcript of evidence of Sharon Ferguson, at p.59.
[2458] See, for example, the transcript of evidence of Professor Brenda Gibson, p.96.
[2459] Witness statement of Professor Brenda Gibson, para. 37.

988. For present purposes, it may be sufficient to notice the following decisions made regarding the use of additional prophylaxis in response to the risk of infection potentially posed by the environment (taken from the IMT minutes):

989. **August 2016**: Prophylaxis (AmBisome or Posaconazole) use planned in response to concerns about increased cases of Aspergillus on Ward 2A[2460].

990. **March 2017**: Prophylaxis introduced as a control measure in response to concerns about increased fungal counts on Ward 2A[2461].

991. **March 2018**: Ciprofloxacin prescribed to patients in the Schiehallion Unit in direct response to concerns that the water supply posed a risk of infection[2462].

- **End-March 2018**: Ciprofloxacin use was reviewed and stopped after the implementation of control measures at the end of March 2018.

992. **June 2018**: Use of Ciprofloxacin was restarted in June 2018, in direct response to a concern that drains posed a risk of infection[2463].

993. **June 2018**: Use of Ciprofloxacin was stopped following implementation of control measures[2464].

994. **September 2018**: Use of prophylaxis was considered in response to gram-negative infections thought to be associated with contaminated drains, but a decision was postponed pending the receipt of epidemiological data (and it is unclear if it was started in September)[2465].

- **September 2018**: Anti-fungal prophylaxis prescribed in response to concerns about cladding works.

995. **November 2018**: Use of anti-fungal prophylaxis associated with cladding

[2460] Bundle 1, p.25.
[2461] Bundle 1, p.35.
[2462] Bundle 1, p.68.
[2463] Bundle 1, p.129.
[2464] Bundle 1, p.132.
[2465] Bundle 1, p.155.

works reviewed[2466].

996. **December 2018/January 2019**: Anti-fungal prophylaxis recommended for patients in Wards 6A and 4C (adult haemato-oncology patients) in response to concerns about Cryptococcus[2467].

997. **February 2019**: Discussions about long-term use of additional prophylaxis[2468]; prophylaxis remains in place for select group of patients.

998. **August 2019**: Ciprofloxacin restarted in response to concerns about gram-negative infections potentially connected to the environment[2469].

999. **September 2019**: Use of additional prophylaxis is placed under review by an *ad hoc* group[2470].

1000. **October 2019**: Use of additional prophylaxis is kept under review. Certain patients remain on Ciprofloxacin[2471].

1001. **November 2019**: Anti-fungal prophylaxis continues. Agreement reached to stop routine use of Ciprofloxacin. TauroLock to be introduced[2472].

1002. **July 2020**: Agreement that current prophylaxis regime should be retained[2473].

1003. Use of additional prophylaxis aligned with periods of concern about the built environment. Although the evidence indicates that Glasgow 2 witnesses believed the use of additional prophylaxis to be justified on a risk/benefit analysis, that is not to say they held no concerns about its continued use. Clinicians were concerned about the prolonged extension of prophylaxis and side effects experienced by patients. At the root of that concern was underlying frustration at the ongoing situation and doubt that GGC had control

[2466] Bundle 1, p.229.
[2467] Bundle 1, p.267.
[2468] Bundle 1, p.307.
[2469] Bundle 1, p.351.
[2470] Bundle 1, p.360.
[2471] Bundle 1, pp.369; 389.
[2472] Bundle 1, p.393.
[2473] Bundle 1, p.435.

of the built environment[2474].

1004. Professor Gibson's frustration caused her to escalate the consultant group's concerns directly to the board Medical Director, Dr Jennifer Armstrong, in an email dated 8 January 2019[2475]. The IMT had decided that additional anti-fungal prophylaxis should be used in response to concerns about Cryptococcus, but this resulted in particular treatment-related challenges. AmBisome was prescribed but patients experienced toxicities, including some with serious anaphylactic reactions. Ordinarily, patients who could not tolerate AmBisome would be given Caspofungin but it was not effective against Cryptococcus. The alternative was to use a drug from the "azole" family, but those drugs cannot be given to patients receiving Vincristine as part of their chemotherapy treatment, including all ALL patients. Clinicians had been informed initially that this prophylaxis policy was short term. On discovering that it was to be extended, Professor Gibson sought assurance that someone at the most senior level was managing the situation. Consultants wanted assurances about the safety of the environment and the long-term prophylaxis policy. Professor Gibson did not have confidence that the "*gravity of this situation [was] really appreciated by those charged with resolving it*"[2476]. This was a reference to the board and the senior management team[2477].

1005. Professor Gibson's email was followed by a meeting among Dr Armstrong and other managers on 9 January 2019 and by a meeting with clinicians on 11 January 2019[2478]. Although Professor Gibson's email was followed by meetings at which these issues were discussed she did not feel that she received an adequate response to her concerns[2479]. Specifically, she did not recall receiving a clear explanation from senior management about the steps that they were taking to resolve the situation; a theme which emerged more than once in Professor Gibson's evidence.

[2474] See, for example, the transcript of evidence of Professor Brenda Gibson, p.151.
[2475] Bundle 6, p.43.
[2476] Bundle 6, p.43.
[2477] Transcript of evidence of Professor Brenda Gibson, p.155.
[2478] Minute of meeting dated 9 January 2019, Bundle 5, p.162; transcript of evidence of Jennifer Rodgers, p.104.
[2479] Transcript of evidence of Professor Brenda Gibson, p.157.

5.3 Years: 2020 to 2023

Introduction to 2020 to 2023

1006. After 2019, the major issues which led to the setting up of the Inquiry had concluded. That is not to say that every issue was firmly closed off, but the available evidence focussed largely on 2015 to 2019.

1007. The Glasgow II witnesses did not recall having further concerns about the pattern of infection in the paediatric haemato-oncology cohort after 2019. The Covid-19 pandemic had a significant impact on the operation of the operation of Wards 6A and 4B. Nonetheless, in January 2020, Molly Cuddihy was advised by nurses to push for admission to Ward 4B over Ward 6A for her stem cell transplant on the basis that it had better ventilation[2480], and in November 2020, Aneeka Sohrab's daughter contracted a pseudomonas infection[2481].

1008. In 2020, Mr Kelly gave evidence that he continued to have record keeping concerns around task completion and there was no evidence that the hospital was operating at its lowest possible risk level[2482]. Indeed, there was no evidence of the status of the deadlegs removal programme[2483]. This raised alarm bells with Mr Kelly, and he could not be completely confident that all the dead legs had gone[2484]. However, in February 2021, the audit noted much improved record systems and updated processes[2485] and the number of audit recommendations had dropped from 54 in 2017 to only 7 in 2024[2486]. It was noted by Mr Kelly that there is still no adequate written scheme for the QEUH meeting the requirements detailed in the HSG 274 document[2487].

Clinician evidence on infections

1009. Dr Peters reports ongoing issues throughout 2020 and 2021, including a

[2480] Transcript of evidence of Molly Cuddihy, (pm) at p.41; witness statement at para. 140.
[2481] Transcript of evidence of Aneeka Sohrab, at p.89.
[2482] Dennis Kelly, Transcript, p184
[2483] Dennis Kelly, Transcript, p187
[2484] Dennis Kelly, Transcript, p189
[2485] Dennis Kelly, Transcript, p192
[2486] Dennis Kelly, Transcript, p199
[2487] Dennis Kelly, Witness Statement, page 9 (Witness Bundle page 52)

cluster of Acinetobacter cases in the PICU in January 2020 [2488] a case of Pseudomonas putida in the NICU in February 2020, with a possible link to a leak from a toilet in the floor above[2489], and Enterobacter outbreak in ITU throughout April and May; she noted a reluctance among colleagues to classify these might be HAIs. [2490] In [redacted] 2020 a child in PICU died of Serratia; Dr Inkster was concerned about the lack of candour about links to hospital [2491] In [redacted] 2020 a patient died of Acinetobacter in the PICU Clinicians reported it to the PF as Healthcare acquired; however, it was subsequently reclassified, despite there being a typing match [2492] In 2021 a cardiac baby died of healthcare-acquired Serratia.[2493]

1010. There were concerns over patient placement, leading to patients being put in the wrong rooms. On 31 January 2020 Professor Leanord circulated a patient placement policy which included provisions for coronavirus, stating that Infectious disease consultants should be responsible for patient placement. Dr Peters raised several concerns, including the fact that the ventilation pressure may not be functioning correctly and a general lack of understanding among clinicians about the properties of various rooms. [2494]

1011. These and other ongoing issues caused her to Whistleblow to the Scottish Public Service Ombudsman in 2021. [2495] She has ongoing serious concerns about risk to patients [2496a]nd the culture within Infection Control. [2497]

Failure of the Chilled Water System in April 2020

1012. The Inquiry heard evidence that the chilled water system that connected to the chilled beams failed in the spring of 2020. Mr Clarkson told the Inquiry that there were ongoing corrosion issues within the chilled water system which may have been caused either from internal corrosion of the pipework or

[2488] Dr Christine witness statement paragraph 248
[2489] Dr Peters Witness statement paragraph 260
[2490] Dr Peters Witness statement p 277
[2491] Dr Peters witness statement paragraph 279
[2492] Dr Peters witness statement paragraph 281
[2493] Dr Peters witness statement para 378
[2494] Dr Peters witness statement para 251
[2495] Dr Peters witness statement para 326
[2496] Dr Peters Witness statement paragraph 340
[2497] Dr Peters witness statement paragraph 345

incorrect fitting of insulation around the thin steel pipework causing condensation resulting in corrosion from the outside in. Mr Clarkson clarified that leaks from the push fittings was a separate issue caused by the connections heating up and expanding resulting in leaks.[2498] This issue was raised with Professor Steele.

1013. Independently of the question of whether Chilled Beam units should be used in patient areas in hospitals there was clearly an issue with the robustness of the chilled beam cooling circuit and no awareness by estates staff or WSG members that the water in the chilled water system needed to be considered as a potential Infection, Prevention and Control issue.

The Role of Professor Wallace as Interim Director of Infection Prevention and Control

1014. Given the challenges and implicit criticisms of the views of some of the participants in events, it may be instructive to consider here the role of Professor Angela Wallace, as Interim Director of Infection Prevention and Control. She did not feel that her lack of specialist qualifications in IPC prevented her effectively doing her job.[2499] She accepted however, the challenges of apparently being appointed by the Scottish Government as an independent, but at the same time reporting to the NHS GGC Chief Executive, Jane Grant. She had said at one point that she intended to be Switzerland, neutrality.[2500] She maintained she had tried to hold onto that as long as possible.

1015. In her witness statement she appeared to make criticisms, particularly of Dr Peters and Dr Inkster. However, she departed from these in oral evidence. There was nothing wrong with colleagues who thought there were problems connected with the environment raising these issues.[2501] She was trying to support all her colleagues. She stressed that she was also challenging to

[2498] Kerr Clarkson, Transcript, Pages 99-101
[2499] Transcript of evidence of Professor Wallace p35
[2500] Transcript of evidence of Professor Wallace p38
[2501] Transcript of evidence of Professor Wallace p42

other colleagues.

1016. She was able to confirm that all of the recommendations of all of the various investigations had been dealt with. There was a spreadsheet with each recommendation, who was in charge of it, what they were supposed to do and what was then done. The 2024 version of that spreadsheet could be made available to the Inquiry.[2502]

1017. Responding to a point raised by NSS, Professor Wallace said that she was unaware of NHS GGC not following the same guidance for the reporting of infection related issues. She accepted it was unhelpful to national oversight if different Boards followed different criteria[2503].

1018. In her witness statement[2504] she had said, 'Performance against the national infection targets were strong and improving across NHS GGC and sitting well against other Health Boards...'' This gave an oversight overall of NHS GGC. However, she accepted that it was not particularly linked to environmental infections.

1019. Questioned about a comment in her witness statement[2505] about something raised by Dr Peters, she confirmed the facts raised were correct. Dr Peters wasn't making it up or alleging something that was untrue or anything of that kind.[2506] She was equally challenging to others in the infection control team (albeit there was no apparent criticism of anyone else in her witness statement -that was an omission on her part).[2507] She tried to treat everyone the same, she said. Asked to look at an example[2508] of a communication from Dr Inkster which she seemed to have selected as problematic, she confirmed there was nothing inappropriate and that Dr Inkster had been 'incredibly helpful'.[2509] The Chair put to her the apparent disconnect between witness statement and oral evidence and asked her whether her oral evidence

[2502] Transcript of evidence of Professor Wallace p56.
[2503] Transcript of evidence of Professor Wallace p65
[2504] Witness statement of Angela Wallace Answer 48
[2505] Witness statement of Angela Wallace Answer 51
[2506] Transcript of evidence of Professor Wallace p70
[2507] Transcript of evidence of Professor Wallace p73
[2508] Bundle 27, vol10 p335
[2509] Transcript of Angela Wallace at p91

supported any criticism of Dr Peters or Dr Inkster. She effectively agreed that it didn't.

1020. Asked the following question, [2510]'You've, I think, accepted that the desire of Drs Peters and Inkster was in the service of patient care. Can you tell us of any occasion in which the concerns they raised were false or spurious or anything of that kind or are all the matters that they've raised genuine points of concern?', while a long answer was given, the gist appeared to be 'no'.

1021. The question was returned to by the Chair, who asked about any inaccuracy or circumstances where matters were raised other than in good faith. She said, 'I believe that everyone was trying to improve care and safety, I absolutely do. In relation to everything that colleagues brought to me, inaccuracy, I would say that's not what I was seeing, but what I was seeing was a difference of opinion …. So, I believe that everyone was absolutely trying to do the right thing. I understood that these colleagues had terrible concerns about the building. In addition to some of the incidents, colleagues are challenging of whether Infection Prevention Control in Glasgow was a good service, and I heard lots of things from colleagues to say they didn't believe it was…So, people in good faith.'

Ventilation Developments

1022. Dr Sastry recalled that on 22 June 2020, a patient was admitted to ward 6A with fever. He was started on broad spectrum antibiotics as he had been on very intensive chemotherapy and was considered severely immunosuppressed. Dr Sastry recounted that on 25 June 2020, the patient had a routine cryptococcal antigen screening which reported a faint line which was considered potentially positive[2511]. On 26 June 2020, Dr Sastry noted that the second cryptococcal antigen test was definitely positive and sent to Bristol laboratory along with the earlier test which the laboratory confirmed were both positive[2512].

[2510] Transcript of Angela Wallace at p102
[2511] Dr Jairam Sastry, Witness Statement, page 4 (Witness Bundle page 542)
[2512] Dr Jairam Sastry, Witness Statement, page 5, (Witness Bundle page 543)

1023. In Dr Sastry's view the cryptococcal infection was new rather than latent because the patient had been serially tested before and after the positive result with all negative results. He also did not consider the positive result to have been a false positive due to the clinical signs of infection present in the child[2513]. He further noted that the child was treated with antifungal drugs very promptly and the illness resolved completely[2514].

1024. According to Dr Peters Dr Sastry indicated that he was told by Jennifer Rogers to tell the patient's parents that it was a false positive but that he refused to do so. [2515]

1025. Dr Peters also noted that an update to parents via a Board Facebook page was inaccurate in that it stated that Cryptococcus he had been isolated on the ward but that there had not been any cases. There had also been no discussion as to whether the current case was linked to the previous paediatric Cryptococcus case. 2516 She also noted that there had been further adult Cryptococcus cases, and that 5 out of 6 had epidemiological links to QEUH. [2517]

1026. In 2019 and 2020 Daryl Conner was asked to do a similar options appraisal for Ward 4C to the one he had done for ward 6A while operating as a decant. He accepted as a description of 4C in the result that it was 'less than completely compliant'.[2518] Rebuild was one of the options not pursued. What was done was moderate rebalancing to achieve positive pressure, the installation of ceiling mounted HEPA filters, checks for dampness in en suites, ward corridor grills replaced by standard ceiling tiles, secondary filtration in the air handling units upgraded from F7 to F9 end electrical load circuits lifted to optimise air change rates. It would seem that by that point NHS GGC had decided to forget about Dr Inkster's work on Ward 4C.

[2513] Dr Jairam Sastry, Witness Statement, page 7 (Witness Bundle page 545)
[2514] Dr Jairam Sastry, Witness Statement, page 8 (Witness Bundle page 546)
[2515] Dr Peters Witness statement para 290
[2516] Dr Peters Witness Statement para 293-294
[2517] Dr Peters witness statement para 295
[2518] Darryl Connor, Transcript, Page 43

Water System Management

1027. The 2023 DMA Canyon L8 risk assessment was carried out in June and July 2023[2519]

1028. No L8 risk assessments were carried out in the QEUH in 2021, 2022, and 2023. The absence of the risk assessments was flagged up in the 2023 annual audit by the Authorising Engineer, Mr Kelly as a high risk.[2520] Mr Clarkson explained that this was due to lack of capacity within DMA.[2521]

1029. Mr Clarkson explained that the process of removing the POUFs in the RHC (excluding the Schiehallion Unit) started in 2020 but then stopped as the laboratories were overwhelmed by the number of samples generated by the three-week filter removal process. The removal of POUFs is currently being considered again for general wards in the QEUH outwith high-risk areas and is being co-ordinated by the compliance department, IPC and microbiologists.[2522]

1030. It is notable that the AE Audit in 2021 carried out by Mr Kelly had 24 recommendations[2523] which was fewer than 2020 (43 recommendations) and by 2023 there were only 9 recommendations. In 2024, there were 7 recommendations.[2524]

1031. The two non-flow-through accumulator expansion vessels in the basement tank room that had concerned Mr Watson in 2015 and were mentioned in the 2015 DMA Canyon L8 Risk Assessment were converted in late 2023 so they are now flushable.[2525]

1032. It is however of concern that in September 2021 Mr Clarkson had identified corrosion of steel rod bars in post-filter storage tanks that appeared to date back to the installation of the tanks before handover. He noted that there were

[2519] Bundle 27, Volume 1, Document 17, Page 51
[2520] Dennis Kelly, Transcript, Page 197
[2521] Kerr Clarkson, Transcript, Pages 60-63
[2522] Kerr Clarkson, Transcript, Pages 81, 92
[2523] Bundle 20, Document 97, Page 2078 (A44312701)
[2524] Bundle 27, Volume 1, Document 18, Page 252 (A49511261)
[2525] Kerr Clarkson, Transcript, Pages 71-72

strainers in the outlets from the tanks to prevent any particles that may be in the water from getting into the supply.[2526] This was reported to the Board WSG.[2527]

1033. In the 2023 L8 risk assessment, it has now changed to a two-year review window because in Mr Watson's opinion the water system is under good control and very close to being compliant with L8. His view was that it would be unfair to say, because a few recommendations made, that the water system is not compliant.[2528] He explained that was in part because in the intervening period:

- There had been the installation of chlorine dioxide dosing, adding a third filter to the filtration banks and changed pipework so all filters fed to a common header.
- POUFs that filter the water to 0.2 micron were now in use.
- There is also a flushing regime in place for dead legs.
- The expansion vessels in the calorifiers have been replaced.
- The number of specification water samples improved from 2020 onwards and in the last couple of years the amount of out of specifications have reduced significantly.[2529]

1034. It was Mr Clarkson's evidence as current Authorised Person (Water) that the Estates team had worked with an Authorised Engineer, Daniel Pitcher, to merge the Written Scheme into the Water Safety Plan to create a more comprehensive Written Scheme. At the time of the Glasgow III hearing, he explained that the last version was Version K. Versions B[2530], C[2531], E[2532],

[2526] Kerr Clarkson, Transcript, Page 94-95 and 58-59
[2527] Bundle 11, Document 45, Page 144 at 146 (A38675882)
[2528] David Watson, Transcript, Page 152
[2529] Kerr Clarkson, Transcript, Pages 93-94
[2530] Bundle 20, Document 121, Page 1978 (A47867410)
[2531] Bundle 25, Document 58, Page 938 (A47867425)
[2532] Bundle 18, Volume 2, Document 122, Page 1091 (A33869811)

F[2533], G[2534], H[2535], J[2536]. His view was that the new merged Water Safety Plan is ahead of British Standard (BS 8680).[2537]

1035. In respect of staffing levels, it seems that compared to 2015 the QEUH Estates team was now using a more lot of outsourced service providers for water compliance and had more staff.[2538]

The Completion of the Refurbishment of Wards 2A/2B

1036. The Schiehallion Unit moved back to the refurbished Wards 2A and 2B in March 2022[2539].

1037. In Glasgow III evidence was heard about some aspects of the scrutiny carried out of the refurbished wards before patients moved back.

1038. It does seem that there was no Stage 4 HAI-Scribe completed for the refurbished Wards 2A/2B. When asked about this, Mr Clarkson (currently Estates Manager for the QEUH Campus) asserted that in the final refit works of Ward 2A in 2021 and 2022, did not require a HAI-SCRIBE as the refit was a big job and HAI-SCRIBE is for making relatively small changes to live environments. However, Mr Clarkson did note that there may be an overarching HAI-SCRIBE to minimise risk to patients where wards such as 2A/2B were within a larger building.[2540] It should be noted that Mr Clarkson may not, despite being responsible for completing many HAI-Scribes for works by Estates in the QEUH/RHC, be doing much more than repeating and following NHS GGC practice in this area. Mr Walsh appeared to take a similar view to Mr Clarkson that a HAI-SCRIBE document be used for refurbishment works but not the whole hospital. In Mr Walsh's view, HAI-SCRIBE would not be a useful document for an entire hospital as it would be hugely unwieldy. He added that it would be for someone in the project team to approve the HAI-

[2533] Bundle 25, Document 59, Page 1044 (A47867423)
[2534] Bundle 25, Volume 60, Page 1152 (A47867426)
[2535] Bundle 18, Volume 2, Document 121, Page 1082 (A45529787)
[2536] Bundle 27, Volume 1, Document 19 at page 276 (A49516753)
[2537] Kerr Clarkson, Transcript, Pages 55-75
[2538] Kerr Clarkson, Transcript, Pages 68-70
[2539] Witness statement of Dr Shahzya Chaudhury, para. 113.
[2540] Kerr Clarkson, Transcript, Page 41

SCRIBE pre-handover[2541].

1039. It was explained by Mr Brattey that a HAI-SCRIBE is a risk assessment for healthcare in buildings and the environment to mitigate hospital acquired infection. He stated that it involved consideration of the intended work tasks, the issues that may arise from those work tasks and how these issues will be overcome to minimise the risk. He added that the HAI-SCRIBE document was quite comprehensive but not difficult to fill out. The process was outlined by Mr Brattey which involved a matrix of risk, category of clientele affected (such as immunocompromised patients), and the mitigations to reduce the risk. The document would be filled in with handwritten details and then passed to Infection Control for approval. It was conceded in evidence that Mr Brattey did not have any training in writing HAI-SCRIBEs and that he had learned it from scratch[2542].

1040. Ms Rankin asserted that HAI-SCRIBE should be used up to Stage 4 which would include changing sanitary fittings or if there is refurbishment to a ward. She gave evidence that they would also be required for bigger projects. She was clear that a HAI-SCRIBE would have been required when the QEUH/RHC opened in 2015 because it is needed to make sure everything is in place. She was also forthright in her response that a HAI-SCRIBE would be required for the 2018 Schiehallion Unit refurbishment and the various works carried out on Ward 4B. In her view, a HAI-SCRIBE would not be required for routine cleaning but would be required for removing wall panelling to get to pipework behind[2543].

5.4 Significant Interventions in Wards 2A/2B, 6A and 4B: 2016 to 2020

1041. This section contains a list the interventions that made in response to concerns that blood and respiratory infections were linked to the water system

[2541] Thomas Walsh, Transcript, page 66
[2542] David Brattey, Transcript, pages 19-20
[2543] Annette Rankin, Transcript, pages 29 to 31

or ventilation system in Wards 2A/2B, 6A and 4B. A shorter version of this was selected for by Mr Mookerjee his Quantitative Report at Section 8.5.1[2544].

Date	Key interventions	Document title	Bundle reference
Jan-16	Wash basins removed; HEPA filters installed	Oversight Board Infection Timeline (Timeline of Incidents for the period 2015 to 2019)	Bundle 6, Document 37, Page 934
Aug-16	HEPA filters installed	05.08.2016 IMT minutes	Bundle 1, Document 6, Page 22
Mar-17	Anti-fungal prophylaxis	07.03.2017 IMT minutes Ward 2A Aspergillus	Bundle 1, Document 9, Page 35
Apr-17	Ward 2A closed to admissions + CD	13.04.2017 IMT minutes Ward 2A rotavirus and VRE	Bundle 1, Document 10, Page 40
Jul-17	HEPA filter installation	21.8.2017 - Email - Calum McLeod to Sandra Devine attaching 1) 19.6.2017 - HAI-SCRIBE for Ward 4B En-suite ceiling replacement and 2) email - (redacted) confirming patient risk level is group 4	Bundle 27, Volume 7, Document 63.2, Page 612
		Closing Submission - Alastair Duncan and Victoria Arnott - June 2023 Hearing	
Sep-17	Bottled water only	22.09.2017 IMT minutes Exophiala in CF	Bundle 1, Document 12, Page 50
		Witness Statement of Stevie-Jo Kirpatrick	Hearing commencing 20 September 2021, Bundle 4, Document 2, Page 55
Oct-17	Prophylactic antimicrobials given	PAG Minute dated 27 October 2017 - Aspergillus - Ward 2A RHC	Bundle 2, Document 25, Page 66
Mar-18	HPV, POUFs, Alcohol gel only, disposable shower heads	06.03.2018 2. IMT Minutes Water Incident Ward 2A RHC	Bundle 1, Document 14, Page 56
		16.03.2018 5. IMT Minutes Water Incident Ward 2A RHC	Bundle 1, Document 17, Page 66
Mar-18	Prophylactic ciprofloxacin given	16.03.2018 5. IMT Minutes Water Incident Ward 2A RHC	Bundle 1, Document 17, Page 66
Apr-18	CD shock dosing, flow straightener replaced, taps replaced	Minutes - Water Technical Group Meeting - 04 May 2018	Bundle 10, Document 5, Page 22
Jun-18	2A admissions restricted	04.06.2018 IMT Water Incident Ward 2A RHC	Bundle 1, Document 23, Page 94
Jun-18	CD dosing, replacement taps, water tank	Minutes - Water Technical Group Meeting - 08 June 2018	Bundle 10, Document 9, Page 35

[2544] Bundle 21, Volume 1, Document 1, Page 33

Date	Key interventions	Document title	Bundle reference
	cleaning, water coolers removed		
Jun-18	Ward 2A and 2B drains cleaned	11.06.2018 IMT Water Incident Ward 2A RHC	Bundle 1, Document 27, Page 114
Jun-18	Filtration unit and water tank cleaned	Minutes - Water Technical Group Meeting - 22 June 2018	Bundle 10, Document 11, Page 44
Jul-18	Water cooler and taps replacement	Minutes - Water Technical Group Meeting - 06 July 2018	Bundle 10, Document 13, Page 51
Aug-18	CD dosing	Minutes - Water Technical Group Meeting - 03 August 2018	Bundle 10, Document 18, Page 71
		Oversight Board Infection Timeline (Timeline of Incidents for the period 2015 to 2019)	Bundle 6, Document 37, Page 960
Sep-18	Decant from 2A and 2B to 4B and 6A	05.09.2018 IMT minutes FINAL	Bundle 1, Document 35, Page 149
		14.09.2018 IMT minutes Ward 2A	Bundle 1, Document 38, Page 164
		19.09.2018 IMT minutes Ward 2A	Bundle 1, Document 41, Page 180
		20.09.2018 IMT minutes Ward 2A	Bundle 1, Document 42, Page 185
		25.09.2018 IMT minutes Ward 2A	Bundle 1, Document 43, Page 190
Sep-18	Restriction of admissions	05.09.2018 IMT minutes FINAL	Bundle 1, Document 35, Page 149
		14.09.2018 IMT minutes Ward 2A	Bundle 1, Document 38, Page 164
Sep-18	POUF fitted in 4B and 6A, sink gaskets	19.09.2018 IMT minutes Ward 2A	Bundle 1, Document 41, Page 180
		20.09.2018 IMT minutes Ward 2A	Bundle 1, Document 42, Page 185
Oct-18	CD shock dosing, flow straightener replaced, taps replaced	11.10.2018 IMT minutes Ward 2A	Bundle 1, Document 46, Page 204
Oct-18	High level chlorine dosing in 2A and 2B	11.10.2018 IMT minutes Ward 2A	Bundle 1, Document 46, Page 204
Nov-18	CD dosing, new showerheads, and hoses	Minutes - Water Review Meeting (Technical) - 09 November 2018	Bundle 10, Document 30, Page 116
Dec-18	CD dosing	Minutes - Water Review Meeting (Technical) - 10 December 2018	Bundle 10, Document 34, Page 131
Jan-19	Restriction of admissions to 6A	21.01.2019 IMT Cryptococcus	Bundle 1, Document 62, Page 278
Jan-19	HEPA filter installation plus 6A patients moved	25.01.2019 IMT Cryptococcus	Bundle 1, Document 65, Page 291
Jan-19	CD dosing	Minutes - Water Review Meeting (Technical) - 11 January 2019	Bundle 10, Document 36, Page 136

Date	Key interventions	Document title	Bundle reference
Jan-19	Decant from 6A	07.01.2019 IMT Cryptococcus	Bundle 1, Document 57, Page 255
Jan-19	HEPA filters fitted to 6A	17.01.2019 IMT Cryptococcus Part 1 AM	Bundle 1, Document 59, Page 266
		17.01.2019 IMT Cryptococcus Part 2 PM	Bundle 1, Document 60, Page 270
Jan-19	General repairs	DMA Canyon Report 2019 - Water System Risk Assessment - 10 July 2019	Bundle 25, Document 11, Page 378
Feb-19	CD introduced into hot water, vent cleaning, end of 6A decant	Minutes - Water Technical Group - 08 February 2019	Bundle 10, Document 38, Page 143
		08.02.2019 IMT Cryptococcus	Bundle 1, Document 69, Page 307
Mar-19	CD dosing increased	Minutes - Water Technical Group Meeting - 08 March 2019	Bundle 10, Document 40, Page 150
Jun-19	CD dosing, filters fitted to all outlets serving high-risk patients	Minutes - BICC Meeting - 03 June 2019	Bundle 13, Document 57, Page 417
		19.06.2019 IMT Gram Negative Blood Ward 6A	Bundle 1, Document 72, Page 320
		25.06.2019 IMT Gram Negative Blood Ward 6A	Bundle 1, Document 73, Page 325
		Minutes - Water Review Meeting (Technical) - 21 June 2019	Bundle 10, Document 44, Page 166
Jul-19	QEUH chlorination system fitted	Minutes - AICC Meeting - 16 July 2019	Bundle 13, Document 22, Page 169
Aug-19	Restriction of admissions to 6A	01.08.2019 IMT Gram Negative Blood Ward 6A	Bundle 1, Document 75, Page 334
		Queen Elizabeth University Hospital and Royal Hospital for Children: Case Note Review Overview Report dated March 2021	Bundle 6, Document 38, Page 975
Nov-19	6A opened to new admissions	01.08.2019 IMT Gram Negative Blood Ward 6A	Bundle 1, Document 88, Page 402
		Queen Elizabeth University Hospital and Royal Hospital for Children: Case Note Review Overview Report dated March 2021	Bundle 6, Document 38, Page 975
Apr-20	Tank levels reduced to allow frequent flushing	Minutes - Water Review Meeting (Technical) - 17 April 2020	Bundle 10, Document 51, Page 192
Jul-20	Open sump in plant room covered with polythene	Minutes - Water Technical Group Meeting - 03 July 2020	Bundle 10, Document 52, Page 195
Sep-20	CD dosage increased in backwash areas	Minutes - Water Technical Group Meeting - 18 September 2020	Bundle 10, Document 53, Page 198

Date	Key interventions	Document title	Bundle reference
Sep-20	Flow straightener restrictors changed every 6 months	Minutes - Water Technical Group Meeting - 18 September 2020	Bundle 10, Document 53, Page 198

6. HOW AND WHY DID KEY EVENTS HAPPEN?

1. Chapter 5 contains a narrative of what took place in the QEUH/RHC from the summer of 2014 until the end of 2023. However, understanding the impact of the building that was built and handed over to NHS GGC in January 2015 on patient safety and care, requires that the Chair reach conclusions on the reasons why NHS GGC staff, HPS and HFS and others reacted (or did not react) to the discovery of what we have called potentially deficient features of the water and ventilation systems and to infections that had the potential to be linked to those deficiencies. Whilst Chapter 5 contains the views, opinions and explanations of key witnesses for events, their actions and those of others, this Chapter attempts to draw these issues together, by focusing on seven periods of time or key events in a manner prefigured in the Opening Note by the first seven fact specific questions set out there.

2. These seven fact specific questions have been focused as:

- What was the reaction of NHS GGC and its staff to discovering the potentially deficient features of the water and ventilation system in 2015?
- What was the scope and the extent of the response to potentially water related infections from early 2016 and what would have been the effect if the 2015 DMA Canyon L8 Risk Assessment had been known to IPCT that year?
- What was the scope and extent of the response to further unusual potentially water related infections in 2017 and what would have been the effect had the 2015 DMA Canyon L8 Risk Assessment been known to IPCT that year?
- At the time of Stage 1 Whistleblow and the 27 Point Action Plan, what understanding was held within NHS GGC about the features of the hospital water and ventilation systems and whether there was any connection to the number of infections?
- How did the IPC team, Estates staff and GGC as an organisation respond

to what appear to be unusual numbers of infections in the Schiehallion Unit in 2018?

- Were the various suspected and confirmed Cryptococcus and Aspergillus cases in the period from 2016 to 2020 properly investigated, and what can be learned that is relevant to the question of whether the ventilation gave rise to an infection link or increased risk to patients?

- What can the events of autumn 2019 tell the Inquiry about NHS GGC's understanding of the state of both the water system and the ventilation system during 2019 and about the way that NHS GGC were responding at that time?

6.1 What was the reaction of NHS GGC and its staff to discovering the potentially deficient features of the water and ventilation system in 2015?

3. The way that NHS GGC staff responded to the relevant systems of the new hospital in 2015 is best considered in three parts: those wards with specialist ventilation requirements, the ventilation of the balance of the hospital and the water system. However, before considering those matters it is necessary to understand what information NHS GGC Estates staff had at handover about the specification of the water and ventilation systems.

Zutec/PPM schedules/Documentation/Commissioning and Validation

4. It seems clear that, from their perspective, NHS GGC Estates staff found the Zutec system hard to use, and it did not appear to contain all the expected drawings, commissioning documentation, and validation documents for the ventilation system. It is entirely appreciated that evidence has still to be heard from staff of Brookfield and their contractors (and they will be heard in Glasgow IV), but it remains the case that those NHS GGC appointed to run the operational estates side of the new hospital consider that they were held back in their understanding by a significant lack of information about the systems of the new hospital. Why it was accepted with so little information of this sort available to NHS GGC Estates staff is a question for Glasgow IV.

Specialist Ventilation Areas

5. At handover treating clinicians were expecting to find enhanced ventilation in three specific wards (Wards 2A, 4B and 4C) and in the isolation rooms in critical care. At that point there were 36 isolation rooms in the QEUH/RHC[2545] of which 10 were in critical care (ITU and HDU). There were no isolation rooms in the infectious disease wards on the 5th floor.

6. In respect of Ward 4B, the patients moved into the QEUH on 6 June 2015, but concerns had been raised about the PPVL isolation rooms in this ward by the Sector ICD, Dr Inkster in February 2015 and about air sampling results, lack of 10 ACH, HEPA filtration outside the isolation rooms and lack of pressure monitors in the summer of 2015. Some work was done in the ward in July 2015, but in any event the haematology consultants raised concerns about safety, and on 8 July 2015 the adult BMT unit moved back to the Beatson. These events were reported to the BICC on 27 July 2015. Putting aside for Glasgow IV why Ward 4B was built as it was, it is completely clear that NHS GGC knew by the end of July 2015 that Ward 4B was not built to the standards their own haematology consultants expected. As Dr Armstrong put it, they did not get what they were expecting. It seems likely that at that point no-one in NHS GGC outside the Project Team really understood how far Ward 4B was away from compliance with SHTM 03-01. What appears to have stopped that being worked out was the lack of clarity about what the ventilation specification was, as built.

7. In respect of Ward 2A the lack of HEPA filters in the isolation rooms was noticed at the start of June 2015. Professor Gibson is right to have been surprised that the omission of filters had not been detected during the commissioning process, but why that was must await Glasgow IV. On 5 June 2015 she raised the issue with Dr Armstrong, but after a series of emails and meetings, transplants did commence on 20 June 2015, with the clinical risk assessment taking account of the needs of the patient. The other differences between Ward 2A at the RHC and the old ward in Yorkhill were noticed almost

[2545] PPP 14, Para 5.8; Bundle 26, Document 4 at page 291

as soon as patients moved in. Strangely, these developments did not seem to have been reported to the BICC when it next met on 27 July 2015.[2546]

8. In the case of Ward 4C there does not to appear to be evidence that it was understood that there was anything especially wrong with the ventilation in that Ward in the summer of 2015, but it may simply be that at that point the focus was on adult BMT and Ward 4B, so the issue did not arise.

9. The isolation rooms in critical care were seemingly intended to be PPVL rooms. How that came to be is a question for Glasgow IV, but in late 2014 Dr Peters had raised the issue of the lack of negative pressure isolation rooms. It was not until June 2015 that Professor Williams, as lead ICD, sought specifications of the ventilation from the Project Team or reported the lack of HEPA filters in the isolation rooms in ITU and HDU.

10. At the start of July 2015 there was then the clear and unmissable attempt by Dr Peters and Dr Inkster to raise concerns about ventilation systems in both Wards 2A and 4B. This was done when they sought to resign their ICD sessions, and the substance of their concerns were repeatedly reported and escalated to Dr Armstrong by Dr Stewart. It should be stressed that the concerns raised by Dr Peters and Dr Inkster about deficiencies in the ventilation systems of both the adult and paediatric BMT wards, and in respect of water quality and testing results, have been shown to be entirely justified.

11. By the middle of July 2015 there can be no doubt that the Lead ICD, the Medical Director and the ICM all knew that the ventilation in Wards 2A, 4B and the isolation rooms in critical care was not as was expected. This raises two questions: what did they do to remedy those problems, and what did they do to find out why this had occurred.

12. The attempt to return the Adult BMT unit to Ward 4B in December 2015 can reasonably be described as inept. Dr Inkster's concerns when she refused to sign off the works were entirely vindicated by the HPS SBAR of December 2015. Fixing Ward 4B took two years, and yet beyond adding HEPA filters and

[2546] Bundle 13, Document 32, Page 250

making other repairs to the isolation rooms in Ward 2A and elsewhere, nothing was done to address the other potentially defective features identified.

13. As far as working out what had gone wrong, there seems to be no evidence that any attempt was made in 2015 to work out what had gone wrong in the procurement of the hospital to cause the ventilation systems features that had caused concern about the Wards 2A, 4B and the isolation rooms in critical care. No convincing explanation has been given as to why Glasgow III witnesses, and particularly the Medical Director, were not demanding answers at this point. From what was heard, ineffectual attempts were made from time to time to ask relevant questions of the Project Team. These either met with no response or bland assurances which were, putting it kindly, incorrect.

The ventilation of the balance of the hospital

14. From the evidence available in Glasgow I, II and III it appears that, outside the Project team, no-one in NHS GGC realised that the ventilation standard for the general wards or the balance of the hospital had been derogated from the standard of 6 ACH advised in SHTM 03-01. However, it is submitted that it is a reasonable inference that, had an attempt been made to rigorously understand what had gone wrong in respect of specialist ventilation spaces then the Ventilation Derogation might well have been discovered in 2015. It is also likely that if validation had been carried out the change would have been flagged to a wider organisation.

The Water System

15. As a consequence of the 5 June 2014 meeting with HPS and HFS, and in light of the Pseudomonas outbreaks in Northern Ireland and Australia in 2012, NHS GGC - and certainly Mr Gallagher and Mr Powrie - knew that the Horne Optitherm taps posed a water safety issue. The issue appears to have been reported as an AOCB to the Board Water Safety Group on 7 August 2014 and considered at further meetings, but it is now clear that nothing substantive or systematic was done to maintain these taps until 2021. No explanation has been given by senior NHS GGC staff for this significant and repeated oversight.

16. In respect of the risk posed by contamination of the domestic water system, there must have been a point, when the water system was filled months before handover, when Estates Staff would have noticed and thus been placed on notice that there might be an issue around water quality. In any event all the members of the Board Water Safety Group (and in particular its co-chairs Ms Kane and Ms Walsh and also Mr Gallacher) must have known or ought to have known that L8, HSG 274 and SHTM 04-01 Part B placed an obligation on NHS GGC to carry out a pre-occupation L8 risk assessment. That pre-occupation risk assessment was carried out in April 2015 in the form of the 2015 DMA Canyon L8 Risk Assessment. The explanations provided by Mr Powrie for not reacting to and escalating the significant failings and risks set out in that assessment once he had received it on 6 May 2015 are not acceptable. It is irrelevant that he maintains that he sought to delegate responsibility to members of his team. This is not something that can be delegated. As the person who ordered the report and received it, he should have acted, and he did not. Failure to do so, at the very least, exposed the Chief Executive as Duty Holder to questions about why this task was not carried out. Others were aware that the report had been instructed (not least Mr Loudon in the Project Team). It should be accordingly made clear that Mr Powrie was not alone, as the members of the Board Water Safety Group – including the Co-Chairs - should have been looking out for an L8 risk assessment. The fact that they did not suggests a real failure of understanding on their part.

17. From the evidence in the Inquiry so far, and as discussed in more detail in Chapter 7.1, there is no reason not to think that the averment in Statement 16 of the NHS GGC summons in their action against Multiplex and others is not correct, when it avers that in 2015 there was "systemic contamination of the domestic water system".[2547] In his evidence Professor Steele confirmed that in 2015, 2016 and 2017, there wasn't a proper structure of designated people and a written scheme for the new hospital. He explained that whether the water system was contaminated or not, the system had the potential to be

[2547] Bundle 17, Document 80 at page 3042

contaminated. The control of the system was not robust enough to eradicate the bacterium. Further, he explained that the systems would support a position that, on review of the data about how the system was commissioned, it compromised the sterility of the pipework as having water not moving in the system compromised the system.

18. Dr Peters had specially raised the issue of water quality and testing results when she attempted to resign her ICD sessions on 8 July 2015. Later developments show that her concerns were vindicated. At this point Dr Stewart and Dr Armstrong would have had the information they needed to in turn press for information from the lead ICD or the ICM (in his role as Co-Chair of the Board Water Safety Group), but it does not seem that they did that.

19. In any event by the end of 2015 the IPCT, the Medical Director and her deputy remained unaware of the high risk that was posed by the domestic water system. The primary responsibility for that must lie with Mr Powrie, but Mr Gallacher holds some responsibility as well given his senior role in the organisation, general lack of action and repeated assumption that someone else had passed on critical information he held.

20. There has been no good explanation yet for the failure to appoint a Designated Person (Water), Authorised Person (Water), and Authorising Engineer for the new hospital. Mr Gallacher accepted some responsibility once he was in post. According to the Board Water Safety System Policy, Mr Walsh was clearly responsible for the appointment of the Designated Person (Water) but maintains he passed on that task, and this question will need to be revisited in Glasgow IV. Whilst to some extent it is speculation to ask whether it would have made a difference for these people to be appointed when they should have been in 2015, the fact that Mr Kelly was clearly so active in his audits after he was appointed, tends to suggest that had these appointments been made it would not have taken until June 2018 for the existence of the 2015 DMA Canyon Risk Assessment to come to wider attention.

6.2 What was the scope and the extent of the response to potentially water related infections from early 2016 and what would have been the effect if the 2015 DMA Canyon L8 Risk Assessment had been known to IPCT that year?

21. If we focus solely on those bacteria genera categorised by HPS in 2019 as Environmental and Enteric Gram-negatives,[2548] then in 2016 within the new build RHC there had been infections of bacteria within the genera of Pseudomonas, Klebsiella, Cupriavidus, Acinetobacter and Elizabethkingia. It is hard to answer whether there were unusual number of infections in 2016, but, as discussed, epidemiology does show that from the second quarter of 2016 there was an increase in these infections that would in 2017 reach a higher level. There was also a Mycobacterium chelonae infection in Ward 2A.

22. There were no IMTs in 2016 that related to these infections, and so it cannot be suggested that those Estates managers who knew about the risk assessment were put on notice about these infections at IMTs. It remains the case that in February 2016 Dr Inkster was told that there were no risk assessments. As a result, the 2016 investigation into Cupriavidus in the aseptic pharmacy focused on a local source of infection.

23. We cannot know whether that source was local or had been seeded from a biofilm across the system, but had the 2015 DMA Canyon L8 Risk Assessment been brought to the attention of the IPCT, and certainly Dr Inkster as the new Lead ICD, given the manner in which she investigated potentially defective features of the ventilation system, it is hard to imagine that she would not have acted to investigate the state of the water system in the hospital at that time.

24. We cannot tell what would have been found by a such an investigation given the small number of water samples being taken, but it must at least be possible that had the 2015 DMA Canyon L8 Risk Assessment emerged around the time Dr Inkster was appointed Lead ICD , steps would have been taken to address the weaknesses of the water system, and the biofilm would not have grown to the extent it undoubtably did by the time of the start of the

[2548] As discussed in Section 7.3

'Water Incident' in March 2018.

6.3 What was the scope and extent of the response to further unusual potentially water related infections in 2017 and what would have been the effect had the 2015 DMA Canyon L8 Risk Assessment been known to IPCT that year?

25. If we focus solely on those bacteria genera categorised by HPS in 2019 as Environmental and Enteric Gram-negatives[2549] then in 2017 within the new build RHC there were infections of bacteria within the genera of Pseudomonas, Acinetobacter, Klebsiella, Elizabethkingia, Stenotrophomonas, Cupriavidus and Stenotrophomonas Maltophilia. As discussed in Chapter 7.3 epidemiology does show rates of Environmental and Enteric Gram-negative were higher in 2017 than in 2015 and the early parts of 2016. Dr Inkster explained that she did not consider that the drains were a route of infection and that seems consistent with the IMT minutes.

26. In contrast with 2016, from 17 September 2017 Estates start to attend IMTs, but the first IMT which was attended by Mr Powrie or Mr Gallacher that dealt with an Environmental and Enteric Gram-negative bacteraemia was 6 March 2018, after the Water Incident IMT had started.

27. There seems no reason not to think that had the 2015 DMA Canyon L8 Risk Assessment been drawn to the attention of IPCT before Dr Inkster went off on sick leave, steps would have been taken to address the weaknesses of the water system and the biofilm would not have grown to the extent it undoubtably did by the time of the start of the 'Water Incident' in March 2018.

28. It is more difficult to work out what was going on in the second half of 2017, when Dr Inkster was not working as Lead ICD. We could not (for good reasons associated with his health) hear the oral evidence of Professor Jones and not all the microbiologists with ICD sessions could give evidence. Professor Jones clearly did step up into a leadership role in Dr Inkster's absence, but it does seem that working relationships in IPCT were not good at

[2549] As discussed in Section 7.3

that time. Some microbiologists who had ICD sessions at this time we have heard from in statement form seem to have forgotten rather a lot. However, we did hear from Dr Peters and Ms Dodd, and Dr Redding was clear that what she was hearing, and what prompted her to contact Mr Calderwood and then Ms Grant was from more widespread sources than just Dr Peters. We also have emails that enable the Inquiry to relatively easily work out that there was real unhappiness amongst microbiologists who had ICD sessions.

29. There is also the strange circumstance of the lack of water testing or report to HPS of the September 2017 Cupriavidus infection. It is difficult to see why such an infection would not trigger a PAG and report to HPS, but it did not. There is also the retrospective review of Stenotrophomonas maltophilia cases in 2017, prepared by Dr Mathers in his SBAR of 1 March 2019[2550] in which he expresses concerns about management processes being weak. The level of redaction in later reports in our bundles around these cases is very high, which renders them unsuitable for high levels of scrutiny in public, but, when taken with the September 2017 Cupriavidus response, it does seem reasonable to conclude that IPC at the RHC was, in respect of response to unusual micro-organisms with a potential environmental link, not as good as it could be.

6.4 At the time of Stage 1 Whistleblow and the 27 Point Action Plan what understanding was held within NHS GGC about the features of the hospital water and ventilation systems and whether there was any connection to the number of infections?

30. It would be naive to think that the Stage 1 Whistleblow was welcomed with open arms by Dr Armstrong and the other key people present at the meeting of 4 October 2017, but two things require to be recognised about this process. Firstly, all the authors of the SBAR were substantially correct about the issues they raised about the water and ventilation systems of the hospital and the infection prevention and control structure, and, secondly, as a direct consequence of the meeting of 4 October 2017 a 27 Point Action Plan was

[2550] Bundle 4, Document 36, Page 151

produced and approved at a high level within a very short period. Given that part of the response was that some of these actions had already started to be addressed, it is mystifying that the Whistleblowers were not kept informed of progress to implement the 27 Point Action Plan once it had been approved.

31. Looking back at these events with the benefit of the evidence in Glasgow III, we can say with some degree of certainty that of the issues raised in the SBAR of 3 October 2017[2551] about features of the hospital water and ventilation systems:

32. NHS GGC had known that there were questions about the use of PPVL rooms for infectious patients since at least Dr Inkster's interventions about Ward 5C in May 2016, and likely since June 2015 when Dr Peters had raised the issue with Mr Loudon.

33. NHS GGC had known that there were issues around specialist ventilation for immunocompromised patients outside 4B since June 2015, when the press statement around the return of the BMT unit to the Beatson had been inaccurate. The SBAR of 30 October 2017[2552] about the ventilation of Ward 2A and the risk of invasive lung disease, summarises in short form what must already have been known by NHS GGC, in the form of the recognition that Ward 2A did not meet the standard in SHTM 03-01 in the March 2017 draft options appraisal document for the NHS GGC Acute Service Committee[2553]

34. NHS GGC executive level management had known of the Ventilation Derogation in respect of the air change rate outside the isolation rooms since Mr Powrie's email of 26 May 2016, but still by October 2017 nothing appears to have been done to investigate why this had happened or to assess risks other than those posed by infectious patients.

35. NHS GGC had known about the risks posed by the Horne Optitherm taps since June 2014 and still they were not being systematically maintained.

[2551] Bundle 4, Document 20, Page 104
[2552] Bundle 4, Document 23, Page 113
[2553] Bundle 27, Volume 7, Document 6, Page 158

36. In October 2017 water testing was still happening at a low rate and NHS GGC executive level management still did not know about the 2015 DMA Canyon L8 Risk Assessment which remained largely unactioned.

37. It is remarkable what the 27 Point Action plan[2554] addresses and what it does not address.

38. There remains no real acceptance that the PPVL rooms are not suitable for infectious patients, but it does recognise that the Infectious Diseases Unit was not commissioned as an infection diseases unit. Why this is seen as resolving matters three years after opening is unclear. (Items 1-4)

39. In respect of Ward 2A, HEPA filters were fitted to more rooms in Ward 2A after the 4 October 2017 meeting, with further feasibility studies planned and what appears to be belated contact of HPS following the March 2017 Aspergillus cases. There is no acknowledgement of the acceptance of non-compliance of Ward 2A with SHTM 03-01 or a commitment to act to address that. (Items 5-10)

40. The action point in respect of the ACH rate and use of chilled beams, proceeds on the basis that NHS GGC is in a position to offer 'learning' to other health boards, without any justification as to why that that rather breathtaking corporate arrogance was justified, or any indication that an attempt was being made to find out why the Ventilation Derogation was made or whether it poses a risk to patients. (Item 17)

41. The actions proposed in respect of the Horne Optitherm taps (Item 21) appear to completely miss the issues of patient safety raised by HPS and HFS back in June 2015 - and maintenance of these taps was still not in place. (Item 21).

42. The Statement that "Board Water Safety is in place and water systems and processes are monitored as per national guidance" (Item 22) was simply untrue. The non-disclosure or actioning of the 2015 DMA Canyon L8 Risk Assessment was dramatically outside national guidance, although an Authorising Engineer (Water) had been appointed in May 2017 – more than

[2554] Bundle 20, Document 48 at page 794

two years late.

43. In respect of numbers of infections, given that we know from the 2019 HPS Review[2555] that rates of Gram-negative Environmental and enteric bacteraemia were substantially higher in the third quarter of 2017 than in 2015 (corroborated by Dr Kennedy's 2018 paper), it seems that unjustified reassurance was being obtained from the results of the Point Prevalence Survey (Item 16).

44. In essence, the 27 Action Plan can only really be seen as demonstrating an existing failure to engage with ventilation issues in specialist ventilation areas, a reluctance to find out why the rest of the hospital had half the air change rate recommended by SHTM 03-01, and a substantial failure to engage with the risks posed by the unmaintained Horne Optitherm taps and the water systems as a whole as described by the 2015 DMA Canyon L8 Risk Assessment.

45. The detailed events of the Stage 2 Whistleblow are described in Chapter 5, but some mention must be made of the Stage 2 Report produced by Dr de Caestecker. No good reason was given for the decision to include a detailed critique of Dr Peters within a report that was supposed to be about whether there was merit in the specific issues raised by Dr Redding. Dr de Caestecker rejected the suggestion that she was "playing the man not the ball" but it is submitted that this was exactly what she was doing. Dr Redding's concerns in her Stage 2 Whistleblow were substantially correct and Dr de Caestecker did not investigate the main point, but she did find the time – just as she had in her statement – to repeat criticism of Dr Peters and avoid giving Dr Peters any indication that she was going to do that.

6.5 How did the IPC team, Estates staff and GGC as an organisation respond to what appear to be unusual numbers of infections in the Schiehallion Unit in 2018?

46. The narrative that relates to this can be found in Chapter 5. This section does

[2555] Bundle 7, Document 6, Figure 1 at Page 223

not seek to repeat what is set out there, but rather attempts a high-level description of how the organisation responded to these infections in the Schiehallion Unit in 2018.

47. The year started with a Cupriavidus infection in Ward 2A in January and attention turned to the water system as whole. Other concerning environmental and enteric gram-negative infections were identified, and on 1 March 2018 Dr Inkster started the 'Water Incident' IMT by email. There seems to have been rapid engagement in the process by Estates Staff and a high level of interest and support from Dr Armstrong. The decision to fit POUFs and the establishment of the Water Technical Group ('WTG') are consistent with such an engagement. However, Dr Inkster is right to be troubled by the fact that those who knew of the two DMA Canyon L8 Risk Assessments and attended the Gap Analysis Meeting on 30 January 2018 and then attended the IMTs and the WTG did not think to mention the risks they knew posed by the water system. It is difficult to know whether it would have made any difference if, between the Gap Analysis Meeting on 30 January 2018 and the first IMTs in March 2018, this had been brought to Dr Inkster's attention, but it is probably a reasonable assumption that the belief that the incident had been successfully resolved that seems to have existed at the IMT debrief on 15 May 2018 might not have been so confident, and the sense of events being out of control once infections returned in May 2018, might not have occurred if she and senior managers had been aware of it earlier.

48. As Dr Inkster explained in her evidence, the focus of the IMT then turned to the sink drains with black grime, probably caused by the fitting of POUFs and the reduction of pressure caused by them. The distress and anxiety caused to patients, families and staff by the realisation that the POUFs and other interventions had not stopped the incident was clearly terrible. It was then, in the summer of 2018, that the consequences of the failure to report or act on the 2015 DMA Canyon L8 Risk Assessment really start to bite, and the problems with the management of the IPCT prior to March 2016 can be shown to have had a real impact. That this is the case can be seen from examination of the case of Ms Cuddihy and her Mycobacterium chelonae

infection.

49. The Inquiry team are grateful to Ms Cuddihy and her father for permitting us to ask specific questions in public about her infection. Ms Cuddihy contracted a Mycobacterium chelonae infection a few weeks after POUFs were fitted in Ward 2A. It seems likely that she came into contact with it from water that was not filtered by POUFs elsewhere in the hospital. The relatively slow process that seemed to be underway to fit a Chlorine Dioxide system would not have directly stopped Mycobacterium chelonae growing in the water supply, but there are two counterfactuals that require consideration. In light of the answers to Key Questions 1 and 4 set out in Chapter 7, it does seem reasonable to think that a hospital water system that was not subject to 'widespread' or 'systemic' contamination in 2015 would have been less likely to have grown a biofilm that contained Mycobacterium chelonae. Secondly, we now know that there was a Mycobacterium chelonae infection in Ward 2A in early 2016 that was not escalated to a PAG and was not reported to HPS. In our submission, had action been taken to prevent or respond to the 'widespread contamination' of the water system in 2015 and had the January 2016 Mycobacterium chelonae been subject to IPCT investigation, then the risk of infection to Ms Cuddihy and all the other patients impacted by infections connected to the water system as a whole from the second half of 2016 would have been substantially less. As it was Ms Cuddihy did contract that infection and it was not until the following year, and a further Mycobacterium chelonae infection, that the time was taken to work out that it was in the pipework of Ward 2A before decant.

50. The discovery of the 2015 and 2017 DMA Canyon Risk Assessments by HPS, and the rapid transmission of that information by Professor Steele to Ms Grant in late June 2018, was pure serendipity. Senior NHS GGC witnesses seemed very proud of the rapid response to the discovery. Such pride is misplaced. The NHS GGC water safety system had failed. The members of the Board Water Safety Group and key named people failed to do what they needed to do. It is undoubtably the case that the Estates team at the QEUH was too small and under-resourced to do its job in this large new hospital. That might

well mitigate matters for those, like Mr Powrie, who have had the self-awareness to recognise that they 'dropped the ball", but it also raises serious questions about why the executive board members and senior managers thought the level of resource was sufficient for their new flagship hospital. The contrast between inaction prior to 2018, and the quiet methodical activity of Mr Kelly, Mr Clarkson and DMA Canyon in more recent years is clear. Given the conclusion to Key Question 1 discussed in Chapter 7.1 there can be no doubt that had the reports been acted on promptly, and escalated beyond a small group of estates staff, the growth of the biofilm would have been to some degree arrested, and the harm that it appears to have caused to vulnerable immuno-compromised patients would have been less likely to have occurred.

51. It seems that, with the benefit of hindsight, the decant of Ward 2A in September 2018 was inevitable, but from the perspective of this Inquiry it would be unfair to consider that the process took too long. The options paper from Mr Redfern was an essential step, and whilst it is easy to see how disappointed clinicians and members of the IMT must have been on Monday 17 September when they were told that executive members had not approved the decant, the decision was made the following morning. Despite a strange attempt by some witnesses to suggest that the whole responsibility for the decant fell on the shoulders of Dr Inkster, it did not. The decision was made by the Water Review Meeting[2556] and given the importance of the decision and its impact on other parts of the hospital that was entirely proper. Given that, at the time, there seems to have been a widespread understanding that the decant would be relatively brief, the decision to move to a former adult ward in the QEUH cannot be criticised.

52. This is probably a good place to note that the system chosen for the management of the wider impact of these infections and water problems above the level of the IMT appears disjointed and ad hoc. Ms Dempster and Dr Mumford's evidence about how these decisions were ultimately for the board are relevant here.[2557] Dr Inkster's sensible idea of an executive control

[2556] Bundle 19, Document 35, Page 614
[2557] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 188-189

group was not taken up, and the management of the impact of these events was divided amongst various groups of which the Water Review Meeting was just one. The BICC and AICC did not seem to engage, and reading Dr Armstrong's statement the impression is gained that key decisions were made by a variable group of senior people (and often by email and informal meetings), rather than one central team who could see the whole picture. That lack of a central executive group may well be part of the reason that there was not a sense that matters were under control for the balance of 2018 and into 2019. This will need to be explored in Glasgow IV.

53. When Ward 2A was decanted to Ward 6A, NHS GGC instructed Mr Lambert to look at the ventilation systems of both Wards 2A and 2B and in due course a statement was issued that the 'opportunity' was being taken to 'upgrade' the ventilation. The communication issues around that statement are discussed in Chapter 8, but it is blindingly obvious that NHS GGC knew at senior level that the ventilation system on Ward 2A did not meet the standard in SHTM 03-01 (not least because of the conclusion reached eighteen months earlier in March 2017 in that report to the Acute Service Committee.) The reports of Innovated Design Solutions and from Mr Leiper were not a shock. The work that was done was not an upgrade, but a complete replacement that involved major building works to strip out the existing systems and replace them. The problem that arises from this conclusion is that if NHS GGC knew eighteen months or more before decant that the works to Ward 2A would be substantial, why did they permit the IMT to think the decant would be short term? That then prompts a follow-up question; surely the realisation of non-compliance in March 2017 should have prompted contingency planning back then that might have changed the balance, as Dr Inkster now sees it, in favour of a temporary ward built in temporary buildings on a car park.

54. The understanding of risk from the water system held by IPC in late spring or early summer of 2018, can be seen from the full Incident Management Team Report covering the IMTs from 2 March 2018 to 13 April 2018[2558]. Take that with the conclusion of Dr Kennedy's October 2018 paper, that there had been

[2558] Bundle 8, Document 6, Page 53

an increase in the gram-negatives that formed the case definition of the water incident IMT in 2017 and 2018. Add the position set out in the SBAR which was used to brief the Chair of NHS GGC, Mr Brown, on or about 13 November 2018.[2559] It has to be the case that, at the end of 2018, NHS GGC clearly considered that the decant was carried out in response to the risk of infection from the water supply and that 23 cases had been linked to the water supply. That determination having been made, and the decant carried through; the burden falls on NHS GGC to explain why its own recognition of November 2018 is flawed and there is in fact no connection to the water supply. Not least because if there was no such connection, why did NHS GGC put the patients, their families and its staff through the decant to Ward 6A with all the risks that it involved?

6.6 Were the various suspected and confirmed Cryptococcus and Aspergillus cases in the period from 2016 to 2020 properly investigated and what can be learned that is relevant to the question of whether the ventilation gave rise to an infection link or increased risk to patients?

55. The way that the IPC responded to these two different fungal diseases has the potential to tell us much about whether the ventilation gave rise to an infection link or increased risk to patients. Aspergillus appears to have been a recurring feature of the RHC and Schiehallion Unit after it opened, whilst Cryptococcus was a jarring and distressing intrusion onto a hospital that hoped it was getting back on its feet after the water incident. Both have the potential to be connected back to potentially deficient features of the ventilation systems that are discussed in more detail in Chapter 7.

56. HPS was asked for details of acceptable Aspergillus limits in July 2015, and the infection is touched upon in the SBAR of 6 July 2015 about the Ward 4B ventilation issue[2560]. PAGs were called about Aspergillus in 2016[2561], 2017[2562],

[2559] Bundle 4, Document 32, Page 133
[2560] Bundle 4, Document 3, Page 11
[2561] Bundle 2, Documents 2 and 4
[2562] Bundle 2, Document 25

2018[2563] with the infection being reported in IMTs in 2016[2564], 2017[2565] and 2019[2566]. The reporting of Aspergillus in air samples seems a recurrent event. We have the evidence of many witnesses about damp ceiling tiles, and there is the issue of condensation and dust on the chilled beams well before regular cleaning of these was instituted. Overall, there were five cases of Aspergillosis in haemato-oncology patients in Ward 2A and Ward 6A. The ventilation on Wards 2A outside isolation rooms and 6A was comparable to a general ward at the time these infections occurred. This meant no HEPA filtration, rooms not sealed with suspended ceilings, 2.5 air changes/hour (ACH) and negative or neutral pressure to the corridors. In light of the number of immuno-compromised or neutropenic paediatric haemato-oncology patients housed outside the BMT isolation rooms in Ward 2A, and the specific standard for neutropenic wards in SHTM 03-01, it remains remarkable that these infections did not prompt an earlier upgrade to the ventilation of Ward 2A outside the BMT rooms.

57. When it comes to the investigation into the Cryptococcus cases from December 2018 there was clearly a lot of suspicion between Dr Inkster and Dr Peters on the one hand and Professor Steele on the other, about whether the latter was keeping information from the former. Given that we doubt that Professor Steele was ever cleaning up pigeon detritus in plant rooms, and the Estates and Facilities staff who seem remarkably open about their lack of appreciation of the dangers of pigeons and Cryptococcus, it seems most likely that the reason reports that would show remarkable amounts of dead pigeons and guano in the key plant rooms are missing was simply because photographs were not taken because the teams who were finding pigeon detritus did not realise the importance of collecting evidence.

6.7 What can the events of autumn 2019 tell the Inquiry about NHS GGC's understanding of the state of both the water system and the ventilation system during 2019 and about the way that NHS GGC were responding at that time?

[2563] Bundle 2, Document 40
[2564] Bundle 1, Document 6
[2565] Bundle 1, Document 9,
[2566] Bundle 1, Document 58

58. There was a rapid change of direction within the management of the Schiehallion Unit IMT between the start of August and mid September 2019. Despite determined efforts by Dr Crighton and others to dismiss their evidence, the treating clinicians were aware of a change of approach, and their experience needs to be explained. Two things happened of real significance, the removal of Dr Inkster as chair of the IMT and the development by Professor Leonord and others of an explanation for the infections, which were still occurring, that they considered was compatible with Ward 6A being "microbiologically safe". The first of these issues requires consideration here and the second is addressed in substance in Chapter 7.4.

59. There was clearly a significant breakdown in trust and confidence between Dr Inkster as lead ICD and IMT chair and senior NHS GGC officials, including Prof Steele, Dr Armstrong and Dr Deighan during 2019. Ms Devine and Dr Kennedy wanted to give the impression that they were only peripherally involved in these events, but both – like Dr de Caestecker – facilitated and enabled the process that ending up with Dr Inkster removed as IMT Chair and resigning as Lead ICD.

60. Before discussing the basis for those conclusions, why these events occurred, and how they are relevant to the Inquiry, it is worth observing that the ultimate breakdown was completely unnecessary in a technical sense. The board of NHS GGC always had the executive authority to take a more widely scoped approach to risk management, and to decide not to follow through on risk-based decisions proposed or implemented by an IMT Chair. Whether the decisions were justified or not, they had approved the decant of Ward 2A at the Water Review Meeting on 18 September 2018, they had taken control of the decision about the Chlorine Dioxide system out of the hands of the IMT in 2018, an ad hoc group including the Chief Executive had approved of the short term decant of Ward 6A to the CDU on 18 January 2019, and, according to Ms Devine, senior members of the board were well aware of the decision to close Ward 6A to new admissions at the start of the August 2019. In essence (and as discussed in some detail by Dr Mumford in her evidence[2567]) the

[2567] Dr Mumford, Transcript, Day 1, Pages 181-189

executive board members had the authority – if they chose to use it – to overrule Dr Inkster and for wider reasons of service management to – as became the issue – re-open Ward 6A to new admissions.

61. Taking Professor Steele first, the clear impression is that his arrival as Director of Estates in October 2018 was a breath of fresh air. Here was the man who had brought the news of the DMA Canyon reports from HFS to the Chief Executive. As he had explained, he had started to take control of issues with the building. The problem appears to be that he did not appreciate that, firstly, he could not easily take control of the infection risk posed to immuno-compromised patients. The POUFs were on (but not ubiquitous) and the Chlorine Dioxide dosing system was running, but Chlorine Dioxide dosing is not a panacea. It takes time to work and will not control some unusual micro-organisms like Mycobacterium chelonae.

62. It appears that he did not appreciate the issues that the chilled beams were causing, from condensation and dust and actual leaks from a chilled water system that would fail in March 2020. There was also the discovery of appreciable, and previously unappreciated, amounts of pigeon detritus in plant rooms and around the hospital as the Cryptococcus investigations began. That this came as a surprise to the Estates and Facilities functions in the QEUH must have been a profound shock to him. After a good start his relationship with Dr Inkster deteriorated. What he described as his ‘jocular’ remark on 10 December 2018, that she should not send him her SBAR about the ventilation of Ward 4C by email, clearly convinced Dr Inkster that he was not interested in keeping accurate records. Given her experience over the years at NHS GGC with senior colleagues who did not like emails and records this will have damaged their working relationship. Things got worse when in January 2019 she formed the view that he was keeping information about pigeon detritus in the plant rooms from her. Then when his ‘jocular’ remark was reported back in an HIS report, he appears to have allowed Dr Armstrong to be concerned that Dr Inkster dishonestly would accuse him of telling her not to put anything in writing. It is not clear why he allowed this issue to run, as when on oath at the Inquiry he did accept that he said something along those

lines. As discussed in the next paragraph the consequences of that seem significant, but Professor Steele claimed not to know the difficulties that Dr Inkster and other microbiologists had had with management in the past, and the thought that the working relationships amongst the clinical staff of the board was more complex than he realised seems not to have occurred to him.

63. Dr Armstrong's relationship with Dr Inkster is complex and more problematic. It is submitted that there was no basis for her assertion at the end of her evidence that Dr Inkster (and Dr Peters) put their interest ahead of those of patients. Until the end of January 2019 relations between Dr Armstrong and Dr Inkster seemed generally good on a professional basis. The impression is gained from their exchanges and from emails that, when Dr Armstrong wanted and needed counsel on IPC and the unfurling issues around infections in the Schiehallion Unit, she would seek the counsel of Dr Inkster and support her decisions. From around the time that she learned of Dr Inkster's report to HIS about Professor Steele's remark about emails things begin to change, albeit slowly. We know that Dr Armstrong was offering support to Dr Inkster (in the form of more sessions from an external ICD) in early February and arranged the meeting between Professor Steele and Dr Inkster on 14 March 2019, as well as backing Dr Inkster about the decant to the CDU on 18 April 2019, but by the start of August things had changed. The failure to even mention the national IPC meeting at the Golden Jubilee Hospital in July to Dr Inkster is, given she was Lead ICD, strange.

64. We have some difficulty accepting at face value Dr Armstrong's evidence that she doubted the decision to close Ward 6A to new admissions at the time it was made. Her likely evidence source about the impact on patients – information from Dr Crighton – appears to come on 14 September. It is strange that none of Professor Steele, Dr Deighan, Dr Kennedy, Ms Devine or Dr de Caestecker mentioned this issue as a concern around the conduct of the IMT before Dr Inkster was removed. As it is a substantive criticism of the decision making of Dr Inkster and the IMT, it is not unreasonable to suggest that if they had known about it at the time they would have mentioned it in evidence to the Inquiry. They did not. The Inquiry does not have to take a view

on Dr Inkster's opinion that the reason for Dr Armstrong's change of heart is related to the issues in Dr Mathers SBAR of 1 March 2019,[2568] nor do we have to decide who is right about what was said at a meeting between Dr Inkster, Dr Armstrong and Ms Devine on 24 June 2019, but whatever was the cause of the change of heart, by the time that Dr Deighan and Professor Steele returned from the IMT of 14 August 2019, Dr Armstrong was ready to act.

65. Reports of Dr Peters making the case that there was a risk of infections from leaking chilled beams in the face of Professor Steele's certainty that there could be no such leaks might have impacted on her decision, but Dr Armstrong's mind was clearly made up at that point to remove Dr Inkster as IMT chair. She did that in a process that was unfair and unjustified, and which amounted to an unnecessary and cruel humiliation for Dr Inkster. If Dr Armstrong had really wanted to hear the views of everyone who attended the IMT, she would have either spoken to Professor Gibson or invited her to the meeting of 20 August 2019. That this was not done and - as Dr de Caestecker explained – was not even considered, suggests that the meeting was conducted in bad faith and for a particular purpose that required those present to only hear the views of the select few before making their decision. The resignation of Dr Inkster as Lead ICD was an inevitable and easily predictable consequence of what was done.

66. The position of Dr Deighan is rather simpler. He had been recruited to do the part of Dr Stewart's job as Deputy Medical Director that did not involve running acute services. He was sent to deal with such issues as Dr Armstrong required him to deal with and that is how he ended up attending some of the meetings of the Gram-Negative Bacteraemia IMT. For someone with no experience of IPC, he seemed very happy to challenge Dr Inkster, and did not intervene during the frankly shabby process of removing her as IMT chair (although he accepted it was unfair).

67. If it is the case that, at the end of 2018, NHS GGC recognised that before decant to Ward 6A there had been a higher level of Gram-negative

[2568] Bundle 4, Document 36, Page 151

environmental infections and a connection to the water, then the issue becomes what was the understanding in 2019. The Cryptococcus cases, though deeply concerning to everyone involved, were clearly not connected to the water. The question in the summer of 2019 was clearly – what was happening now?

68. It does seem that, at those first six IMT meetings before Dr Inkster was removed as chair, the IMT was struggling to find an answer to that question. Professor Steele stated in his evidence that "when we went into meetings, there would be other – seemed to me to be always another very rare thing we had found"[2569]. That in itself was cause to keep investigating, but some reassurance must have come from the sampling of the domestic water system, but unusual microorganisms were being found associated with the chilled beams. At the same time Dr Kennedy's refreshed epidemiological report was reporting that Enterobacter cloacae had not seen the same reduction as other organisms. It seems that resistance to the approach taken by Dr Inkster was built around a belief that the decant and Chlorine Dioxide system would have removed the risk from the water and that chilled beams could not be the source of infection risk. Given the presence of Mycobacterium Chelonae behind the filters, what is found in and around the chilled beams, and the corrosion issues that seem to exist with the chilled water circuit, that does not seem the greatest source of re-assurance.

69. In July and August Profess Leanord was not yet involved,[2570] and Ms Devine has explained that she was trying to stay away from clinical issues at the time.[2571] There is therefore no evidence of an alternative source of IPC advice to Dr Armstrong at the time, beyond Dr Kennedy's epidemiological reports. Given Dr Armstrong's avowed lack of expertise in the field of IPC, it is difficult not to reach the conclusion that that the real reason for the decision to remove Dr Inkster was that events were becoming just too much for the senior management. They could not understand why Dr Inkster was pressing on now

[2569] Transcript, Professor Steele, page 92
[2570] Professor Leonord, Statement, Question 332, Hearing Bundle page 263 and Question 339, Hearing bundle page 264
[2571] Ms Devine, Transcript, Page 127

that the water was being treated. They could not move the children back to Ward 2A because of the ventilation issue, and a further decant must have been a real prospect. Better to get control and change the Chair of the IMT, for someone who will focus on getting events under control in the widest sense of that word.

7. THE KEY QUESTIONS AND THE OPINIONS OF EXPERTS

7.1 The Key Questions as they apply to the water systems of the QEUH/RHC

1. This chapter addresses Key Questions 1 and 3 by reference to the evidential contributions of Dr Jimmy Walker, Andrew Poplett, and insofar as they might offer expertise of specialist knowledge of a particular subject or subjects, Dr Tom Makin and Tim Wafer. Reference is also made to some parts of the evidence of Mr Watson of DMA Canyon in respect of the management of water systems.

70. The approach taken is to tackle in turn each of the main features of the water system as they emerged in evidence. By 'main' features it is intended to address only those features which carried particular importance in the overall context of water at QEUH. It is not intended to be entirely comprehensive. Therefore where, for example, the Water PPP addresses a topic which did not feature heavily in evidence (most notably water tanks, sinks, and several minor pieces of equipment such as Arjo baths, water coolers and dishwashers), that topic is not covered by this Chapter, but those issues remain potentially deficient features of the water system.

71. Each section broadly follow the same pattern – a summary of Dr Walker's evidence on the matter; a summary of Mr Poplett's evidence on the matter; a summary of any other 'expert' evidence on the matter (meaning objective evidence from other witnesses with a background expertise in a particular element of the system; rather than evidence of their observations of the system in operation, which are covered in section 5); and finally, whether these three things are in accord and what conclusions can be drawn (often in the form of a submission as to safety).

72. The chapter then proposes answers to Key Questions 1 and 3 (insofar as it applies to the water and drainage system of the hospital). These key questions being:

(1) From the point at which there were patients within the QEUH/RHC was the water system (including drainage) in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?

(3) Are the water … systems no longer in an unsafe condition in the sense that they now present no additional avoidable risk of infection?

The Expert Witnesses appointed by the Inquiry

73. Dr Jimmy Walker is an expert microbiologist with more than thirty years' experience in research projects at Porton Down, including advising on outbreaks at healthcare facilities. He contributed to the drafting of certain parts of the HTM water guidance for the NHS in England. He was involved in the investigation into an outbreak of pseudomonas aeruginosa in hospitals in Northern Ireland, which work in turn led to involvement at QEUH regarding the retention of taps during the build process.

74. His professional engagements include work with Public Health England, the Department of Health, and the Health and Safety Executive. He has been responsible for contributing to British Standards and other guidance, and also undertakes a teaching role. He has published on water microbiology, biofilm, pathogens and decontamination in public health microbiology. He now acts as a consultant.

75. Dr Walker had one episode of involvement with QEUH prior to being instructed as an expert witness for the Inquiry. In June 2014 he attended a meeting to discuss the proposed use of Horne Optitherm taps at QEUH, following their implication in an incident in Northern Ireland in 2012. Dr Walker attended that meeting in his capacity as an advisor to Public Health England.[2572] He did not take an executive role and was restricted to giving one of two competing presentations on use of the taps. It is not considered that a conflict of interest arises.

76. Dr Walker has had some working relationship with the QEUH witness, Dr Inkster. She gave an account in her evidence of having collaborated with him

[2572] Jimmy Walker, transcript page 44

via Teams meetings in the course of writing papers, but they have never actually met. She has sat on the non-tuberculous mycobacteria group with Dr Walker, and both were involved in speaking at a conference by the European Society of Infections, Diseases and Microbiology in Northern Ireland, albeit without interaction as Dr Walker's speech was delivered in person while Dr Inkster's was delivered remotely. Dr Inkster made clear that she has never discussed the Public Inquiry or the June 2014 Horne Taps meeting with Dr Walker.[2573] Again, it is not considered that a conflict of interest arises.

77. Mr Andrew Poplett also has more than thirty years' experience in the field of healthcare, in his case in healthcare engineering. He specialises in both water and ventilation systems. He has been a specialist project engineer and an operational engineer with NHS Trusts in the north-east of England. His publications primarily relate to ventilation matters. He has also provided a report on ventilation matters, which is addressed elsewhere in these submissions.

78. Both experts have written Expert Reports for the Inquiry[2574][2575], and adopted them as their evidence. Those documents are commended to the Inquiry. Within their fields they are comprehensive treatments of the water system at QEUH, on the basis of the material provided to the experts by the Inquiry. In each case the expert has considered that material in order to reach conclusions regarding safety and the presence of deficiencies within the water system.

79. In their oral evidence the experts spoke to their reports, elaborating upon a number of points and commenting upon evidence as it had emerged from other witnesses during the course of the Glasgow III hearings. Their evidence was straightforward and consistent with their reports, and largely with the

[2573] Dr Inkster, Transcript, Day 2, Pages 207-209
[2574] Dr Jimmy Walker "Expert Report: Review of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children water and waste-water system from the point at which patients occupied the site in 2015"; Bundle 21 vol.1 at page 180
[2575] Andrew Poplett "Independent Expert Report Concerning Domestic Hot and Cold Water Systems at The Queen Elizabeth University Hospital, Glasgow, and the Royal Hospital for Children"; Bundle 21 vol.1 at page 354

evidence of other witnesses and of each other. It is commended to the Inquiry.

Submissions

80. The submissions below address around twenty areas on which the experts were invited to give oral evidence. In most cases the evidence of both experts is set out and supplemented by references to other witnesses who, it is submitted, had useful specialist knowledge of these areas and where that would be useful to the Inquiry (without themselves having been instructed as experts).

Absence of precautions during build phase

81. Dr Walker recorded that DMA Canyon had, in their 2015 Legionella Risk Assessment, identified certain issues as having arisen during the build phase leading to the presence of waterborne pathogens in the water system, including pipe ends being left uncapped.[2576]

82. Dr Walker referred to 'contamination' of the water system as being constituted where external material such as debris or sediment were introduced; or where microorganisms had been allowed to proliferate beyond a level at which they might be expected to be there:

> "[wholesome water becomes contaminated] where it's not managed, where the risk assessments are not implemented, where the planned preventive maintenance is not undertaken, where the staff are not trained, where there's a lack of communication between staff, then the risks which have been identified in the system are not addressed."[2577]

83. He described 'contamination' as resulting from the presence of debris which could serve as nutrients for organisms in the water, and as being microbial contamination where microbial growth had been permitted to expand beyond safe levels:

[2576] Jimmy Walker Expert Report, Table 2 at section 3.4
[2577] Jimmy Walker, transcript page 109

> "Where the line crosses is where you provide opportunities for growth of those organisms which have been delivered as wholesome water. As that water is within the building where you provide nutrient sources which otherwise would not have been there and you provide temperatures for the optimal growth of those micro-organisms, you will raise the level of number and concentration of bacteria to a level that would be considered unsafe ... wholesome water will contain a certain amount of bacteria within it. Where you're then providing nutrients and opportunities for growth, you will have more bacteria, and that will then lead to further numbers, proliferation and growth of those microorganisms"[2578]

84. Mr Poplett described the need for caution to be used during a build phase, such that, in particular, pipes should be sealed rather than being left open to the elements:

> "When pipework is installed, or prior to being installed and delivered to site, it should be sealed; plastic end caps, normally. It shouldn't be left outside in the mud and contaminated. Once installed, at the end of each period of installation, ends should be, again, sealed so as to not to act as a point where contamination can ingress to the pipework system prior to it being sealed, as it were, or completed ...
>
> The biggest problem is soil, which is absolutely laden with bacteria, but also open ends. Where you are doing other building works in the area, you will create dust, you will release fungal spores, you will potentially open it to any manner of contaminants ...
>
> … no control over what goes in it, and clearing it out requires flushing, but you don't flush until you've completed everything, at which point you've put restrictions on the system. So it's not like clearing out an open hose pipe; it is-- had to go through valve seats and valve assemblies, and hence the proliferation and spreading of that potential contamination throughout the system."[2579]

85. Keeping pipework capped appropriately is "basic stuff".[2580] A different type of issue in the earliest phases related to design. His view was that full consultation with appropriate stakeholders ought to have been carried out in order to ascertain what is required, and that adequate safety was provided,

[2578] Jimmy Walker, transcript pages 106-107
[2579] Andrew Poplett, day two transcript pages 81-82
[2580] Andrew Poplett, day two transcript page 83

but he had not seen evidence of this having been done.[2581]

86. Dr Makin had seen numerous examples of a recurring theme within newly built hospitals, whereby the system might be left open and contamination thereby introduced with proliferation as soon as the system is wetted. It was also fairly typical for contamination problems to emerge after around three years, as happened at the QEUH, or perhaps slightly earlier.[2582]

87. Dr Lee spoke to the problems that might arise from leaving pipes open-ended during a build phase:

> "If the pipes are open-ended on site, that means they're not actually looking after the components that they're going to be building the system with, and it allows for dust, nutrients, insects, potential rodents to get into the pipework and leave nutrients behind, and those nutrients then will provide a food source for bacteria and other microorganisms to feed on."[2583]

88. Although the build phase predates the events with which the Glasgow III hearings were concerned, and hence Glasgow IV will explore this phase in greater detail, it appears probable that practices at that time with regard to maintenance/storage of pipes contributed to contamination of the water system at QEUH. The expert witnesses separately described the mechanism by which various sources of microbial organisms, and nutrients to enable growth, might have been allowed to enter the pipework.

89. This was further emphasised by Dr Makin's evidence of having seen two recurring patterns at hospitals, one involving exposure of pipework to contaminants and the other whereby new build hospitals displayed contamination problems on a similar timescale to that which occurred at QEUH.

Early filling of water system

90. Dr Walker was unequivocal on the negative effects of pre-filling a water

[2581] Andrew Poplett, day two transcript page 84
[2582] Tom Makin, transcript page 19
[2583] Susanne Surman-Lee, transcript page 132

system, as happened at QEUH during 2014:

> "We know and we have it in guidance after many years of experience that pre-filling water systems leads to contamination of the water system, leads to stagnation because these systems are traditionally filled but they're not flushed. There's no management particularly going on ... if it's just a stagnated system, then you have an ideal opportunity for areas of the system to provide areas where microbial growth will occur"[2584]

91. Mr Poplett was surprised that wet testing had been carried out on the water system at all. It is standard practice, reflected in the HTM guidance, that it is not done.[2585] He explained that the early 'wetting' of a water system created potential for microbial growth, and hence the recommendation in SHTM was for pressure testing to be done with gas rather than with water. What ought to happen, once a system is wet, is for the system to be kept wet and actively managed; he gave the example of a perfect mortuary water system which had been ruined by the early wetting and draining down of the tables, which when fitted 'seeded' the whole system.[2586] He noted evidence that a 'damp' system, namely one which had been wetted and then dried, was more likely to encourage proliferation than a completely wetted environment.[2587]

92. Mr Poplett was unequivocal about the problems arising from early wetting, and the need for active management thereafter, which appeared to be entirely lacking from QEUH:

> "Once the system is wetted, it should be kept wet, and we then use flushing to basically replicate the system being in use. So as soon as you've wetted the system, it then goes into a programme of all outlets being flushed on a regular basis to ensure avoidance of stagnation. There are no records present to say that that was undertaken during the construction stage having wetted the system, and, indeed, the system was wetted, drained, left for an extended period of time and re-wetted.

[2584] Jimmy Walker, transcript page 145
[2585] Andrew Poplett, day two transcript page 83
[2586] Andrew Poplett, second day transcript page 52
[2587] Andrew Poplett, day two transcript page 94

> The problem with that is that the damp system, for want of a better term, the wetted and then drained, has residual water and residual material that will promote microbiological growth ...
>
> So it is incredibly difficult, once you get a systemic colonisation, to clear it, and if you've got a wetted and then drained system, that promotes significantly, in my opinion, a systemic colonisation potential."[2588]

93. A further point which he made is that, once a system is wetted, flushing should commence immediately and should continue until occupation and full use.[2589]

94. Mr Poplett also referred to the need for a 'shock disinfection' upon first wetting, the point being to kill any microorganisms which might be present at the outset, in order that the system start clean.[2590] This accorded with Mr Powrie's recall of being concerned at the filling having happened nine months early, without filters, his feeling being that chemical treatment ought also to have been in place at that time.[2591]

95. Dr Makin noted that twelve months was an "unusually long time" to have a water system filled in advance – not only did this allow contamination to occur, but it also allowed for the contamination to become established in the form of biofilm, which was particularly difficult to remove.[2592]

96. Professor Steele described, upon his appointment in 2019, having reviewed the period of commissioning and concluding that the system had been compromised at the filling stage, the stagnant for a period thereby compromising the sterility of the pipework.[2593]

97. It appears clear that the early filling of the system, compounded by a lack of proper management between that point and handover, resulted in the system suffering from contamination. The expert evidence was unanimous that that would be the expected outcome.

[2588] Andrew Poplett, day two transcript pages 80-81
[2589] Andrew Poplett, day two transcript page 91
[2590] Andrew Poplett, day two transcript page 41
[2591] Ian Powrie, transcript page 42
[2592] Tom Makin, transcript page 55
[2593] Tom Steele, transcript page 106

Controlling microbial growth within a water system

98. Dr Walker drew a distinction between sterile water (no bacteria in the water at all) and wholesome water, per the statutory definition, which may and will contain microorganisms. The majority of patient groups do not require sterility, but there may be cohorts who do. Management of the water system is essential.[2594] The essential points of water management are:

- to keep hot water hot (above 55-60C prevents microorganisms from multiplying)[2595]
- to keep cold water cold (below 20C prevents proliferation)[2596]
- to keep water moving (physically removing microorganisms from the system)[2597]

99. Dr Walker explained these temperature parameters as reflecting selected points along a bell curve, such that it kept water temperature away from the highest growth zones either side of the 37-40C "sweet spot", where microbial growth is at its peak. Ensuring that the water kept moving also assisted by removing water where proliferation may have occurred.[2598] Mr Poplett gave a similar explanation of the use of temperature control of a water system, adding also that this was not in itself an adequate control in respect of pseudomonas aeruginosa, which unlike legionella proliferated at low temperatures; pseudomonas also required to be addressed by physical movement of water i.e. regular flushing to remove contaminated water (usually found at outlets) from the system.[2599] In general, flushing was a necessary measure to ensure movement of water through parts of the system where regular movement could not be guaranteed.[2600]

100. Dr Walker mentioned that dump valves were a mechanism for ensuring

[2594] Jimmy Walker, transcript pages 17-20
[2595] Jimmy Walker, transcript page 21
[2596] Jimmy Walker, transcript page 21
[2597] Jimmy Walker, transcript page 22
[2598] Jimmy Walker, transcript pages 29-33
[2599] Andrew Poplett, day two transcript page 42
[2600] Andrew Poplett, day two transcript page 46

removal of water where necessary,[2601] although those had been identified as non-operational by DMA Canyon.[2602] A risk factor was design of the pipe system, whereby a failure to insulate properly, or proximity of hot and cold pipes, could result in temperature gain.[2603]

101. Mr Poplett also described temperature gain, with regards to cold water. Where temperature gain over the course of the water's journey through the system was no more than 2C, the water would remain within the safe parameter to control microbial proliferation of legionella.[2604]

102. Dr Lee agreed with the target of no more than 2C heat gain, that being a function of a system being well-designed.[2605]

103. Dr Walker identified that a particular issue arose with the hot water system, which was not controlling within these temperature parameters, with temperatures as low as 40-45C, this being an “ideal opportunity” for growth.[2606]

104. Mr Poplett likewise identified hot water temperature control as having been an issue, such that pre-occupation return temperatures were only reaching 50C, rather than the 55C envisaged. He noted that this had been addressed by setting the overall temperature control for the hot water system higher to bring return temperature up to 55C.[2607] This might bring about an unintended but beneficial consequence of increasing cold water usage, more cold water being required in certain places to reduce blended water temperatures, and thereby increasing flow and movement and enabling more system control.[2608] To some extent this illustrated the importance of a validation process, as one could never have 100% confidence that a system of complicated interlocking features would operate in the manner intended.[2609] An example of the difficulty

[2601] Jimmy Walker, transcript page 132
[2602] Jimmy Walker, transcript page 134
[2603] Jimmy Walker, transcript page 129
[2604] Andrew Poplett, day two transcript pages 91-93
[2605] Susanne Surman-Lee, transcript page 119
[2606] Jimmy Walker, transcript page 136
[2607] Andrew Poplett, day two transcript page 66
[2608] Andrew Poplett, day two transcript page 68
[2609] Andrew Poplett, day two transcript pages 70-71

which might have arisen in practice would be if the hot water usage were higher than expected, leading to more need to heat water from cold (as opposed to reheating hot water as returned in the hot water loop). That might be an explanation for the calorifier heaters being unable to heat to the temperatures required.[2610]

105. Mr Lambert identified in his evidence another related issue with water temperatures, in that he had observed the hot water 'control' system (i.e. the loop 'fuelling' the calorifiers, as opposed to the loops actually feeding the outlets) failing to attain the prescribed 105-75C temperatures, and instead being observed at times as low as 60C. This had negative consequences for proper operation of air and water heating.[2611]

106. The expert evidence was that temperature (plus movement) is the primary means of control of the water system, but that the records indicated that initially the temperatures necessary to achieve control were often not being reached. The inference must be that at those times microbial proliferation took place beyond what would have been expected in a system which was under proper control.

Chemical control

107. Dr Walker also identified biocide treatment, i.e. chlorine dioxide, as a useful control measure, with movement an important factor by replenishing the water with new water in which biocide levels were maintained – a feature of biocide materials is that they are used up by contact with the organisms which they are designed to kill.[2612]

108. Mr Wafer explained the method by which the biocide worked, being through physical contact with the organism and penetrating its cellular wall; although the location of the organism within biofilm would reduce its effectiveness and may cause it to work slower.[2613]

[2610] Andrew Poplett, day two transcript page 74
[2611] Matthew Lambert, transcript pages 115-116
[2612] Jimmy Walker, transcript page 33
[2613] Tim Wafer, transcript pages 110-112

109. He was however very clear including within his recommendation of chemical control methods for various reasons to do with the NHS operating environment:

> "If you can provide a surety that your primary control measures are in place and that everything else is absolutely functioning as it should be – your cleaning regimes are spot on, your infection prevention controls and everything else are spot on – then you can more likely get away without the secondary control measures.
>
> "However, in the environment that we're in and the challenge that microorganisms are presenting us with, secondary control measures are becoming almost obligatory [in the] environment across the country we're in. We've got ageing water systems, we've got an NHS infrastructure that needs money, we've got components that are-- have got wear, we've got water systems that may be failing to be balanced in terms of the hot and the cold, and the secondary control strategies give us that extra resilience. And certainly, if you're looking at a new build, please put it in from day one."[2614]

110. Mr Poplett spoke to his concerns around chemical biocide control measures which, although they could be 'highly effective', removed flexibility to relax the use of other control measures. In addition, the chemicals could damage the pipework. If used, appropriate management was required. Particular care was needed in specialist areas to ensure that these were not reached by the selected chemical, which could in some circumstances be harmful (he gave the example of use in baby formula, as did Dr Makin).[2615]

111. Mr Clarkson in his evidence also referred to the scope for corrosion of metal pipework where chlorine dioxide is used, potentially reducing the lifespan of the system.[2616] Mr Powrie also alluded to this issue.[2617]

112. Dr Makin identified that, due to its natural properties, Scottish water was more

[2614] Tim Wafer, transcript pages 169-170
[2615] Andrew Poplett, day two transcript pages 44-45; Tom Makin, transcript page 99
[2616] Kerr Clarkson, transcript page 36
[2617] Ian Powrie, transcript page 108

prone to causing corrosion than was water in England.[2618]

113. Dr Makin did not accept that the use of chemical treatment could be taken as an admission that a system was out of control. He considered them to be an increasingly common feature of hospital water systems across the UK.[2619]

114. Dr Lee and Mr Powrie also referred in their evidence to a different chemical dosing agent, Sanosil, although this appears to have been pre-handover only and not used in accordance with manufacturer's specifications. Dr Lee identified it as having had some success when used in Scotland.[2620]

115. The expert evidence thereby indicates that the secondary control method of chemically dosing a hospital water system is increasingly being viewed as standard. It is striking that this is consistent with the approach taken by DMA Canyon in their 2015 DMA Canyon L8 Risk Assessment. [2621]

Formation of Biofilm

116. Dr Walker described the process of biofilm formation and persistence as follows:

> "Bacteria will arrive in your water system within the water phase. Those same bacteria, when given the opportunity, will start to become attached to the surfaces either through gravity, sedimentation or attraction to a surface for nutrients. That biofilm will then grow on a surface, and as it grows it will produce products like polysaccharides, which will then encase the bacteria. As biofilm develops, it will encompass other bacteria, other microorganisms, other sediment and debris to become a niche environment where those bacteria will grow and multiply … It's the tolerance of those bacteria within a meshwork of the biofilm, tolerance to biocides, to temperature. The retention of it and the viability of the material will be retained even where biocides and sometimes where higher temperatures are developed …"[2622]

117. Once present removal of biofilm presents a difficult problem, in that if biofilm

[2618] Tom Makin, transcript page 22
[2619] Tom Makin, transcript pages 13-15
[2620] Susanne Surman-Lee, transcript page 128; Ian Powrie, transcript pages 79-80
[2621] David Watson, Transcript, Pages 64-65
[2622] Jimmy Walker, transcript pages 97-98

persists anywhere within a system, it risks re-contaminating the system even if removed in part by e.g. biocide measures. Chemical dosing may be an effective means of managing the problem and thereby ensuring that the system operates safely; nevertheless, it is essential to keep the system properly operated in accordance with the water safety plan, by monitoring, by carrying out PPM, etc. as the chemical treatment becomes exhausted as it acts.[2623]

118. Mr Poplett indicated that certain elements of a water system are more likely to harbour biofilm than others. In particular, where a surface is rough, unnecessarily complex, or has 'nooks and crannies', that creates a risk of biofilm colonisation in that those are perfect locations for biofilm to lodge and seed.[2624]

119. Dr Makin emphasised the need for flushing to draw chemical treatment agents to all parts of a water system, as biofilm would not be treated if not physically in contact with the dosing agent. This was particularly important in the case of Cupriavidus, being a pathogen commonly located at outlets.[2625]

120. The expert evidence points towards biofilm as a serious point of concern for the water system at QEUH. Dr Walker also noted that the presence of biofilm had been recorded at various locations within the water system.[2626]

Bypass pipe

121. Dr Walker made reference to a bypass pipe found to have been in place around the entry filtration system over a period of some months to April 2015. The pipe ran from the mains supply into a point above the booster pipes, thereby bypassing filtration and storage tanks.[2627] As a result sediment, debris and bacteria would have been introduced into the QEUH water system.[2628] There was also some indication of this from the later identification of

[2623] Jimmy Walker, transcript page 101
[2624] Andrew Poplett, day two transcript pages 114-115
[2625] Tom Makin, transcript page 34
[2626] Jimmy Walker Expert Report, paras 3.3.6-3.3.9
[2627] Jimmy Walker, transcript page 126
[2628] Jimmy Walker, transcript page 127

contaminated residue on the mains water inlet, although he stressed that in those circumstances that ought to have been filtered out by the filtration devices.[2629]

122. Debris was observed in the filtered water tank, with the result that material from that tank would be distributed to every water outlet in the hospital.[2630]

123. Mr Poplett also discussed this bypass pipe, in the context of its possible purposes. He speculated that it may have been part of the initial wetting of the system, but that if the water pressure were insufficiently high, as reported by Mr Macmillan, then the water would not have reached the upper floors and so would have been ineffective, standing Dr Walker's observation that the pipe rejoined the system after the booster pumps. He was not able to explain why such an arrangement would have been put in place.[2631]

124. He was unable to explain why the filtration measures in place at entry into QEUH had been thought appropriate.[2632]

125. The bypass pipe is a confusing element within the narrative of the water system. The expert witnesses were unable to explain why it might have been there at all, which matched the other witness who could not speak to the reason for its installation.

126. It is submitted that the bypass pipe is of itself unlikely to have created a risk of contamination of the water system, since the water thereby introduced would not have differed from the water being introduced 'normally', save for the lack of filtration. The lack of filtration is rendered somewhat academic by other evidence indicating that water should not be expected to be sterile, and that there were rogue sources of contamination or nutrients elsewhere within the system.

127. Rather, it appears more likely that the bypass pipe may have contributed by way of being an ineffective means of filling the upper floors within the hospital,

[2629] Jimmy Walker, transcript page 155
[2630] Jimmy Walker, transcript page 130-1
[2631] Andrew Poplett, day two transcript pages 50-51
[2632] Andrew Poplett, day two transcript page 113

as identified by Mr Poplett, such that water in those locations was more likely to have experienced a prolonged period of stagnancy.

Absence of a Water Safety Plan, Water Safety Group, Written Scheme

128. Dr Walker was concerned that QEUH did not have those measures properly in place at the time of the 2015 and 2017 DMA Canyon L8 risk assessment reports. The appointment of a Water Safety Group, with responsibility for writing a Water Safety Plan, was an essential part of managing a water system.[2633]

129. Mr Poplett described the purpose of these institutions as being to secure and assure that the water system was under control. The Water Safety Group ought to be the locus of blending high-level, executive individuals with operational staff who could report on conditions, events and progress on the ground.[2634] He was not concerned by what he knew over participation in such groups at QEUH, though he would expect chairing of the Group to be carried out by a high-level individual.[2635] The Group should be able to co-ordinate responses as issues arise, and keep on top of modifications.[2636]

130. Mr Watson in his evidence had spoken to the Written Scheme, which was designed to set parameters within which the water system ought to be kept, and to provide a pattern for checks and maintenance, with the absence of thereof indicating that nobody was taking proper responsibility for its operation.[2637] The Written Scheme ought to be prepared as soon as the system was filled.[2638]

131. In Mr Poplett's view, the Written Scheme now appeared to be comprehensive (on the basis of its described contents).[2639]

132. Mr Powrie spoke to developing a legionella training matrix, but only having

[2633] Jimmy Walker, transcript pages 88-90
[2634] Andrew Poplett, day two transcript pages 29-30
[2635] Andrew Poplett, day two transcript page 33-36
[2636] Andrew Poplett, day two transcript pages 29-30
[2637] David Watson, transcript pages 19, 22
[2638] David Watson, transcript page 106
[2639] Andrew Poplett, day two transcript pages 117-120

delivered part of it (not including legionella training) when it was overtaken by an indication from Mr Gallacher that a new compliance team would take over. He observed that this thereby ran into the difficulties during that period around the lack of nominated role-holders such as authorised persons, which is addressed below.[2640]

133. The evidence is clear that the presence of a Water Safety Plan and Written Scheme, and the meeting of a Water Safety Group, is a required element of a safe water system. The evidence indicates that these features were deficient at initial handover and for a period afterwards, but that improvements have been occurring since around 2017 such that the arrangements are satisfactory.

The 2015 DMA Canyon L8 Risk Assessment

134. Dr Walker made reference to the fact that the 2017 DMA Canyon L8 Risk Assessment recorded many of the same issues as had already been flagged by DMA in their 2015 DMA Canyon L8 Risk Assessment. He concluded that in 2017 the system was not in a safe condition.[2641] This view was compounded when considering the negative reports coming in in 2018 throughout RHC and QEUH, leading him to state that this was a picture of systemic contamination and unsafe in 2018, not only for high-risk patients but for anyone.[2642]

135. Mr Poplett considered the level of defects in the 2015 DMA Canyon L8 Risk Assessment to be “completely unacceptable”. “The fact is that, in a brand-new system, there shouldn't have been issues to be addressed”. He did consider that significant progress had been made by the time of the 2017 report, but that significant progress remained to be made at that time – the system was “improved, but still not compliant”.[2643]

136. Mr Clarkson in his evidence stated his concern at the number of issues identified in the 2015 DMA Canyon L8 Risk Assessment which remained

[2640] Ian Powrie, transcript pages 63-64
[2641] Jimmy Walker, transcript page 147
[2642] Jimmy Walker, transcript page 151
[2643] Andrew Poplett, day two transcript page 86

unaddressed at the time of commencement of his employment in 2018. His view was that those should have been actioned before occupation, rather than being left until 2018.[2644]

137. The expert evidence is clear. There is no doubt that the non-actioning of the 2015 DMA Canyon L8 Risk Assessment was a serious failure.

Designated roles in the water system

138. Dr Walker emphasised the importance of having competent, trained staff in the necessary roles for operating the water system. Where a designated role had not been appointed, *"then someone up the chain hasn't been doing their job because these are legal obligations through the health and safety guidance to put people in these roles in order to ensure there's a safe water system"*.[2645] He reiterated this failure of management when considering the absence of an Authorised Person as late as 2017.[2646]

139. Mr Poplett also highlighted this as a concern. The responsibility for the water system lay in the first instance upon the Duty Holder; if delegation of that responsibility to a Designated Person occurred, the Designated Person should be at Board level. It was then the Designated Person's responsibility to ensure that the other appointees were appointed. It was a concern to him that the Water Safety Group had not taken note of the fact that such appointments were not being made.[2647]

140. Professor Steele was made the Designated Person for Water when he took up his post, in 2019. His evidence was that prior to then there had been no proper structure of designated people or a written scheme for the new hospital.[2648] His view was that the system had the potential to be contaminated, control being insufficiently robust to eradicate microbial material.[2649] He also spoke to having reviewed the period of commissioning

[2644] Kerr Clarkson, transcript page 23-24
[2645] Jimmy Walker, transcript page 124
[2646] Jimmy Walker, transcript page 146
[2647] Andrew Poplett, day two transcript pages 36-37
[2648] Tom Steele, transcript pages 101-104
[2649] Tom Steele, transcript page 105

and concluding that the system had been compromised by a lack of exercised control at that early stage, the water being left stagnant for a period thereby compromising the sterility of the pipework.[2650]

141. Mr Poplett also made the- perhaps-obvious point that having the system operated for three years by persons who lacked formal assessment of competency, raised serious concerns about whether maintenance activities during that time would have been satisfactory, although he was not sighted on this one way or the other.[2651]

142. Mr Kelly made the perhaps-equally-obvious point that a lack of clarity around such appointments led to a corresponding lack of clarity around *"who is responsible for what"*.[2652]

143. Mr Purdon identified in his evidence that an absence of authorised persons made it "difficult to assess certain situations in relation to water safety. So, you require a trained competent person to manage the system, and the authorised person would be the person that you would go to".[2653]

144. The expert evidence is in agreement that not having in place appointees to the designated roles was a serious failure in the operation of the water system. In particular it demonstrated an undermining of accountability in two important ways – firstly by indicating that management had not carried out its duties to make the necessary appointments, and secondly by eliminating the clear point-of-reference when problems did arise.

Lack of record-keeping

145. Mr Poplett repeatedly expressed concern as to the record-keeping at QEUH. Where SHTM guidance was not mandatory it was legitimate to derogate from its specifications, and there might be numerous reasons for this to be done – but if so, he would have expected to see derogations being properly recorded. An acceptance of risk and potential consequence of derogating, which was

[2650] Tom Steele, transcript page 106
[2651] Andrew Poplett, day two transcript page 123
[2652] Dennis Kelly, transcript page 145
[2653] Colin Purdon, transcript page 124

attributed to the person with appropriate responsibility, had not been the case at QEUH.[2654]

146. The absence of records had been a concern for DMA Canyon, with Mr Watson identifying that their absence meant it was not possible for the managers of a system to demonstrate that it was being operated properly.[2655] DMA had attempted to obtain from NHS GGC full records of commissioning of the water system, but complete records were never provided.[2656]

147. Dr Walker noted that DMA Canyon had observed, at the time of their report in 2015, a lack of records relating to training and competency[2657] and a complete absence of corrective actions in relation to calorifier problems.[2658] He also noted that Mr Kelly had observed in 2017 the lack of recording of remedial action, and a lack of general hot water temperature recording.[2659]

148. Mr Kelly also spoke to the difficulty at QEUH with what he described as "haphazard" recording at the start of his involvement with the hospital in 2017. He explained his view that it made the tasks of those holding nominated roles probably unachievable, but that that had been fixed in the system as it now stood:

> "The issue with it being haphazard, because there is an issue with that, is that part of what a responsible person should do or an authorised person should do is review the records, look for trends, see if things are going awry and proactively trying and address them, and if the records were that haphazard, then it was very difficult to do that. Probably impossible to do that. I've got to say, when you look at happens there now, it's superb, but this was my findings at the time in 2017 … The records are excellent now. You know, they're accessible, they're all there, they're up to date. There's virtually no gaps at all, and they're very impressive."[2660]

149. Mr Kelly identified another issue with 'haphazard' recording, being that where

[2654] Andrew Poplett, day two transcript pages 28-29, 72
[2655] David Watson, transcript page 106
[2656] David Watson, transcript pages 27-28
[2657] Jimmy Walker Expert Report, para 6.2.1
[2658] Jimmy Walker Expert Report, para 6.4.1
[2659] Jimmy Walker Expert Report, para 6.7.1
[2660] Dennis Kelly, transcript pages 142-143

a task such as sampling required to be performed in a specific manner, haphazard recording meant that, even where the task had been carried out, there might be insufficient recording to satisfy the reader that it had been done properly and thereby undermine the entire process. This had been an issue with legionella sampling at QEUH to 2017.[2661]

150. The expert evidence, particularly that of Mr Poplett, was in accord that proper record-keeping is necessary for a water system to be considered safe. In practice, those scrutinising the system were simply unable to say whether certain metrics were met, or certain tasks had been carried out. While it does not necessarily follow that the system would have been unsafe in practice, it is simply impossible to conclude that it is in a safe state.

Asset register, Planned Preventative Maintenance

151. Dr Walker identified the link between PPM and an Asset Register as a key point, insofar as proper servicing required that those doing the servicing know where all the items to be serviced are.[2662] He described in his report how HSG guidance required that an asset register checklist be maintained for all associated plant, pumps, strainers, outlets and other relevant items, and that failure to do so would itself amount to non-compliance.[2663] It follows that the absence of PPM schedules at handover would have increased risk.

152. This accorded with the observations of a number of witnesses including Mr Powrie, who stated that the absence of 'asset tagging', which was not completed until 2017, meant that PPM took longer and became more difficult to do.[2664] Mr Leiper had commented that this amounted to a ’dysfunctional‘ system, and Mr Watson of DMA Canyon recalled having had no indication of the necessary registers when carrying out his 2015 Report.[2665]

Size of water system

[2661] Dennis Kelly, transcript page 165
[2662] Jimmy Walker, transcript page 91
[2663] Jimmy Walker, Expert Report at section 6.14
[2664] Ian Powrie, transcript page 47
[2665] David Watson, Transcript, Pages 80-82

153. A concern of Dr Walker lay in the need, in a hospital of this size, to identify which patient cohorts were more vulnerable than other cohorts, such that a greater degree of protection can be given to the former.[2666]

154. The issue of dead legs was a concern to Dr Walker, the presence of these having been identified by DMA in their 2015 DMA Canyon L8 Risk Assessment; in particular, the presence of these was prevalent in the hot water system due to the length of spurs from the circulating loops to outlets, the spurs presenting opportunities for microbial growth.[2667] The 'last two metres' of any system presented a risk of forming a stagnating pipe.[2668] This also informed Mr Poplett's observation that an open hot water outlet should get to the correct temperature within one minute, that being the time taken for that spur to clear.[2669]

155. Mr Poplett was concerned about the size of the QEUH water system *per se*. Consideration ought to have been given at the design stage as to whether the benefits of a single system outweighed the disadvantages. A single system, such as at QEUH, carried benefits by reducing the need for storage (and thereby locus for contamination) or for ancillary facilities, but introduced the risk of a single point of failure as well as raising the issue of a vastly increased number of outlets, carrying a consequent risk of disused outlets or dead legs, each being potential sites for contamination. The 'single room' philosophy at QEUH also carried inefficiencies in terms of numbers of staff required for operating it.[2670]

156. Dr Makin identified that the very size of the water system at QEUH might present a problem, size bringing complexity in a system's design.[2671] This would be enhanced by a single-room philosophy increasing the number of outlets.[2672] Dr Makin's view is that all large hospitals should use chemical

[2666] Jimmy Walker, transcript page 92
[2667] Jimmy Walker, transcript page 138
[2668] Jimmy Walker, transcript page 162
[2669] Andrew Poplett, day two transcript page 63
[2670] Andrew Poplett, day two transcript pages 11-14
[2671] Tom Makin, transcript pages 37-38
[2672] Tom Makin, transcript page 52

treatment.[2673]

157. Dr Lee also identified size of a system as creating difficulties for control, particularly where thousands of outlets were involved.[2674] Multiple systems might be better, particularly where high-risk patients are involved.[2675]

158. It is submitted that although the consensus appears to be that increased size of a water system creates more difficulties for its safe operation, it cannot be concluded that the large size of the QEUH system necessarily rendered it unsafe, or even that it materially contributed to the question of whether it was safe or not. What may be more significant is Mr Poplett's observation that size was a factor which should have been considered at the design stage, which will be among the stages considered during the Glasgow IV hearings.

Materials used

159. Dr Walker expressed concern about the fact that visible elements of the pipework were in copper. The specification for the water system was in stainless steel, to reflect the SHTM guidance which had been rewritten in the 1990s to address observed problems of copper pipe failure as a result of 'soft' water in Scotland (England having 'hard' water and thus not suffering this problem). However visible pipework in the form of 'tails'/'spurs' was in copper. This was a relatively small part of the overall pipework, the majority being behind walls. The extent of the copper parts could not therefore be known.[2676]

Expansion vessels

160. The expansion vessels fitted near calorifiers and in the basement plant room were identified as a risk in the 2015 DMA Canyon L8 Risk Assessment. Dr Walker described the expansion vessels installed in the hot water system as a risk factor, in part due to their material being the same EDPM material that is present in flexible hoses and in part due to their design where they formed dead-ends in the system rather than allowing the excess water to flow

[2673] Tom Makin, transcript page 61
[2674] Susanne Surman-Lee, transcript pages 106-108
[2675] Susanne Surman-Lee, transcript page 108
[2676] Jimmy Walker, transcript pages 22-27

through. These were found to be “heavily, heavily contaminated”, including with biofilm.[2677]

161. Mr Poplett also expressed dissatisfaction with the expansion vessels being of a non-flow-through type.[2678] He also noted that this failing had been repeatedly drawn to NHS GGC's attention by Mr Kelly.

162. It is evident that the expansion vessels being of a design which did not require flow-through, and which thereby encouraged stagnant water to remain within the vessel, posed a safety risk to the operation of the water system at QEUH.

Point of Use Filters

163. Point of Use Filters (“POUFS”) were fitting in high-risk areas (starting in Ward 2A RHC) at start of the ‘Water Incident’ in March 2018. Dr Walker offered his view that POUFs are a useful element of a water system, but that alone they are not a panacea – a holistic approach to system safety entails that they should be employed with other measures such as use of biocide. It is possible to have filters in place and yet for patients to be exposed to contaminated water from some other source, as was witnessed with mycobacteria infections in 2023.[2679]

164. Mr Poplett emphasised his view that POUFs should be considered to be a temporary measure, and that if in place for extended periods they could themselves act as a site of contamination, and risk contaminating other areas e.g. if removed for sample-taking. He also spoke to the risk, if an individual filter were left in place for a long time, that despite the specification microorganisms can grow through a filter.[2680] If filters are still being used in the hospital today, he explained:

[2677] Jimmy Walker, transcript page 142, 156
[2678] Andrew Poplett expert report, para 5.11.18
[2679] Jimmy Walker, transcript page 188-189
[2680] Andrew Poplett, day two transcript pages 56-60

> "… It indicates that the evidence should still support that there's an ongoing problem with the management of water because, in a well-designed, well-installed system, they shouldn't need to be a permanent feature."[2681]

165. The experts were in agreement that POUFs have a place in the normal operation of a water system. It is clear, however, that neither of them considered POUFs to be an appropriate principal method of addressing risk.

Flexible hoses

166. Dr Walker identified that flexible hoses were prohibited in the hospital, but that they had been found to be present. These items served as connection between the fixed pipework and the outlets to the system. The specific problem with these items was that their fabric, being a black rubberised carbon material called EPDM, served as a locus of growth for bio-organisms, due to its rougher surfaces providing gaps and holes for organic material to colonise; and due to additives and hardeners within the material itself being nutritious to organic material, that being inherent to its flexible characteristics.[2682]

167. Mr Poplett agreed with this.[2683] He also identified flexible hoses as being contrary to the guidance in the SHTM materials.[2684]

168. Dr Walker also mentioned the noting by DMA in 2017 of an absence of records for disinfection of shower heads and hoses, which in his view indicated an increased risk to patients.[2685]

169. The consensus is thereby that, so long as they were there, the presence of flexible hoses was a risk factor in the water system at QEUH.

Drains

170. Dr Walker raised concerns around the potential for harmful material to be

[2681] Andrew Poplett, day two transcript page 61
[2682] Jimmy Walker, transcript pages 36-41
[2683] Andrew Poplett, day two transcript page 115
[2684] Andrew Poplett, day two transcript page 76
[2685] Jimmy Walker Expert Report, para 6.9.15

spread from drains, referring to evidence of material being spread back from drains into sink areas, and being distributed further by splashing.[2686] He suggested that it might be sensible to take measures to reduce contamination of the drains in higher-risk areas, but that that should be considered in tandem with assessing the need for staff training on use of drains, because there was evidence of drains being used to deposit contaminant material which ought not to have been there.[2687]

171. Mr Poplett outlined what he described as the 'current thinking' around drains, being that as continual cleaning and sterilisation of drains is impractical (drains being microbiologically recolonised on every use), the better course is to reduce the potential for cross-contamination and splashing from them. There would also be negative environmental consequences from taking an active approach towards decontamination of them.[2688]

172. Dr Lee spoke to drains being a common site for microbial growth, drains in hospitals being:

> "a nutrient-rich, growth medium for bacteria, in effect ... it's something you see in every hospital. Every hospital has a problem with growth within the drains."[2689]

173. A different issue that she identified with respect to drain design was the possibility that, if poorly designed, a backed-up drain could lead to e.g. showering patients in effect paddling in drain water, with consequent exposure to microorganisms.[2690]

174. The expert evidence suggests strongly that the primary risk feature from drains lies in poor design, whether splash risk or backing-up, such as would cause contaminated material to emerge and make contact with patients.

Taps

175. Around 2012 Dr Walker was a senior water expert within Public Health

[2686] Jimmy Walker, transcript pages 167-168
[2687] Jimmy Walker, transcript page 171
[2688] Andrew Poplett, day two transcript pages 110-112
[2689] Susanne Surman-Lee, transcript pages 114-115
[2690] Susanne Surman-Lee, transcript page 160

England dealing with water microbiology, and risk related to water systems within buildings. He was approached in order to assist with an outbreak of pseudomonas aeruginosa in Northern Ireland, specifically by investigating internal tap components. He expressed concerns about components which increased surface area available for organisms to grow. Flow straighteners and aerators were specifically identified. As well as providing a high surface area, they also trapped debris, providing nutrition and locus for biofilm. Water flow then acted to distribute this when the taps were switched on.[2691] He presented to NHS GGC on this in 2014 when NHS GGC were considering whether to continue with installation of Horne taps which they had acquired.[2692] He was present at the 5 June 2014 meeting about the Horne Optitherm Taps,[2693]

176. The specific problems which he identified were:

- the presence of flow straighteners within the taps, being complicated plastic devices with a large surface area upon which organisms could grow, this being in particular a risk for pseudomonas, as well as a trap for debris;[2694] and

- the specific mechanism within the Horne taps, whereby the mixing arrangement created a significant risk that the cold water channel would remain largely unused and hence effectively a deadleg, with consequent risk of biofilm.[2695]

177. His view was that those problems could be addressed via risk management arrangements, such as regular flushing, but that in the event he was unaware of it being discussed in the meeting around his presentation, although *"They decided to retain the taps, and therefore they would have had to implement some form of control strategy."*.[2696]

[2691] Dr Jimmy Walker, transcript pages 4-6
[2692] Jimmy Walker, transcript page 44
[2693] Bundle 15, Document 9, Page 692
[2694] Jimmy Walker, transcript page 48, 52-54, 56
[2695] Jimmy Walker, transcript pages 58-65
[2696] Jimmy Walker, transcript page 74

178. Mr Poplett's evidence on taps was relatively straightforward. The principal risk factor was in taps being over-complicated, by containing components or fittings which created a risk of colonisation by micro-organisms.[2697]

179. It is clear that the two experts are in agreement as to the potential risk coming from tap selection. Dr Walker's concerns around the Horne Optitherm tap are specific examples of the risk points identified by Mr Poplett.

Miscellaneous other elements of the system

180. Dr Walker described strainers, being wire grids designed to prevent debris from entering the thermostatic mixer valves, but which as result presented a risk by themselves becoming a locus for trapped debris.[2698]

181. Mr Poplett drew a distinction between: strainers, being a 'basket'-type design to catch larger debris and prevent it from entering the system; and filters, which were a more complex barrier of fine particles designed to prevent finer particles from entering. Finer filters might have the effect of notably decreasing flow rate.[2699]

182. Mr Clarkson identified one of the purposes for having strainers as being to remove particles which are emitted by corrosion of the system components themselves.[2700]

183. Dr Walker was concerned by the identification of a calorifier which had been left stagnant and in which there were ideal conditions for microbial growth due to the materials involved.[2701]

184. Mr Poplett described the operation of thermostatic mixer valves, the failure of which could potentially lead to scalding if there were a loss of control preventing the hot supply from shutting off if the cold water supply were to fail. He described this as a 'never event' due to the potentially catastrophic consequences of scalding in a hospital environment. He had not seen any

[2697] Andrew Poplett, water expert report paras 5.11.13-5.11.16
[2698] Jimmy Walker, transcript page 67
[2699] Andrew Poplett, day two transcript pages 21-22
[2700] Kerr Clarkson, transcript pages 57-58
[2701] Jimmy Walker, transcript page 137

recording of testing of these valves for this risk.[2702]

System safety

185. Dr Walker described four main parameters to inform an ultimate assessment of whether a water system was safe or not, being

- the water content itself;
- the manner of operation;
- evidence of contamination; and
- use of mitigation/control measures.[2703]

186. It is necessary to assess the system holistically, rather than drawing a conclusion on safety from a single parameter; the key was to address a failure in any one of these areas as part of the risk assessment and mitigation strategy.[2704] The appointment of a Water Safety Group, with responsibility for writing a Water Safety Plan, was an essential part of management.[2705] His conclusion was that QEUH did not have those measures properly in place at the time of the first and subsequent Legionella risk assessment reports.[2706]

187. Dr Walker however did also observe that improvements were visible in the system and in practices around it from 2019; in particular with regard to use of biocide dosing, in the use of filters, but also in a recognition that the areas identified by DMA in 2015/2017 had to be addressed, such as by improving the Water Safety Plan and the Written Scheme.[2707]

188. A specific improvement which he identified in that period related to the continual PPM work to replace shower heads, which were a common site for microbial growth – using a completely new unit eliminated that possibility.[2708]

[2702] Andrew Poplett, day two transcript pages 95-100
[2703] Jimmy Walker, transcript page 84
[2704] Jimmy Walker, transcript page 86-87
[2705] Jimmy Walker, transcript page 88
[2706] Jimmy Walker, transcript page 90
[2707] Jimmy Walker, transcript page 174
[2708] Jimmy Walker, transcript page 177

Increased emphasis on flushing, maintaining correct temperatures, removal of unnecessary equipment and other better practices amounted to a good response from 2019 onwards.[2709]

189. The Authorising Engineer Audits from 2020 to 2023 demonstrated clear progress, but Dr Walker emphasised that there remained scope for growth of microorganisms within the water system. He identified practices which he had seen in the hospital, such as storage of items in the vicinity of outlets encouraging stagnancy through disuse, lack of flushing, or the possibility of contamination through disposal practices, as creating that scope.[2710]

190. Ultimately, his view was that no system could or perhaps should be described as entirely safe, as there was always the scope for a development in an in-use system which might call safety into question. He therefore restricted himself to offering his view that the water system at QEUH was 'safer'.[2711] He would not commit to a view that the system was 'as safe as possible', because the auditing of the system was at this time an annual or irregular event, when he would like to see a continual assessment process internally in order to monitor safety performance.[2712]

191. Mr Poplett declined to express his view in terms of safety, preferring the view that safety is a function of multiple variables, including fact of use and patient cohort; but he was clear that where measures should have been taken but were not taken, the hospital presented a greater risk to patients than it need have done.[2713] As noted above, he expressed serious dissatisfaction ("completely unacceptable") with the level of defects which DMA were able to identify in 2015 in a newly-built system, and although he identified progress to 2017 remained unsatisfied with the level of deficiencies at that point.

192. When discussing the audits carried out by Dennis Kelly, he was able to identify that there had been clear progress over the period from 2018

[2709] Jimmy Walker, transcript page 178-180
[2710] Jimmy Walker, transcript page 197-198
[2711] Jimmy Walker, transcript page 198-203
[2712] Jimmy Walker, transcript page 205-206
[2713] Andrew Poplett, Day 2 Transcript, Page 89

onwards, describing the delivery of the required risk reduction processes as "virtually complete". He however emphasised that a still-better approach would be for AE reporting to be done quarterly, to avoid the risk of problems arising soon after an audit and remaining undetected for almost a year.[2714]

193. Mr Poplett concluded his evidence on the current state of the system positively, while still avoiding the paradigm of safe/unsafe:

> "it is incredibly difficult to give a binary answer as to whether a system is safe or unsafe. What I can say is that the current maintenance practices, on the evidence that I've reviewed, appear satisfactory and the systems, subject to some underlying design issues, are being appropriately managed and maintained"[2715]

194. Dr Mumford accepted that NHS GGC was now doing a lot more testing that hospitals she knew about in England but felt that it was being done in response to having had huge problems with your water system it would make sense to increase the amount of testing in order to become confident that those issues were resolved.[2716]

Proposed answers to the key questions

> (1) From the point at which there were patients within the QEUH/RHC was the water system (including drainage) in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?
>
> (3) Are the water … systems no longer in an unsafe condition in the sense that they now present no additional avoidable risk of infection

195. There is a strong inference that during the build phase the pipework was left in a condition open to the elements. The experts were unanimously of the view that such a practice likely led to the water system being seeded with micro-organisms, and that nutrient material would likely have been introduced.

196. It is beyond doubt that the early filling of the water system led to the system

[2714] Andrew Poplett, day two transcript pages 124-129
[2715] Andrew Poplett, day two transcript page 131
[2716] Dr Mumford, Transcript, Day 2, Pages 160-161

being left in a stagnant condition for a period of some nine or twelve months.

197. The combination of these events means that during that period the system was in an ideal position to become contaminated, and that this was likely to the extent of becoming colonised with biofilm, a condition which was likely in practice irreversible.

198. There is a recurring pattern of failures of individuals to carry out specific functions. A DMA Canyon risk assessment in 2015 was not actioned or disseminated widely, leading to a large number of specific remedial actions not being carried out.

199. It is likely that the failure to have in place from handover parameters such as the Water Safety Plan or the Written Scheme would have led to a diffusion of responsibility. Likewise, the failure to have in place officials in necessary designated roles such as Authorised Person for Water likely led to an absence of executive action when problems arose.

200. In an extremely practical sense, a repeated theme from a number of witnesses was the failure to maintain records on a number of actions taken with respect to the water system, be that training, or the keeping of temperature records, or the methodology used for sampling. The significance is that it became impossible to tell whether the system was being operated as it was supposed to be; which in itself indicates failure in the proper operation of the system.

201. It is clear that at the time of handover the system was suffering from numerous defects, as identified by DMA Canyon. This was compounded by their not being systematically addressed over the following two years, such that by 2018 a number of water incidents emerged, at least in part as result of the contamination described above, but also as a result of other flaws inherent to the system, such as regarding drainage design, or the use of prohibited materials.

202. It is also clear, however, that from later in 2018 onwards and as the result of concerted action by a number of individuals in putting together a chemical

dosing system, and also between Mr Clarkson and Mr Kelly in seeking and putting in place a continual process of improvements in record-keeping, the system has become one where the operation is now satisfactory.

203. Both experts' evidence is broadly in accordance with that, albeit that from their perspective neither was entirely willing to express their broad answers in terms of 'safety'.

204. Dr Walker stated directly that the water system in 2015 and in 2017 was not safe[2717], and he repeated that in 2018 due to the detection of E. coli at that point.[2718] Mr Poplett described the system in 2015 as *"certainly suboptimal and it certainly didn't comply to all of the requirements of SHTM standard"*, and in 2017 as *"Improved, but still not compliant"*.[2719]

205. With regard to the present day, Dr walker would only go so far as to say that the system now was "safer".[2720] Mr Poplett stated that *"the current maintenance practices, on the evidence that I've reviewed, appear satisfactory and the systems, subject to some underlying design issues, are being appropriately managed and maintained"* and that *"it needs to be kept under continuous review to ensure that the condition remains satisfactory [and asked whether the current means of operation and maintenance of the system are doing so**]** Yes."*.[2721]

206. On that basis, it is submitted that the answer to Key Question 1 is that from 14 June 2015 when the move by all units and hospitals into the new hospital was complete the water system (including drainage) of the QEUH/RHC was in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients and certainly remained unsafe until NHS GGC began to actively respond to concerns about the safety of the water supply in the hospital in 2018.

207. It is submitted that the answer to Key Question 3 it is that now in 2024 the

[2717] Jimmy Walker, transcript pages 143 and 147
[2718] Jimmy Walker, transcript page 151
[2719] Andrew Poplett, day two transcript page 87
[2720] Jimmy Walker, transcript pages 197-201
[2721] Andrew Poplett, day two transcript page 132

domestic water systems of the QEUH/RHC are no longer in an unsafe condition in the sense that they now present no additional avoidable risk of infection due to active management of a system that had become a source of risk to immunocompromised patients. It should be noted that statement is made on the assumption that the POUFs that are currently in place remain in place.

7.2 Potentially Deficient Features of the Ventilation Systems

208. This Chapter first seeks to summarise conclusions on ventilation deficiencies, before turning to review the evidence- including expert evidence – and looking specifically at risk.

209. The following deficiencies have identified from the evidence led at Glasgow III and the material set out in PPP 12: Potentially Deficient Features of the ventilation system of the Queen Elizabeth University Hospital and the Royal Hospital for Children.[2722] They are as it turns out, mainly, if not exclusively, potential deficiencies identified in PPP 12. They are also so identified against the background of the evidence on Principles of Ventilation led in relation to the Edinburgh Hospital (in relation to which a Report is imminent).

210. It is submitted that deficiencies identified below should be considered to be unsafe, in the very specific sense that they present an additional risk of avoidable infection to patients. That risk may or may not lead to harm and may or may not be capable of being managed in a variety of ways. However, it is submitted that in each case the risk exists. The deficiencies are,

211. The deficiencies are:

- A reduced air change rate of 2.5 to 3 air changes per hour (ACH), compared to the rate specified in SHTM 03 01 for all general single patient room provision of 6ACH. [2723]

- The use of active chilled beam units (CBUs[2724]) in patient rooms throughout the hospital.[2725] In light of a more detailed understanding of their negative implications following events in the QEUH, they are now, in effect, prohibited in clinical areas (that word is deliberately selected notwithstanding that NHS GGC and some other Core Participants object to it, as said to be not reflective of Guidance wording) without the approval of

[2722] Bundle 26, Document 2
[2723] PPP 12 (Bundle 26 Document 2) para 6.7
[2724] This label is used notwithstanding debate as to whether the Swegon Parasol units are technically CBUs.
[2725] PPP 12 (bundle 26 Document 2) At para 6.13

a VSG[2726]. While it is accepted that their use was not discouraged in Guidance at the time the construction contract was agreed (e.g. HTM of 2007), the challenges of cleaning and of introducing a potential contamination source over a patient's bed were obvious No evidence is presently available of detailed research by the Project Team into their practical use in single room healthcare settings prior to the contract. Their use also precludes significant increase in air change rates, if found desirable for any reason.

- The lack of validation of ventilation systems throughout the hospital before these systems were accepted by NHS GGC. [2727](This is accepted by NHS GGC).

- The failure to carry out annual verification of ventilation systems in critical care areas prior to 2019.[2728]

- In Ward 2A,[2729] a series of deficiencies, being the absence of HEPA filtration at handover, the failure to provide an ACH of 10, the failure to provide a positive pressure of 10 pascals, the failure to provide a sealed room (both in relation to the ceiling and other room features), failure to provide an airlock to enter the ward and failure to provide a backup air handling unit or pressure monitoring systems. (These deficiencies were rectified by the installation of a new ventilation system in 2019.)

- In Ward 4B there were multiple deficiencies at handover. However, as patients moved out of the ward almost immediately, the deficiencies specified at handover in PPP 12 are not repeated here. Following remedial works, Ward 4B does not have HEPA filtered corridors nor an ACH rate of 10. It does not have a backup air handling unit.[2730]These remain deficiencies.

[2726] SHTM 03 01 – 2022 - Hearing Commencing 9 May 2022 - Bundle 1, Document 10
[2727] PPP 12 (Bunde 26, Document 2) at para 6.14
[2728] PPP 12 (Bunde 26, Document 2) at Para 6.15
[2729] PPP 12 (Bunde 26, Document 2) at para 6.16 on
[2730] Dealt with more fully in para 6.71 on

PPVL rooms

212. A much-debated topic. On the evidence, at the time of the construction of the QEUH. the use of PPVL rooms to protect severely immuno-compromised and infectious patients was contrary to guidance in SHPN 04 Supp1. It was accordingly a deficiency at that date.

213. However, the 2024 version of HBN[2731],now advises lobbies should be provided with both negative and positive pressure rooms (though rooms without lobbies remain an option). More significantly, it also mandates PPVL rooms as a solution for both source and protective isolation. However, at whatever date, construction of PPVL rooms in a manner contrary to guidance – particularly with the main extract in the patient bedroom - and thus not meeting the performance aims of the guidance -does meet the test of a deficiency. The 2024 Guidance now states [2732]specifically that any deviation from the validated design specification 'is likely to compromise airborne isolation protection'.

Other Potentially Deficient Features

214. There are other areas where it is more challenging to immediately conclude that deficiencies meeting the test used in these Submissions exist. For instance, in relation to Wards 2B (paediatric day-care haemato-oncology patients) and 4C (adult immune-compromised haemato-oncology patients), the clear consensus among those with expertise who gave evidence to the Inquiry was that, in both instances, they should also be considered for full specialist ventilation treatment, similar to Wards 2A and 4B. It would be open to the Inquiry to decide that that evidence was sufficient to conclude that, to the extent that these wards did not meet the same standard as 2A, there were deficiencies. It is submitted that this should indeed be the conclusion for Ward

[2731] Health Building Note 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings The lead author was Malcolm Thomas and a contributor Professor Hilary Humphreys. There is not currently a Scottish version.
[2732] Health Building Note 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings The lead author was Malcolm Thomas and a contributor Professor Hilary Humphreys. There is not currently a Scottish version.at p3

4C.

215. However, it must be acknowledged that there is an alternative view in relation to Ward 2B that patients do not require this protection, as for much of their time they are in an unprotected environment, outwith the hospital. The NHS GGC approach seems dismissive of the efforts many families described of keeping children as safe as possible when not in hospital. Perhaps the correct conclusion is that the protections required for neutropenic patients, which are clearly set out in SHTM 03 01[2733] , are regarded by the consensus of evidence to the Inquiry as desirable for this ward, but ultimately it is a clinical decision as to which patients require this level of protection. Accordingly, the absence of the same standards as Ward 2A cannot be regarded as a deficiency.

216. In addition, there are other wards, such as the respiratory ward and the cystic fibrosis ward, where some would regard a requirement for specialist ventilation as sensible, even desirable. Again, the evidence does not meet the necessary standard.

217. Further, the Specialised Ventilation PPP touches on a range of areas where provision at the QEUH is challenged. It might be possible to conclude, for instance, that the absence of negative pressure rooms is a deficiency meeting the test. However, it is possible that additional evidence will be heard during Glasgow IV' and accordingly no conclusion is reached at this stage.

What evidence did the Inquiry obtain?

Foreword – and a critical one at that

218. Before looking at the evidence in detail, it is worth quoting something said by Mr Leiper.[2734] It should underly the correct approach to the entire consideration of ventilation issues, in these Submissions and elsewhere. He said that the primary focus should be,' safety. Every day of the week and twice

[2733] Bundle 23 Hearing Commencing 26 February 2024 Document 12 page 131 2009 draft at Appx 1 p142
[2734] Transcript of evidence of Jim Leiper p72

on Sunday. …, these are people's lives that we're dealing with. First rule is do no harm, and that should be a prime objective of how we build and design environments for patient care, so I think it should be the primary focus. I think as public servants we also must have an eye to the economy because, we're dealing with the public purse, we're dealing with money that's provided for that. So, the appropriate stewardship of that finance is of prime importance, but what trumps that is the safety-- the patient safety, and not just the patients, staff, anybody that -- comes in contact with the business'.

The evidence

219. The Inquiry instructed two expert reports on ventilation, from Mr Alan Bennett and Mr Andrew Poplett respectively. As well as producing their Reports, each gave oral evidence. In addition, the Inquiry heard from skilled witnesses in the shape of Mr Lambert of Innovated Design Solutions (IDS), and Mr Leiper. Each had been instructed by NHS GGC. Some other evidence was also given on ventilation by, for instance, Peter Hoffman, and ICDs such as Dr Peters and Dr Inkster. All of that has been taken into account in this Chapter (even though in the interests of space every individual piece of evidence is not narrated).

Alan Bennett

220. Alan Bennett gave evidence on 31st October and 1st November 2024. His expert report was entitled, 'Ventilation Deficiencies at QEUH and RHC and their potential impacts'[2735]. He had worked at the famous Porton Down laboratory for over 35 years. He specialised in the airborne transmission of infection and its prevention. He headed a team of up to 20 scientists carrying out research in that area. He regarded a hospital as an' unusual public space'[2736]. He was used to dealing with spaces that the public move through transiently, but in a hospital, patients were there 24 hours a day - and of course there was a duty of care to staff and visitors as well. Interest in healthcare ventilation had increased post-Covid.

[2735] Bundle 21 Vol 1 p611
[2736] Transcript of evidence of Alan Bennett p 10

221. His expertise was challenged by NHS GGC, essentially on the basis that he was not a clinician, had not worked in hospitals and had no experience of assessing clinical risk. These restrictions, which were acknowledged by Mr Bennett,[2737] do not, with respect, detract from his ability to give valuable expert evidence to the Inquiry. Given the experience he had accumulated, the focus of his life's work and the investigations and other work he has carried out, there is no reason for the Inquiry not to place significant weight on his conclusions.

Andrew Poplett

222. Mr Andrew Poplett gave oral evidence on ventilation on 7th November 2024. His report was entitled, 'Independent Expert Report concerning Critical Healthcare Ventilation Systems at QEUH and RHC.[2738] He had experience in roles in the estates department of various hospitals, at a senior level. He had then moved to become an independent consultant and held a large number of posts as Authorised Engineer for ventilation. He spent the whole of his time advising on healthcare ventilation. He had authored various guidelines and commentaries on them.[2739]

223. His value as an expert witness was also challenged by NHS GGC, essentially on the same grounds as the challenge to Mr Bennett. Clearly, it cannot be doubted that he had extensive experience (18 years) of working in hospitals and dealing with ventilation issues as part of those roles. That he was not a clinician and not directly involved in assessing clinical risk, while acknowledged, does not in any way support the proposition that the Inquiry should not place significant weight on his views and recommendations. He had also worked with microbiologists and IPC professionals for over 30 years. His evidence should be given considerable weight,

224. There were no significant areas of disagreement between the experts. Their agreement will not always be reiterated in these Submissions.

[2737] Bundle 21 volume 1 page 616
[2738] Bundle 21, Vol 1 page 468
[2739] Transcript of evidence of Andrew Poplett at page 5a

The Issues Reviewed

225. Mr Poplett preceded his views on the QEUH with a full and detailed discussion of healthcare ventilation, its mechanics, purposes and parameters. Mr Bennett preceded his with a focus on transmission routes.[2740] He pointed out that people at complete rest still inhaled about 6 litres/minute (almost 9 cubic metres/day[2741]). The evidence behind hospital ventilation guidance was largely based on theoretical studies. Case control studies were difficult. As Mr Leiper put it,' patients couldn't be Guinea pigs'[2742]. However, Mr Bennett also stressed the comment - with which he agreed [2743] - of Malcolm Thomas, the lead HTM author. Mr Thomas had said that HTMs were based on,' on good solid work many years ago … Where we have encountered problems, it's generally been clear that guidance wasn't followed". … "ventilation rates noted in HTM 03-01 are not opinion they have been proven to work in practice and over an extended period of hospital design and operation. History appears to show that this is the correct way of doing things".[2744]The recommended ACH rates had remained stable since 2007.

226. Mr Bennet also suggested, having discussed the significance of the US Center for Disease Control (CDC) as a source of knowledge and advice in ventilation issues, that for, 'a flagship hospital these facilities would be expected to take account of best international practice and be in advance of current practice.'[2745] That is worth bearing in mind when reviewing what was, is, and should be in place at QEUH.

227. Looking for a moment beyond national guidelines, in Glasgow II Professor Gibson explained that transplant units must also adhere to the standards set by the Joint Accreditation Committee ISCT-Europe ("JACIE") and be accredited by JACIE[2746]. All of Europe adheres to the JACIE standards; the USA operates a similar accreditation system. The standards set by JACIE are

[2740] Bundle 21 Volume 1 Expert Report, Alan Bennett page 625
[2741] Transcript Alan Bennett p33
[2742] Transcript of the evidence of Jim Leiper at p66
[2743] Transcript of the evidence of Jim Leiper at p52
[2744] Transcript of the evidence of Jim Leiper at p33.
[2745] Expert Report of Alan Bennett p 66
[2746] Witness statement of Professor Brenda Gibson, paras. 39; 62-64.

not overly prescriptive to enable compliance by low and middle-income countries. The standard set by JACIE is simply that transplant units should be designed to "minimise microbial contamination" [2747].While not, therefore prescriptive as to means, JACIE does suggest that every available step should be taken, if full meaning is to be given to the word 'minimise'.

228. Mr Bennett was pressed on what would need to be done, if it was thought necessary to try to prove whether reduced ACH increased infection risk. He explained that a lot of attempts were being made with mathematical modelling, but the 'problem about that is everybody's different. People go through different stages of infection, people get infected in different ways, people produce aerosols during different routes, so it's very difficult to get a correct source term that is realistic to model what an infected person does.'[2748]

229. For Mr Poplett, CBUs restricted the possible ACH.[2749] (Mr Leiper agreed[2750]). As noted above, they were not now recommended in clinical areas. They introduced further sources of possible contamination[2751], a point also made by Mr Hoffman[2752].Mr Bennett pointed out that the need for maintenance and cleaning had been in guidance since 2007. Mr Leiper asked the rhetorical question, 'Would you actually put something in the room that you need to go and maintain and disturb the patient environment?' (Mr Bennett agreed. He was also surprised that there was no indication, so far as he could see, that evidence on CBU performance in situ, reliability and previous use in healthcare environments had been obtained[2753]).

230. Mr Poplett would not recommend thermal wheels in immuno-suppressed areas or highly infectious patient areas. Though the risk of cross contamination was low, devices seeking to achieve the same heat recovery

[2747] Witness statement of Professor Brenda Gibson, para. 62.
[2748] Transcript Alan Bennett p148
[2749] Expert Report of Andrew Poplett para 6.10
[2750] Transcript of Jim Leiper p34
[2751] Transcript of Andrew Poplett p38
[2752] Witness statement of Peter Hoffman para 71
[2753] Expert Report of Alan Bennett p 91

exercise, but with notably lower risks were readily available.[2754]Mr Leiper[2755] agreed, as did Mr Lambert[2756].

231. Looking to the basics, in Mr Poplett's view, the standard for general wards of 6 ACH was not met. [2757]

232. There was an absence of HEPA filtration in the air handling units (AHU) – with only Ward 4B having room-mounted filters. A non-filtered corridor created a risk of contamination entering rooms.[2758]According to Mr Bennett, while there was little in the literature on the benefits of positive pressure and HEPA filtration that did not mean they were of no value.[2759]

233. AHU were close to capacity and could not achieve ACH of 6 in general rooms. There was no provision for back-up plant.[2760] The '3 resilience principles (robustness, redundancy and reconfigurability) should have been applied.[2761] Low levels of leakage had not been provided in areas where pressure cascades needed to be maintained. Mr Bennet added that, without solid ceilings, permeability testing was meaningless.[2762]

234. Before looking at individual wards, it may be appropriate to pick up a debate Dr Inkster created about the meaning of the phrase 'neutropenic ward' in SHTM 03 01.[2763] She appeared to argue that the phrase did not mean that a whole ward would have to be at a standard for neutropenic patients. That would mean sealing the ward from the rest of the hospital. On that basis the phrase would apply to neutropenic rooms. She did accept, in the context of paediatric haemato-oncology, the reality of how patients moved within the ward (including for play) might suggest the phrase should cover the whole ward. She also accepted that in the context of an adult BMT ward (such as

[2754] Expert Report of Alan Bennett at 7.51
[2755] Transcript of Jim Leiper p65
[2756] Transcript of the evidence of Matthew Lambert p45
[2757] Transcript of the evidence of Matthew Lambert 7.3
[2758] Expert Report of Alan Bennett para 6.12
[2759] Expert Report of Alan Bennett p32
[2760] Poplett Report at 6.16
[2761] Poplett Report at 7.55
[2762] Expert report of Alan Bennett p48
[2763] For example, Alan Bennett, Transcript, Day 1 pp53-55

4B) the whole ward required the triumvirate of 'HEPA, 10,10'.

General Ward ACH

235. There is further discussion of the issues arising from a reduced ACH of 2.5-3 rather than 6 in the section below on risk. What is worthy of comment in the meantime is that, while a number of witnesses now stress the failure to follow the SHTM 03 01 advice, initial focus was not on this general ward rate at all. It may be understandable that a member of Estates (like Mr Powrie), given information indicating that the rate had been 'agreed' in a derogation, would not immediately raise a challenge. Early action from an IPC perspective is less easy to understand. While Dr Peters immediately questioned who had signed it off from an IPC perspective, Dr Inkster's focus at that time was on infectious patients.

236. Given the issues which emerged over Ward 4B, Ward 2A etc it is perhaps understandable that the most vulnerable patients – and the largest discrepancies found on wards between recommended and actual ACH - became the priority. Does the way it was treated at the time undermine an argument for the general ward rate being a deficiency? It is submitted it does not. Reactions at the time are important (as set out in Chapters 1 and 2), but they cannot ultimately direct the decisions the Inquiry must take. SHTM 03 01 should have been followed – and the absence of clear recorded discussion at the time with IPC (or anyone else according to Professor Steele's searches), combined with lack of a risk assessment is significant. Perhaps Glasgow IV oral evidence will reveal more (though the prospect of new documents on the topic seems poor).

Ward 2A – The Schiehallion Unit

237. Before turning to the expert evidence, it is worth noting that on 30 October 2017 Dr Peters produced an SBAR titled "SBAR: 2A Patient Accommodation and Risk of Invasive Fungal Disease"[2764]. She explained that she produced it for Professor Jones.[2765] In Glasgow II, Dr Ewins confirmed that the building

[2764] Bundle 4, p.113.
[2765] Dr Peters, Statement, Para 143

requirements listed in the SBAR for "Neutropenic/BMT patients" broadly accorded with her understanding of the specialist ventilation required by such patients: 10 ACH, positive pressure at 10Pa to the corridor, all air entering the room should be HEPA filtered and alarms should be present to monitor for failure[2766]. According to Dr Ewins, not all neutropenic patients required this level of protection at all stages of their treatment.[2767] A highly specialised environment was required for BMT and SCIDS (severe combined immune deficiency) patients. Other high-risk patients may benefit from this protective environment at particular stages of their treatment.

238. Mr Poplett looked specifically at Ward 2A. Though HEPA filtration and positive pressure was required, the ward appeared to have been built as a general ward. He agreed with Mr Lambert's conclusions in his IDS Report, which highlighted 'numerous significant deficiencies/inadequacies'.[2768]At the risk of repetition, these included lower than required ACH, rooms at slight negative pressure, AHU not providing 25% spare capacity, no back-up AHU, plant with no allowance for dirty filters, thermal wheels, cleaning problems due to CBUs, non-sealed rooms with suspended ceilings, need for HEPA filters, need for pressure sensors, 'dirty' extract air moving to 2A intake, no entrance lobby and inadequate as-fitted records.

239. Mr Lambert of IDS – instructed of course by NHS GGC - was particularly scathing. He said, 'the original accommodation design philosophy was not intended for use by patients with immune response impairment/deficiency. On the contrary, the existing ventilation strategy would appear only likely to promote the risks associated with uncontrolled ingress of infectious aerosols into patient areas."[2769]

240. Mr Leiper provided a useful discussion of how to view the need for back-up AHU plant. That was to ask,' if I have to give a protective environment to the patient, at what time does this protective environment become unnecessary?"

[2766] Supplementary witness statement of Dr Anna Maria Ewins, para. 21-22.
[2767] Supplementary witness statement of Dr Anna Maria Ewins, paras. 21 to 25.
[2768] Bundle 6 doc 34 p674
[2769] See transcript of Matthew Lambert p 73

Well, the answer is, "At no time." [2770] Breakdown, cleaning, and maintenance could all require resilience.

241. Mr Poplett did not agree with Peter Hoffman's view that ACH was not relevant for immuno-compromised patients[2771](Mr Hoffman maintained that view notwithstanding that an ACH requirement of 10ACH for this patient cohort had consistently appeared in Guidance). It might not matter, Mr Poplett said, in the theoretical situation where the patient was always in the room alone, but nursing staff, visitors etc might be there. They were all possible sources of contamination. So 'ACH is also as fundamentally critical in isolation rooms as the pressure cascade or the filtration rate.[2772]For what it is worth in this context, Dr Inkster agreed with Mr Poplett's view for very similar reasons.[2773](Mr Bennett – who said he didn't often agree with Mr Hoffman – agreed with his hierarchy[2774] of HEPA filtration as most important for immuno-compromised patients, then positive pressure. However, the rejection of ACH as important depended on no source of contamination entering the room.) [2775]

Ward 2B – the Schiehallion Unit

242. Ward 2B had similar issues to 2A. A view on its ventilation environment created more debate but, 'it would not be unreasonable to ensure a safe and appropriate environment;[2776]according to Mr Poplett. Mr Leiper tended to agree, – 'if there's immunocompromised patients there or people who are susceptible or more susceptible than the general population, you might consider that even in a general ward situation that perhaps 10 air changes would be more appropriate'.[2777] Mr Lambert thought 10ACH and positive pressure should have been provided.[2778]

[2770] Transcript of Jim Leiper p62
[2771] Transcript of evidence of Peter Hoffman at p32
[2772] Poplett transcript 99
[2773] Transcript of the evidence of Dr Inkster, Day 2, pp1-5
[2774] Hoffman transcript at p19
[2775] Bennett transcript at p 143
[2776] Transcript of evidence of Andrew Poplett p 46
[2777] Transcript of evidence of Jim Leiper p69
[2778] Transcript of the evidence of Matthew Lambert p25

Ward 4B – the QEUH

243. On Ward 4B, even after upgrades the ACH was still only 6. 'The ward was still below specification'.[2779]Mr Bennett expressed it in this way – and no apology is made for quoting in full – 'It is disappointing that despite significant remedial works Ward 4B still does not meet the intention to replicate the standards shown in the Beatson facility which was built and commissioned in the 1990s and to perform to ventilation standards specified in HTM 03-01 (2007) and SHTM 03-01 (2013). It is also disappointing that the ventilation system used to protect these patients is currently far below that provided for paediatric patients in Ward 2A'. [2780]Right at the outset Dr Peters had expected to see 10 ACH, 10 pascals, HEPA filtration and monitoring.[2781]

Ward 4C – the QEUH

244. On Ward 4C Mr Poplett argued that it should have been designed for immuno-suppressed patients. Accordingly, he concluded that it was below standard, having 2.5ACH, and neutral pressure. Portable HEPA filters were deployed but were not validated for performance.[2782] They should not be considered as a long-term solution.[2783] (Mr Bennett pointed out that portable filters would not prevent introduction of airborne opportunistic pathogens). The correct environment for Ward 4C was again the cause of more debate - in Mr Poplett's view, the decision was for a multi-disciplinary group not just a ventilation specialist.[2784] Mr Bennett's view was that, 'he was unaware of any clinical reason why these patients required less protection than those on Wards 2A and 4B.'[2785]Mr Leiper's view was, 'if there's immunocompromised patients there or people who are susceptible or more susceptible than the general population, you might consider that even in a general ward situation that perhaps 10 air changes would be more appropriate.' Dr Inkster had expressed not dissimilar views back in 2018.[2786] However she had not at that

[2779] Expert Report of Andrew Poplett para 7,14
[2780] Expert report of Alan Bennett p78
[2781] Day 1 transcript Dr Peters p81
[2782] Expert Report of Andrew Poplett 7.2
[2783] Expert Report of Andrew Poplett 10.16
[2784] Expert Report of Andrew Poplett at 48
[2785] Expert report of Alan Bnnett p80
[2786] See e.g. Bundle 27, vol 7 p378.

time been pressing e.g. for 10ACH. Given the evidence from Dr Hart[2787]about the regular presence of patients with recent neutropenia, hindsight suggests she – and others should have.

Ward 5C – Infectious Diseases

245. For the Infectious Diseases Ward 5C, it had been designed as a general ward, with 2.5 ACH and only having access to 3 negative pressure[2788] rooms in critical care. (Dr Inkster had written a SBAR on concerns in 2016.) For Mr Poplett this too was 'not considered appropriate'.[2789]Isolation rooms should have 10ACH and 10 pascals of negative pressure[2790] .A minimum of 5 pascals should be in place.[2791]Pressure differentials around neutral or e.g. -1, if they fluctuated, potentially caused problems – such as positive moving to negative or vice -versa.

PPVL Rooms

246. Mr Poplett looked at the controversial issue of PPVL rooms. He felt that PPVL rooms, could be used for immuno- compromised or infectious patients, provided they were designed to SHPN 04 Supp 1 and HBN Guidance (an important point emphasised by Mr Hoffman[2792]who, however, contrary to Mr Poplett, maintained they were not suitable, a view also recorded at Stage 2 Whistleblow by Dr Redding). While they had to be maintained, said Mr Poplett, they had additional resilience because of the lobby arrangement.[2793](That was a similar conclusion to that described by Professor Williams after discussions with David Loudon and others)[2794].

Impact of BREEAM

247. Generally, said Mr Poplett, the desire to achieve a BREEAM excellent rating had led to a design which 'did not adopt a patient centred approach or have

[2787] Bundle 27, Vol 7 p375
[2788] Bundle 4 p49
[2789] Poplett report 7.29
[2790] Poplett Transcript p 52
[2791] Poplett report para 10.20
[2792] Transcript of evidence of Peter Hoffman at p12
[2793] Transcript of Andrew Poplett at p 102
[2794] Transcript of evidence of Craig Williams p67 on

infection prevention and control at its heart'.[2795] The BREEAM system was not' specifically designed for healthcare buildings, and should never be used as a primary performance driver where clinical or infection prevention and control needs could be jeopardised or compromised'.[2796]

Validation of the ventilation system

248. Further, there was no validation of the ventilation system – '… the failure to appropriately undertake the validation process enabled the systems to operate in a sub optimal state, potentially exposing patients to an elevated level of risk'.[2797] Wards should never have been accepted by NHS GGC without validation. Mr Bennet agreed on the importance of commissioning, validation and verification.[2798]

Other issues- and consequences

249. It was Mr Poplett's opinion that AE (Ventilation) audit reports were' overly reassuring' and did not highlight or escalate serious issues to an appropriate level.[2799] What now? Mr Poplett's view was that all wards with sub-optimal parameters should be assessed against SHTM and best practice, so that a conclusion could be reached as to how improvements could best be made (whether that involved major building works or not). If that assessment could only be addressed by, for example, the removal of CBUs from clinical areas, that would be his advice'.[2800]

Aspergillus

250. This potentially infective airborne fungal organism is dealt with only briefly here. It is ubiquitous – so attention need not focus, e.g. on destroying it - but for present purposes the key point is that, though usually harmless, it can cause serious illness in immuno-compromised patients.

[2795] Poplett Report 7.30
[2796] Poplett Report 12.1
[2797] Poplett Report para 8.14
[2798] Bennet report at 62
[2799] Poplett Report para 9.89
[2800] Transcript of evidence of Andrew Poplett p16

251. That in a sense provides the whole of the answer. If an immuno-compromised patient who – to follow Mr Hoffman's thesis – is not in an environment where 'every breath' is HEPA filtered, then that patient is at risk. Likewise, if that patient is in a room without an adequate number of pascals of positive pressure to exclude potential Aspergillus infection from outwith the room, that patient is again at risk. Finally, the lower the number of air-changes, the lower the level of dilution of anything harmful – including Aspergillus - which may have entered the room.

252. That simple analysis doubtless explains why ICDs like Dr Inkster and Dr Peters were (what may have seemed to be obsessively) concerned with ensuring that paediatric patients (and indeed adults) with immuno-compromised systems were housed in appropriately protective environments. Any drop from that combined level of protection put patients at risk. There is little in the evidence before the Inquiry to suggest that if they did have an obsession, it was anything other than entirely justified.

An Assessment of Risks

253. Assuming there are deficiencies do they create avoidable infection risks?

254. Mr Poplett confirmed that the extent of elevation of clinical risk was outwith his scope. However, he was confident that 'a lower air change rate, a lower dilution rate, and the presence of sources which can encourage proliferation would be detrimental in a clinical setting'.[2801]There was not just patients to consider, but staff and visitors who needed protection.[2802]

General wards

255. Mr Bennett accepted that the prevention of nosocomial infection involves a range of preventative measures often called bundles. However, did what was found at QEUH create risks? Looking first at general wards, the reduction in ACH impacted the time taken to remove any airborne contaminants. 'With 2.5ACH it would take 56 minutes to remove 90% of an airborne contaminant

[2801] Trancript of evidence of Andrew Poplett at p 7
[2802] Transcript of evidence of Andrew Poplett p31

and 110 minutes to remove 99% of the contaminant. At 6ACH it would take 23 minutes to remove 90% of the contaminant and 46 minutes to remove 99%'[2803]There was also the possibility of a contaminant moving from room A to room B, as pressure differentials either side of zero could fluctuate for all kinds of reasons[2804] .

256. While there might be an argument for reducing ACH, he had seen nothing addressing the possible impacts. This was a point made as long ago as 2016 by Dr Inkster.[2805] Dr de Caestecker had looked for a risk assessment but could not find one[2806]. Mr Bennett's conclusion –contrary to the NHS GGC view - was that 'lower air change rate on general wards than recommended by guidance would potentially increase the risk of transmission of respiratory infection between patients, staff and visitors, especially in winter, as compared to a standard ward'[2807]. That had been Dr Inkster's view too[2808].While there was a range of respectable views about the means of spread of e.g. influenza and Covid, Mr Bennett regarded himself as being in the middle of that range. Someone in the middle would reach his view about increased risk.[2809] Unfortunately, it was not possible on the available information to specify the magnitude of that increase. Notwithstanding being pressed on the point, he maintained that he was still convinced there was an increased risk.

Chilled Beam Units ('CBUs')

257. Adding an extra water supply created a foreseeable risk, 'for instance of leaks.' Then there was the additional risk of condensation. Even if dew point controls were in place that would not eliminate the issue completely. As Mr Bennett put it, 'having a reservoir of opportunistic pathogens in the ceiling of a patient room is obviously not a perfect situation in any hospital. There is a potential for the transfer of these agents from the CBU to the patients (drips, re-entrainment of dust into room air) and a potential for these agents to infect the

[2803] Expert Report of Alan Bennett p 88
[2804] Transcript of Alan Bennet p98
[2805] Dr Inkster transcript Day 1 p105
[2806] Dr De Caestecker transcript at p10. Nor could Professor Steele.
[2807] Allan Bennett Report at p90
[2808] Dr Inkster transcript at Day 1 p117
[2809] Alan Bennett transcript p101

patient through inhalation or contact. It is difficult to put a risk value on this exposure, but it is not zero and for immunosuppressed patients the consequence of infection could be serious.'[2810]In his view it was sensible to discontinue the use of CBUs, with priority being given to wards with the most vulnerable patients.

Infectious patients

258. Mr Bennett pointed out, as is perhaps obvious, that having an ACH of 2.5 rather than 10, would increase the risk to anyone entering a patient room by fourfold. No RPE was 100% effective. It was his personal view that risk would increase. Even with negative pressure or PPVL rooms a reduced ACH increased exposure. A PPVL room could provide protection - however, only if' operating correctly'.[2811]Mr Leiper's view -and he had seen it demonstrated at a conference -was that PPVL rooms designed with the extract in the patient room (as they were at QEUH) did not achieve the desired air flow.

Immuno-compromised patients

259. For similar reasons to those explained above, Mr Bennett was firmly of the view that a reduced ACH increased patient exposure to any infectious agents generated from staff or visitors or the environment. 'For such vulnerable patients this increased exposure risk is unacceptable in a new hospital.'[2812] If, as was the case originally in Ward 2A, there was no positive pressure differential, or the differential was only nominal, then there was the potential for ingress of air. That meant the patient did not have the enhanced protection against pathogenic agents that should have been provided. The increased risk could not be easily measured. The same was true for the lack of HEPA filtration. However, there was no doubt as to the value of that filtration in removing the risk of incoming infective microbes (a point also made when by Mr Bennett when discussing Cryptococcus[2813]). The HEPA controls what comes into the room via ventilation, the positive pressure controls what comes from the corridor, thus the ACH impacts what happens when anyone else is in the room – the lower the ACH the

[2810] Expert report of Allan Bennett p93
[2811] Expert Report of Allan Bennett p97
[2812] Expert Report of Allan Bennett at 99
[2813] Expert Report of Allan Bennett at 8.13

higher the exposure.[2814]

260. While not a clinician, Mr Bennett expressed a strong view on prophylaxis – 'many of these therapeutics have serious side effects which can impact on patients and cause serious symptoms in themselves. The use of prophylaxis is a clinical decision but should not be used to cover for deficiencies in ventilation systems especially if the prophylaxis used is likely to have serious side effects'.[2815]

Thermal Wheels

261. Mr Bennett assumed that a well-maintained thermal wheel posed limited risk. However, each of the engineers who considered the matter (Poplett, Lambert and Leiper) took the view that, if there was any risk at all, that should be reduced or eliminated by using a different device.

Cryptococcus

262. Is Cryptococcus a topic for this submission focussing on ventilation? Tangentially, the answer is 'yes', in part because the evidence on it was given to a significant extent by ventilation experts. Clearly the topic has other implications, but it is dealt with here, at the risk of some repetition. A detailed narration of the establishment of the Cryptococcus Expert Advisory Sub Group, how it worked, the views from NSS about its operation and the views of Dr Armstrong, Professor Steele, Dr Inkster and Ms Devine can be found in in the section of Chapter 5 that addresses the The Cryptococcus Expert Advisory Sub Group.

The Evidence

263. The Inquiry instructed one report on the topic – from Mr Bennett.[2816]He also answered Supplementary Questions in a Direction 5 Report.[2817] So far as

[2814] Allan Bennett transcript p 122
[2815] Also discussed in detail at 154 on of Alan Bennett transcript
[2816] Bundle 21 Vol 1 p738
[2817] Bundle 21, Vol 6 p154

other documentary material goes, the main item is, of course, Dr Hood's report[2818] as an output from the Cryptococcus Expert Working Group. That was ultimately treated not as a report of the group, but as an NHS GGC Report. Both Mr Hoffman and Mr McLaughlan commented on that document (though neither had direct recollection of it).

264. Mr Bennett reported that there was relatively limited information about the Cryptococcus pathogen, but it had been linked to pigeons and pigeon droppings.[2819] It could also be found in soil and rotting wood. (Mr Hoffman agreed with this description of sources). Much of the discussion on the topic had arisen because it caused serious infections in immune-compromised hosts and had thus come to prominence at a time when HIV treatments were not as advanced as they presently are. Cryptococcus remains one of the four highest priority fungal agents on the WHO fungal priority pathogens list. That was because there were other countries where HIV treatment was not as advanced or as available as e.g. the UK. [2820] The statistics were far from ideal, but the best figures suggested between 28 and 38 cases in the period between 2016 and 2023. If there were 5 cases just at QEUH that seemed high (but Mr Bennett stressed he was not an epidemiologist). The vast majority of witnesses – including many of considerable experience such as Mr McLaughlan[2821] – had never come across Cryptococcus in a healthcare environment.

265. The incubation period for Cryptococcus was highly variable. It could be short - a period of weeks according to the CDC website - or it could be reactivated after a long time.

266. Mr Bennett had not carried out any separate investigation, nor had he carried out any investigations at the QEUH to support his report. He did have one general point to make about the Hood investigation. He described the group as' looking forward but not back'.[2822] They were not tasked with identifying a

[2818] The final version is dated 5th April 2022
[2819] Transcript 2 of Allan Bennett p4
[2820] Transcript 2 of Allan Bennett at p7
[2821] Transcript of evidence of Eddie McLaughlan p 75
[2822] Transcript 2 of Allan Bennett at17

common source or an event deriving from the patients' stay in the hospital. They seemed to be looking at whether what had happened could happen again. The group contained no epidemiologist, and the one clinician left after one meeting, as he thought his expertise was not relevant.

The Hood Report[2823]

267. Bennett as if the audience was NHS GGC senior management. As confirmed by Mr McLaughlan, NSS were not happy with the report. Among other things, they were not happy with some of the methodology and conclusions, and thought it was biassed towards a particular result exonerating the hospital environment[2824]. Mr Bennett agreed with these criticisms.[2825]

268. Assuming a minimum incubation period of seven days, Mr Bennett thought there was an overlap in hospital over the two patients of about 9 days in 2018. He was surprised that the group did not thoroughly investigate what might have been happening in the hospital during that period. It was also, he accepted, possible that the two patients had picked up the infection from a common source but at different times.

269. Another puzzle for Mr Bennett was what was 'amiss' on 21st December 2018. Cryptococcus diffluens was found both in plant rooms and in a ward supplied by these plant rooms. That might have been due to clean up activities, but again he did not think this was very closely identified or investigated by the group.

270. Apparently, Cryptococcus neoformans was difficult to detect. Mr Bennett did not know why that was. While there was a lot of air sampling, that had to be done after the event, so it was not known what was in the air during the likely incubation periods. While a large quantity of air was sampled, that was also done in various places in the hospital.[2826]

[2823] Bundle 6, Document 39, Page 1115
[2824] Transcript of evidence of Eddie McLaughlan p83
[2825] Transcript of evidence of Eddie McLaughlan p21
[2826] Transcript of evidence of Eddie McLaughan 33

The Hypotheses considered

271. The Hood Report worked through a series of hypotheses. One of the most controversial - inevitably - was access via the plant rooms where heavy pigeon dropping contamination had been found. (The overall evidence allows the Inquiry to conclude that – contrary to some reports and the understanding of some witnesses – that the contamination was indeed heavy). A series of possible means for access via the plant rooms had been identified, investigated, and then rejected in the report.

272. Mr Bennett was unconvinced that these possible routes should be completely excluded and felt a label of 'possible' was appropriate.[2827] Notwithstanding the investigations, it was possible that one or more of the ventilation system defects which would have allowed access had existed. (Mr Hoffman agreed in oral evidence that as the filtration and mounting of F7 filters were less secure the possibility could not be excluded[2828]). In addition, the concurrence of finding the same strain of Cryptococcus in both plant room and ward suggested a link.

273. The second main hypothesis was an outside air source, in other words air not necessarily coming from contamination in the plant rooms but entering the wards through other routes when doors were opened or whatever. The Hood Report categorised that as 'feasible'. Mr Bennett agreed. Of all the hypotheses this was most favoured by Mr McLaughlan[2829].

274. The third main hypothesis - lack of protective isolation - was of a different nature to the others. It was not a possible source at all, as much as a result, if airborne Cryptococcus was present. As Mr Bennett put it,' if these patients were in protective isolation, we wouldn't be having this discussion we're having today.'[2830] He pointed out that if there was a HEPA filter in the patient room there would be 200 times minimum less numbers of Cryptococcus in that room (comparing an F7 filter with 90% efficiency with a HEPA validated at

[2827] Transcript of evidence of Eddie McLaughlan p37
[2828] Transcript of evidence of Peter Hoffman at p86
[2829] Transcript of evidence of Eddie McLaughlan p82
[2830] Transcript 2 of Alan Bennett p38

99.95%).

275. There was no real difference - apart from the precise words used - between Mr Bennett's view of hypothesis 4 (cylinder room in PICU) and that in the report.

276. Hypothesis 5 was downwash from helicopter landings. This was a more complex issue, where computer modelling had been done to try to assist the investigation. Mr Hoffman (who regarded his role on the group as purely advisory and did not himself carry out any investigations or visit the hospital[2831]) had urged caution about reliance on modelling because, of course, it was entirely dependent on the assumptions in the inputs…' the model is only as accurate as those assumptions are both accurate and complete'.[2832] Nevertheless, he agreed with the report's rejection of this option. Mr Bennett was less certain, as he felt weather conditions were very variable and only some had been taken account in the modelling. His ultimate label was 'not ruled out'.

277. The next hypothesis was air from the hydraulic sample transmission system. The report's conclusion was that this was unlikely. Mr Bennett thought very unlikely.

278. The final hypothesis was, in effect, that these infections were simply the revival of latent infections acquired by patients elsewhere. Mr Hoffman had not been able to comment on this possibility as it was beyond his area of expertise. Whether it is a credible hypothesis may depend on whether the view is taken that it is likely that Glasgow had patients with Cryptococcus acquired outwith the hospital in numbers not seen elsewhere in the UK (notwithstanding that pigeons are ubiquitous). There was little difference between Mr Bennett's view and that in the report - both stressed the difficulty of proof. The report conclusion of 'very possible', ultimately seemed to morph into the main hypothesis for the internal NHS GGC presentation. Mr Bennett felt reactivation had to be accepted as a possible hypothesis, given

[2831] Transcript of evidence of Peter Hoffman at p78
[2832] Transcript of evidence of Peter Hoffman at p94

confirmation in the literature that the infection could remain latent for long periods.[2833]

Conclusion on Cryptococcus

279. Where Mr Bennett[2834] and Mr Hoffman[2835] did agree was that (with the possible exception of the hydraulic specimen transport system), none of the hypotheses should have been' conclusively ruled out'. (This is, of course, contrary to the view attributed to Professor Steele, who was recorded as saying that all but reactivation had been ruled out[2836]). The NSS view that the ultimate presentation of the report was biassed towards a solution avoiding any imputation against the hospital is also persuasive. Near the conclusion of his oral evidence, Mr Bennett returned to his thesis that a different type of investigation, possibly involving epidemiology, might have produced a different result. It was suggested to him, that a possible investigation would have looked at lack of isolation in a HEPA filtered environment, a prophylaxis ineffective against Cryptococcus and the epidemiology link of time, place and pigeon infestation. He thought there might be other infection control issues to add.

280. Mr Bennett also stressed the significance of when samples were taken. 'I always tell people when I'm asked about sampling the really important thing is not the kit or the sampler, but actually, when it's taken."[2837] Samples in December didn't really tell you anything about what was going on in November. That view was endorsed by Mr Hoffman who described air sampling as 'of limited informative value'.[2838]

281. There is no good reason not to accept the thrust of Mr Bennett's evidence on Cryptococcus. But where does that take a conclusion? It is suggested that the following approach might be appropriate. Firstly, rejection of the NHS GGC line, which comes close to stating that the answer was latent reactivation.

[2833] Transcript of evidence of Eddie McLaughlan at p43
[2834] Transcript of evidence of Eddie McLaughlan at p44
[2835] Transcript of evidence of Peter Hoffman at p98
[2836] See for instance Transcript of evidence of Eddie McLaughlan at p80.
[2837] Allan Bennett transcript at 52
[2838] Transcript of evidence of Peter Hoffman at p 77

Secondly, rejection of the idea that any of the hypotheses can properly be ruled out on the material available. That the infections had some link to the hospital environment remains a possibility. However, ultimately perhaps Mr Hoffman was right[2839] to suggest that, in reality, it is not possible one way or another to establish the source. What is clear is that a HEPA filtered, positive pressure, room for patients would very likely have prevented the issue arising.

Proposed answers to the key questions

282. Key Question 2 remains in the form set out in Direction 5.

> [2] From the point at which there were patients within the QEUH/RHC was the ventilation in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?

283. The answer to this question is 'yes'. The various deficiencies in the system as currently determined are set out above.

284. Some of the deficiencies - and many of the details of individual items - need no repetition here. What was found - relatively quickly - on Ward 4B is a good example. In a rare display of unanimity, everyone, from clinicians, through Professor Williams on (and with the possible exception of David Loudon from whom we will hear in Glasgow IV) agreed the ventilation system in Ward 4B was flawed. The dramatic return to the Beatson took place. An astonishing example of people voting with their feet. As set out above, there is strong support from both experts that even now it is unsatisfactory.

285. Ward 2A, in contrast, is an example of an area where deficiencies were also recognised early, but a full record of all of the deficiencies was not put together until Mr Lambert's report in 2018 (although that the Ward was not in compliance with SHTM 03-01 was recognised in March 2017 at the latest and should have been recognised in 2015).Those deficiencies were clear to Mr Lambert and Mr Leiper and would find no argument with either of the Inquiry's experts. That it took until 2019 for the ventilation system to be replaced is

[2839] See transcript of evidence of Peter Hoffman at p99

almost inexplicable.

286. To answer a broad question all the instances need not be repeated but it is worth mentioning Ward 4C where the consensus of experts is that it too was deficient in very similar ways to Ward 4B.

287. So far as general wards are concerned, both an air change rate of 2.5-3 instead of 6 as advised by SHTM 03 01 and the deployment of chilled beams do present additional infection risks to patients. That is certainly endorsed by Mr Bennett.

288. Were the risks avoidable? Again, the question draws a simple answer of 'yes'. It is very clear from all the expert evidence, and evidence of those with expertise, that building ward ventilation systems without these flaws was not only perfectly possible in a new build, but to be expected.

289. Key Question 3 remains in the form set out in Direction 5 and in respect of ventilation amounts to:

> [3] Are the … ventilation systems no longer in an unsafe condition in the sense that they now present no additional avoidable risk of infection?

290. Have the defects been sorted? The answer is 'no'.

291. The outstanding positive feature is Ward 2A. It is accepted that, following the extensive work carried out in 2019 to entirely replace the ventilation system for that ward, the result 'meets, or exceeds, all relevant requirements'. It could not be described as unsafe.

292. The question is again put in a general way. The position for Wards 4B and 4C, remains that there are outstanding deficiencies - not repeated here - and that these deficiencies give rise to risk. For Ward 4B there is what might be described as a 'consensus of disappointment' among those with expertise. While the consensus is not as complete over Ward 4C, Mr Bennet and Mr Poplett certainly agree.

293. On general wards there is complete consensus over the need for an ACH of 6, and Mr Bennett is clear – for reason we accept that this deficiency – as with

the others gives rise to an additional avoidable risk of infection.

7.3 What can the epidemiology tell us?

294. In order to address TORs 1 and 8 the Inquiry has set itself Key Question 4:

- [4] Is there a link, and if so in what way and to what extent, between patient infections and identified unsafe features of the water and ventilation systems

295. It is submitted that an important part of finding the answer to this question is, for the reasons set out in this Chapter, to examine the epidemiological evidence that is available to the Inquiry, and which is structured in a way that provides meaningful assistance to the Chair in answering Key Question 4 and discharging his remit and terms of reference.

The Inquiry's appointed expert epidemiologist Sid Mookerjee

296. Sid Mookerjee is an Epidemiologist at University Hospital Sussex. He joined Sussex in Nov 2023. Prior to that he was a hospital epidemiologist in London (ICL) from Feb 2011 and took ownership of leading the epidemiology unit in 2015. He kept that role until he left in June 2023.

297. He noted that at both ICL and Sussex, the role of hospital epidemiologist sits within the IPC department. The Epidemiologist for the hospital is working for the hospital but based within IPC unit. He had been offered opportunity to build the unit at Sussex, which is currently just himself. At ICL at height the team was around 5 or 6 people.

298. In explaining his duty to the Inquiry as an expert[2840], Mr Mookerjee stated that it was fundamentally to provide an unbiased analysis using the information provided to him, and using it as a lens taking into account the expertise that he has to explain what the trend in infections is, what the variations are in the trend and how the trend then compares to the trend in water positivity.[2841] He confirmed that he did not have any connection to QEUH/RHC or NHS GGC

[2840] See Bundle 21, Vol 1, page 5
[2841] Mr Mookerjee Transcript, page 13

prior to being instructed as an expert.[2842]

299. He confirmed that it was correct to say that if in his investigations he was faced with the realisation had misunderstood something or made error, it was his responsibility to correct it.[2843]

300. Asked about his professional background and experience as an epidemiologist Mr Mookerjee stated that within the IPC team at ICL he reported to the Operational Head for IPC, who is normally the director of IPC. His immediate manager would be Director for IPC ('DIPC'). He noted that Sussex is similar, but that he has a few more lines. He reports to the LICD and DIPC. He confirmed that, in an English hospital, the DIPC is the director of the team and that the LICD, LICN and Epidemiologist, amongst others, reports to them.

301. Mr Mookerjee stated that his role is unique in the sense that he is an epidemiologist in IPC. He is based in IPC, doing something where you are the elbow between the information that you get for the patients and the clinician. His job is to make sense of the date. The process is both continuous and reactive. One is making sense of infections, where they occur and why. He looks at outbreaks and clusters. He noted that he is also at the behest of the clinicians who have picked up things which need to be responded to concerning the cause of an infection.[2844]

302. He confirmed that he has had a professional connection with paediatric haemato-oncology units in hospitals, though he could not comment on the services offered in those units. His role was across all of the units of the hospital. He further noted that he has carried out epidemiological exercises regarding these units at both ICL and Sussex.[2845]

303. He explained that his role is to deal with infection incidents. One can have an infection and need to look into a patient. Or one may have to look into a

[2842] Mr Mookerjee Transcript, page 12
[2843] Mr Mookerjee Transcript, page 13
[2844] Mr Mookerjee Transcript, page 6 and 7
[2845] Mr Mookerjee Transcript, page 7

cluster. He noted the need to make sense of the infection, where the patients are, are they linked and always ask if the source is the fact that all had been in the same room and caught it from each other, or if there are other causes such as the environment, water or any sort of line that may have been inserted into the patient.[2846]

304. Given his current role, Mr Mookerjee was asked whether comparative epidemiology was needed in managing hospital outbreaks He noted that every attempt should be made to compare, so you have clearly marked out as unusual or if it is an outbreak or part of a cluster.[2847]

305. Regarding whether the best comparator is the unit itself, in the sense that you plot the interventions and look at the changes, Mr Mookerjee stated that is only as good as the surveillance that you have. There needs to be ongoing surveillance. You need to be able to understand soon after that something has happened and moving on from incidents to rates in a live, on the ground, manner. If you see 5 or 6 cases and you tag them as a cluster, you can then institute some steps and then look at what do the mitigation steps do to the outcome. If the cases go down, you have some sense that your mitigations have worked. If they don't go down, whatever you have done is not working. Clinicians need to have the data in a live manner to do something about it, or to get comfort that what they have done has worked.[2848]

306. Mr Mookerjee has a wealth of experience as an epidemiologist, working in hospitals that have paediatric haemato-oncology units, and in carrying out epidemiological analysis into those units. Mr Mookerjee prepared a series of reports in which he calculated the rate of infections within the Schiehallion Unit at the RHC and compared it with four comparator hospitals in England and Wales. In doing so, Mr Mookerjee provided the Inquiry with an extremely useful analysis of the data from NHS GGC, and an indication of the potential link between the infections and the environment. Mr Mookerjee was also able to put into context the various other reports and presentations which the

[2846]Mr Mookerjee Transcript, page 8
[2847] Mr Mookerjee Transcript, page 154 and 155
[2848] Mr Mookerjee Transcript, page 155 to 157

Inquiry has heard evidence of concerning infections at the QEUH/RHC.

307. Mr Mookerjee was able to give evidence as to his chosen methodology, the organisms which he chose to include in his study, the basis upon which he carried out his calculations, and the conclusions that he reached. In doing so, Mr Mookerjee sought to always assist the Inquiry. Mr Mookerjee was prepared to accept points put to him, to point out any limitations to the exercise that he carried out, and to answer questions from core participants in a forthright and straightforward manner.

308. Mr Mookerjee was an impressive witness with a strong background in the subject matter for which he was engaged by the Inquiry. Mr Mookerjee was also a credible and reliable witness, and his evidence should be treated as such by the Inquiry.

Reports from Mr Mookerjee

309. He produced a series of epidemiology reports designed to assist in reaching a conclusion on Key Question 4. These reports are:

- Quantitative Infection Link Report - 9 May 2024[2849]
- Supplementary Report – 12 August 2024[2850]
- An addendum to that report – 16 October 2024[2851]
- Direction 5 response dated 11 July 2024[2852]

310. In evidence Mr Mookerjee explained that he produced his Quantitative Report in May 2023, but that he then had to address comments from Core Participants and so he had prepared a Supplementary Report on 12 August 2024, and an Addendum Report on 16 October 2024. There was a small error in the Addendum Report as it was issued to Core Participants which needed

[2849] Bundle 21, Volume 1, Document 1, Page 3
[2850] Bundle 21, Volume 1, Document 3, Page 71
[2851] Bundle 21, Volume 1, Document 10, Page 767
[2852] Bundle 21, Volume 5, Document 3, Page 104

to be explained. Referring to Figure 2 in the Addendum Report[2853], he explained that, after he had issued his Addendum Report, Dr Mumford noticed a numerical error to some of the labels in the chart. Two of the values pertaining to the dotted line in purple in 2018 and 2022 were incorrect. He confirmed that these numbers on the dotted line, should be the same as the same Figure 2 where it appears in the Supplementary Report.[2854] The version now available to Core Participants and on the Inquiry Website is the correct version where both versions of Figure 2 are identical.

311. The general principles of epidemiology are set out by Mr Mookerjee in Section 5 of his Quantitative Report[2855]. In his work for the Inquiry Mr Mookerjee attempted to address a particular hypothesis which he set out at paragraph 5.7[2856]:

> That there existed a positive association/correlation, defined as one where there exists a higher disease risk than when said exposure is less or absent, between the occurrence of patient infections with environmental organisms and the presence of environmental microbiological contamination at QEUH and RHC between 2015 and 2022.

312. Mr Mookerjee looked at these issues in three ways.

> Firstly, he applied epidemiological and statistical tools to the question of whether there is measure of association between the exposure of certain patients treated in certain places to the environment in those places and the risk that they will suffer an infection. This, Mr Mookerjee explained, included considering whether there was a correlation between a measure of environmental risk and the rate of infections in the same places. Whilst some witnesses and Core Participants[2857] challenged his conclusions, and aspects of his methodology, the general principles of how such a consideration of measures of association and assessment of correlation can be carried out was not seriously challenged.

313. Secondly, he sought to apply epidemiological and statistical tools to the

[2853] Bundle 21, Vol 1, Doc 1 page 772
[2854] Sid Mookerjee Transcript, page 11
[2855] Bundle 21, Volume 1, Page 11 (A49142433)
[2856] Bundle 21, Volume 1, Page 13 and Mr Mookerjee, Transcript, page 26
[2857] Specifically, NHS GGC and NHS NSS in informal Rule 9 applications.

question of whether, by controlling for all other circumstances, there is a difference in the rate of infections between the Schiehallion Unit and other paediatric haemato-oncology units in the UK - and whether this could tell us something about whether the experience of infections in the Schiehallion Unit was significantly unusual. Something broadly similar was also attempted by NHS HPS in their October and November 2019 Reviews of Paediatric Haemato-oncology Data, by comparison between the whole RHC and the combined Aberdeen and Edinburgh children's hospital.[2858] Whilst there was near unanimity from witnesses in Glasgow III that such comparison exercises were worth attempting, there was a wide range of views expressed by witnesses about whether such an exercise could be successfully carried out, whether the data obtained was sufficient and whether it had been successfully carried out. This debate will require serious consideration.

314. Thirdly, he made use of the nine guidelines or postulates proposed by Bradford Hill as an aid to epidemiologists in interrogating the available evidence. He was careful (as were other qualified witnesses) to draw to our attention Hill's advice against the use of the guidelines as a 'criterion' and in particular the observation that:

> "None of my nine viewpoints can bring indisputable evidence for or against the cause-and-effect hypothesis and none can be required as a sine qua non".

Approach to correlation and causation

315. Mr Mookerjee has explained there are many things one can understand from the term causality. When it comes to the realm of infections in a hospital, and its sources, you are taking the definition of causality in para 5.5.3 of his quantitative Report[2859]. One is looking at association, and in this case the association between the exposure variable (microbiology from water) and the output variable (infections). One had to consider how those variables are associated. Broadly, if one goes up, exposure, what happens to the outcome? If exposure goes away, what happens to the outcome? If you look at a trend of

[2858] Bundle 7, Documents 6 and 7
[2859] See Bundle 21, Vol 1, page 11.

the exposure, how does the trend of water positivity make itself available over a period of time? If you overlay that with the trend of infections, what does that say about the peaks within water positivity and how they relate to peaks in infection?[2860]

316. He explained that this can be done with observation, and also with epidemiological tools. One is something like a correlational of a coefficient. How do these two sets of data, which have multiple points over years, present themselves and how are they associated with each other. Essentially asking how the trend, peaks and troughs, over time, within water positivity look in background if one puts infection in the foreground.[2861]

317. With regard to the extent that a mathematical process gives one comfort that there is a correlation, Mr Mookerjee said that what the tool allows you to do is to look at the slant of the trend over time - it gives you a coefficient of correlation, which is essentially a number. The closer that number is to 1, from 0 to 1, the more associated the two values are. As the number gets closer to 0, the values are less associated with each other.[2862]

318. Regarding the relationship between correlation and a causal link, Mr Mookerjee thought that in reality and on the ground, what one is looking for is on the balance of probabilities that the exposure variable is linked to the outcome variable. It was not possible to do better than that. That correlation is the best that one could do.[2863]

319. Mr Mookerjee further stated that if one wanted to go down the academic route of examining whether an exposure variable like microbes in water can cause infections in patients, the approach would be to do something like a randomised control trial to expose patients to water based contamination, but you have to adjust for confounders. In a hospital there are many. They are the level of risk that the patient cohort carries. That might be that they are more susceptible to infections. It could also be how far away the patients are from

[2860] Mr Mookerjee Transcript, page 16 to 18
[2861] Mr Mookerjee Transcript, page 18 to 19
[2862] Mr Mookerjee Transcript, page 19 and 20
[2863] Mr Mookerjee Transcript, page 20 and 21

water outlets. If they are closer, there may be more of a risk that microbiology from water could impact patients.[2864]

320. Mr Mookerjee also noted that age and demographic background can be confounders. It could be age or the antibiotics they are on. It could be how sick they are. To adjust for these things is not possible. The word 'causality' came about in the 1950s because people were looking at how smoking related to lung cancer. One often hears people say that there is a causal link between smoking and lung cancer, which is not absolutely the case. He noted that what smoking does is increase the risk, but nobody can say that if you smoke you will get lung cancer. Mr Mookerjee argued that causality is concerned with an academic pursuit of linking two things, where exposure will 100% lead to the outcome, and the outcome cannot happen without the exposure.[2865]

321. He confirmed that it is more than simply trying to understand the risk that an exposure causes and if it is significant. If one asks that question, what you are doing is you are asking something much more practical. Causality is trying to ask a specific question which is: does the exposure always lead to the outcome? In practical terms the answer is no. In practical terms, you can never prove causality. He stated that what you can show is the relatedness or degree of association.[2866]

Approach to the work of Bradford Hill

322. Given the comments by NHS GGC in response to the draft CNR Overview Report, the evidence of Dr Kennedy and response to his own reports about the use of Bradford Hill's guidelines, Mr Mookerjee was asked for more information about this work and its utility for epidemiology. He explained that work being done in the 1940s-1960s around the link between smoking and lung cancer was associated with Hill. What came out of that is called 'the 9 guidelines.'[2867] They are also referred to as postulates. What is key, and

[2864] Mr Mookerjee Transcript, page 21 and 22
[2865] Mr Mookerjee Transcript, page 22 and 23
[2866] Mr Mookerjee transcript, page 23 and 24
[2867] See Bundle 21, Vol 1, page 14

Bradford Hill himself said, is that what the nine postulates do is they outline the core things that one needs to think about in terms of frequency, association and impact when interrogating the evidence. None of the 9 postulates can bring evidence for or against the cause-and-effect hypothesis. They provide a framework from which to work and from which one can use to make sense of the evidence.[2868]

Calculation of Infection Rates

323. Mr Mookerjee's approach was that simply adding up the infections would not inform how the infections relate to the activity and therefore the exposure to risk related to that activity. He explained that to do that requires that there has to have been a measure of activity, and one makes a calculation where the number of infections is the numerator, and the measure of activity is the denominator, which would ultimately give a rate of infections for a certain measure of activity.[2869]

The geographical scope of Mr Mookerjee's work

324. In their evidence Dr Mumford and Ms Dempster explained that they had seen the Schiehallion cohort of paediatric haemato-oncology patients as the most vulnerable to infections within the QEUH/RHC, and thus proceeded on the basis that if there was a link between the hospital environment and hospital acquired infections in the hospital it would be most clear within that group of patients. As he explained in evidence, Mr Mookerjee designed his methodology on the understanding that the Schiehallion cohort of patients were accommodated in Wards 2A/2B and thereafter Wards 6A/4B. After his supplementary report was produced it became clear that to some extent the situation was more complex than that.

325. Mr Mookerjee had not visited the QEUH/RHC and explained that it is often the case that regardless of the work, the lens used by an epidemiologist is the information given to them. His understanding of the unit and the infection was from the information provided to him. He felt able to extrapolate from that

[2868] Sid Mookerjee transcript, page 25 and 26
[2869] Sid Mookerjee transcript, page 37 and 38

information based on his experience of 14 years working within large hospitals and how these types of units look. He stated that, in this instance, the work is unique because the only thing he had to go on was the information presented to him.[2870]

326. In oral evidence Mr Mookerjee referred to the haematology-oncology admissions data produced by NHS GGC following the production of his Qualitative Report.[2871] He was referred to columns for each of the years from 2015 to end 2022, and the rows for different wards. He was referred to the data for Yorkhill Hospital, which noted 52 admissions in 2015. He was asked if patients had actually been admitted into Yorkhill, or into the new unit and mislabelled. Mr Mookerjee stated that he could not tell. He was only able to go on what was on the sheet. If it had been mislabelled or a patient had just been moved, he would not be able to know or comment on it.[2872] It is notable that the CNR Expert Panel had the same sort of problems.[2873]

327. Given his understanding of the September 2018 decant, Mr Mookerjee explained that prior to that he had focused only on patients admitted to Wards 2A and 2B, and after then patients admitted to Wards 4B and 6A. He had therefore not included the nearly 400 patients recorded in that list of admissions as haemato-oncology patients in RHC area 1B because he was asked to look at the rate of infection in the Schiehallion unit and understood that to be geographically limited to Wards 2A/2B and then 6A and 4B.[2874]

328. His approach remained to work on the basis that the paediatric haemato-oncology unit he was comparing to other paediatric haemato-oncology units was geographically constrained to that extent. His focus should remain on patients, BSI samples and water testing results recorded by NHS GGC to have been take in those wards, and those wards alone. As he explained in oral evidence, “the ward location where the sample has been taken is the

[2870] Sid Mookerjee transcript, page 13 and 14
[2871] Bundle 27, Volume 17, Document 45, Page 539
[2872] Sid Mookerjee transcript, page 15
[2873] CNR Overview Report, Bundle 6, Document 38, Page 1075
[2874] Sid Mookerjee transcript, page 15 and 16

version of the truth that can be most-- that is most helpful and trustworthy".[2875]

329. This constraint did not apply to Dr Kennedy, who had access to a wider range of data than Mr Mookerjee or HPS. As he explained in evidence, Dr Kennedy could look at location data, consultant name data, details of treatments underway, to decide whether the patient was a paediatric haemato-oncology patient.[2876] Dr Kennedy clearly saw this as an advantage, in that it enabled him to identify all infections of the sort he was looking for in paediatric haemato-oncology patients wherever located. Mr Mookerjee wanted to compare infection rates with water testing positivity, and so he needed a geographically constrained group of patients whose aggregate numbers of infections could be divided by an appropriate activity denominator for those patients and compared with water testing positivity for spaces occupied largely only by paediatric haemato-oncology patients.

The choice of micro-organisms and infections to consider

330. The infections and organisms considered in Mr Mookerjee's work are those listed in the table at para. 8.1.16 of the Quantitative Report [2877] and were selected with the help of Dr Mumford and Ms Dempster from the whole data set of all BSI infections in the QEUH/RHC supplied by NHS GGC[2878] The selected Gram-Negative and Fungi pathogens were chosen (as they explained it) "as per published literature, predominantly linked to water and ventilation systems" and were collectively defined as environmental pathogens, but only included micro-organisms found in the BSI list supplied by NHS GGC and geographically linked to the chosen wards .[2879]

331. In evidence Dr Mumford and Ms Dempster compared the list of environmental micro-organisms used for Mr Mookerjee's work with the groups of environmental micro-organisms used within the Eight Contemporaneous Epidemiological Reports and the work of the Case Notes Review. Whilst Dr

[2875] Mr Mookerjee, Transcript, Page 67
[2876] Transcript, Dr Kennedy, Pages 189-191
[2877] Quantitative Report, Bundle 21, Document 1, Pages 25-26
[2878] Mr Mookerjee, Transcript, page 35 and 36
[2879] Quantitative Report, Bundle 21, Document 1, para 8.1.7 and Supplementary Report, Bundle 21, Document 3, Section 2, Pages 72-73 and Dr Mumford, Transcript, Day 1, Pages 65-67

Mumford, Ms Dempster and Mr Mookerjee have clearly created a list that is different from that used in these reports there is a close connection between their list of organisms and the CNR list[2880] and the 'Environmental including Enteric (ENT) group in the draft and final versions in the HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data.[2881] Two further observations seem of significance:

- The choice of micro-organisms to study was mostly driven by what micro-organisms were found in the blood stream infection samples taken from the Schiehallion Unit patients.

- Equally, inclusion of micro-organisms was on the basis that they are found in environmental sources – such as water and ventilation systems - and on that basis Mr Mookerjee, Dr Kennedy and the CNR all excluded *Escherichia coli* (E-Coli), *Staphylococcus aureus* and Gram-Positive bacterial as these are not known to be environmental organisms

332. There was some debate about why rates of *Mycobacterium chelonae*, *Aspergillus*, *Cryptococcus*, *Fusarium*, and *Mucor* infections were excluded from Mr Mookerjee's work. Dr Mumford, Ms Dempster and Mr Mookerjee explained that this was because no blood stream infection samples for these micro-organisms were tagged in the data set they were provided with by NHS GGC as being taken from patients in RHC Wards 2A and 2B and QEUH Wards 6A or 4B.[2882] As is discussed elsewhere this seems to have been partly a factor of the way that these infections were recorded in NHS GGC systems.

333. In the case of *Mycobacterium chelonae* this also seems to have impacted on the work of the CNR and the Oversight Board. Mr Mookerjee's work was geographically constrained to infections (and for comparison water testing results) tagged to RHC Wards 2A and 2B and QEUH Wards 6A or 4B. There was evidence that might well entitle one to conclude that certain patients had samples taken on other wards after spending significant amounts of time in,

[2880] OverView Report, Bundle 6, Document 38, Table 4.2, Page 1028 and Mr Mookerjee, Transcript, page 51 and 52
[2881] Bundle 7, Documents 6 and 7, Pages 219 and 255
[2882] Mr Mookerjee, Transcript, page 53 to 55, Dr Mumford, Transcript, Day 1, Pages 67-70 & 72-75

for example, Ward 2A, but Mr Mookerjee explained that, in the context of an epidemiological study, it should be accepted that the correct way to proceed was to remain consistent and not to attempt to work out whether other samples and micro-organisms should be included because of the specific information that might be thought to 'correct' data. As he put it, it is important to 'compare apples with apples'.

334. Dr Mumford explained that *Mycobacterium chelonae* was not included as it was a gram-positive bacteria and "if you start including gram-positives, then there's more than just one that they would have to look at" and their focus was on the gram-negatives.[2883]

335. Mr Mookerjee explained that the fungi and yeast species came to be in the list because in discussions with Dr Mumford and Ms Dempster these were seen as species of yeast which were found in the environment. They were also found in showers and in samples from drains in the QEUH/RHC. As such, he thought it prudent to include them, although, they make up a very small proportion of the total list. He noted that this was not a list of infections he was looking for, but what he found.[2884] Dr Mumford took a similar approach and noted that the *HPS GGC Situational Assessment RHC Wards 2a 2b Draft – 5 June 20195 June 2019*[2885] had concluded that there was no change in the overall incidence of fungal positive blood cultures before and after the move to the RHC.[2886]

Choice of Comparator Hospitals

336. Mr Mookerjee decided[2887] to ask (via Freedom of Information Request sent by the Inquiry Team) as many hospitals in England and Wales as had a paediatric haemato-oncology unit for data (including a complete anonymised list of all Blood Stream Infections) for each year from 2015 and then to attempt to work with those who responded. Four did. He noted that there were three

[2883] Dr Mumford, Transcript, Day 1, Pages 67-68
[2884] Mr Mookerjee Transcript, page 53 to 55
[2885] Bundle 7, Document 5, Page 194, particularly Appendix 4 at page 205 at Page 205
[2886] Dr Mumford, Transcript, Day 1, Pages 82-84
[2887] Dr Mumford and Ms Dempster agreed: Transcript, Day 1, Page 143

others which responded, but the data was not what had been asked for. Broadly, those hospitals were not able to extract the admissions specific to the paediatric haemato-oncology unit or could not give an exact number of infections.[2888]

337. In her evidence Ms Imrie explained the reasons that HPS did not carry out a similar exercise is that they could obtain data with sufficient granularity they felt was necessary carry out a proper comparison with the RHC.[2889] Professor Wilcox clearly saw the task in a similar way to HPS. [2890]Dr Crighton agreed that Great Ormond Street, Leeds, Oxford and Cardiff and the Vale would be valid comparators.[2891] As discussed below Professor Stevens saw value in the comparisons made.[2892]

338. Mr Mookerjee[2893] and Dr Mumford and Ms Dempster[2894] were clear that there would not have been value in making a comparison with other types of hospital units, such as the entirety of a large teaching hospital with A&E, as you would not be comparing the same thing. The same would apply to comparing the Schiehallion Unit with a regional cancer centre for adult patients, or a large district general hospital with no oncology services. In respect of a comparison with other Glasgow hospitals they would have a very different patient cohort.

Graphical representation of infection rates

339. A final point that needs to be mentioned is the question of where the debate on SPC charts takes the Inquiry, as they are widely used by NHS NSS and NHS GGC. In essence the criticism being made of the use of Statistical Process Control Charts by HPS by Mr Mookerjee is that these charts seek to understand changes in the rate of infection shown by reference to a baseline that appears to be unvalidated.[2895] It was accepted by Dr Imrie in her

[2888] Mr Mookerjee, Transcript, page 32 and 33
[2889] Laura Imrie, Transcript, Page 20
[2890] Transcript, Professor Wilcox, page 143 to 146
[2891] Dr Crighton, Transcript, Page 137
[2892] Professor Mike Stevens, Transcript, Pages 122-128
[2893] Sid Mookerjee Transcript, page 34 and 35
[2894] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 143-144
[2895] Quantitative Report, Bundle 21, Document 1, Page 58

evidence that it was the case that in the SPC charts in the three HPS reports the baseline was the average of the rates of infection for the period covered by the chart and not some external validated baseline, but that as it was the same patient population, receiving the same procedures and therapies, it was really the only baseline HPS could use.[2896] Dr Kennedy accepted that there was a circularity about the baseline in an SPC chart.[2897] Dr Inkster was critical of HPS SPC charts as they will not necessarily show an outbreak where the organism is not an endemic organism (and has no background rate). However, she conceded that HPS did not have an alternative available to use other than SPC charts.[2898]

340. Mr Mookerjee was also referred to the October 2019 Report by HPS, and specifically a SPC chart[2899]. He noted that SPC charts tend to give the reader a sense of comfort. The upper limit of infections is the worst-case scenario. He noted that his rate of infection is above the upper limit. Mr Mookerjee stated that the learning is not to wait for the upper limit line. When one sees a lot of peaks, look into it. Further, in a vulnerable population, he considered that the SPC charts leads the reader to wait for the data points to fall into the realm of the unusual to suggest that something is wrong. Mr Mookerjee stated that he would not take much from the charts.[2900]

341. SPC charts would appear to be useful where there is a known baseline, but there was no known baseline when HPS was preparing their reports. It is submitted that too much reliance can be drawn from the relationship between the infection rate on an SPC chart and the mean, the upper warning line (UWL) and upper control limit (UCL) if there is no external validated baseline.

342. In addition, Mr Mookerjee made a powerful point about the utility of charts that present the rate of infection month by month or even quarter by quarter, as opposed to annual figures as his had done. In essence he argued that the rapid changes of direction in these charts as rates jumped from zero in one

[2896] Laura Imrtie, Transcript, Pages 19-21
[2897] Dr Iain Kennedy, Transcript, Page 153
[2898] Dr Inkster, Transcript, Day 2, Pages 196-197
[2899] Bundle 7, Document 6 at page 229
[2900] Sid Mookerjee Transcript, page 142 to 145

month to a potentially significant rate in the next confused the eye and made trends hard to read.[2901] He also explained that one would expect month to month variability of infection rate data, and you want to adjust for the variability. You can do that by aggregating the monthly rate of infections into a yearly figure, which allows you in terms of observation and tools to apply to data to work out a trend.[2902]

343. It is submitted that his point is again well made and that by focusing on changes over the space of years or half years sense can be drawn from otherwise visually complex charts.

Criticisms of Mr Mookerjee's work and conclusions

344. In light of evidence from Dr Kennedy and others, informal Rule 9 questions by Core Participants submitted and the Direction 5 responses of Core Participants to his Quantitative Report, we can anticipate the following criticisms will be made of Mr Mookerjee's work and conclusions.

- That the choice of infections uses to for Mr Mookerjee's work was undermined by including infections which, it seems to be implied, are less likely to be of an environmental source and more likely to come from commensal or enteric source.

- That his approach was flawed because each of the comparator units were different and he could not know the make-up of their patient groups (or indeed for the Schiehallion cohort) in terms of age, sex, nature of illness, form of treatment and other variables that might impact on their susceptibility to infections.

- That he had failed to use statistical techniques to deal with what was said to be a risk of confounding bias, in that any connection might arise from a factor other than the hospital environment.

- That Mr Mookerjee had used a method to de-duplicate the data for

[2901] Mr Mookerjee's evidence, Transcript, Page 61
[2902] Mr Mookerjee Transcript, page 60 and 61

infections in the data sets he was working on that was inconsistent with current NHS practice in Scotland.

- That Mr Mookerjee was wrong to use admissions data as the denominator in his calculation of the rate of infections for parts of the RHC and for the comparator units. The alternative denominator being Occupied Bed Days, on the basis that only Occupied Bed Days captures exposure environmental infection risk to long stay patients.

- That a correlation analysis comparing changes in the rate of infection and the water positivity rate in the RHC was not possible, because it was said, Mr Mookerjee had only used a small number of data points.

Responses by Mr Mookerjee to these criticisms

345. When dealing with the criticism that his methodology could not deal well within infection that came from commensal or enteric sources, Mr Mookerjee explained that when you look at the time series of rate water positivity and infections rates, they wouldn't match because the enteric infections would not be affected by the rate of water positivity. The Bradford Hill guidance would not be satisfied. If the cause of infection was unrelated to the water, then when the water positivity dropped, the infection would be unaffected.[2903]

346. Mr Mookerjee accepted that the data produced from the comparator units depends on how the compiler interprets the term 'paediatric haemato-oncology unit'. One would normally go about it in two ways. One must remember you are making this request of a trust within the NHS. He argued that the wording of the Freedom of Information Request makes sense and will make sense to anyone in receipt of the FOI. As he understood from his own experience when an FOI is received by Trust, when a FOI officer reads it, they will send it to the paediatric haemato-oncology unit. There has to be a measure of trust in the expertise of the institutions from which data is sought.[2904]

[2903] Mr Mookerjee Transcript, page 59 and 60
[2904] Mr Mookerjee Transcript, page 38 to 40

347. It was put to Mr Mookerjee that he has suggested that the cohort will be the same in each comparator hospital, but that he did not know that. He acknowledged the fact that there will be variability but maintained that it would be addressed by the large size of the aggregated sample of the comparator institutions, which will tend to reduce the impact of any differences between the various units.[2905]

348. Mr Mookerjee did not know what the differences were between the units that had responded but relied on the large aggregate sample size to smooth out any differences in patient populations. However the Inquiry did hear evidence from Professor Stevens who clearly has the knowledge needed to provide an answer that: Great Ormond Street is a much busier and bigger unit than Glasgow and has a restricted age range, so is skewed to the youngest patients, particularly to under-two-year-olds; Cardiff and Oxford are both relatively small units, neither of which do bone marrow transplantation, and Leeds is an above average size unit which does do bone marrow and so would be quite a good fit to the RHC.[2906]

349. It was also put to Mr Mookerjee that if the initial request to NHS GGC produced only the overnight admissions, not all admissions, how could he be sure that the comparator units had not done the same? Mr Mookerjee hoped that one of the other trusts would not have done the same. The FOI asked for the number of admissions to the unit. To any NHS Trust trying to respond, the ask is really clear and is not asking to split admissions by overnight or day cases.[2907] However, in respect of the data for the number of admissions at each comparator unit[2908], he noted that the number of admissions for Cardiff and the Vale is less than Leeds, and a little less than Oxford, but that they are all providing more admissions than NHS GGC is providing. Mr Mookerjee believed this was because the comparator units have responded with the number of patients having an admission date assigned, which would include day cases, and thus they have correctly interpreted the questions asked in the

[2905] Mr Mookerjee Transcript, page 40 and 41
[2906] Professor Mike Stevens, Transcript, Page 122
[2907] Sid Mookerjee Transcript, page 41
[2908] As seen in the table at para 8.3.6 of the Quantitative Report (Bundle 21, page 29)

FOI.[2909]

350. Mr Mookerjee set out his de-duplication process in his second report.[2910] When asked, he maintained that he had not taken a different approach to HPS in this regard. A scenario was put to Mr Mookerjee that on day one a patient gets an infection and a positive blood screen result. On Day 12, there is another positive test. On Day 18, they have another. NHS NSS maintain that the correct HPS approach is to count 14 days from the first positive, and so the second does not count. Mr Mookerjee agreed about that but stated that the third positive culture would count. The reason is you go back to the understanding that what blood cultures are trying to do is give you a cross-sectional report on if a patient has an infection. In the example, you know on day one the patient had X organism. At or after day 14, if the patient continues to be positive, despite treatment, that is both by the definition of the UKHSA and ARHAI regarded as a new episode of infection. Mr Mookerjee confirmed that he used the same process with the Schiehallion unit as with the comparators, and therefore any difference in approach between him and HPS does not affect the utility of his work as a comparison exercise between two data sets de-duplicated in the same way.[2911]

351. This issue was re-raised in the informal Rule 9 process. It was put to Mr Mookerjee that he was de-duplicating on a 14-day basis on a different basis from NSS or UK standard, and that he should have ignored anything that happened 14 days after any positive. Mr Mookerjee stated that if one looks at the protocol on the NSS website, and puts that guidance into practice, if the patient came in on 1 November and had a positive blood culture, that is reported to UKHSA or HPS. If that patient had blood cultures taken every day from day 1 to day 14, it is considered that those cultures are indicative of the same episode of infection. He noted that, in practice, you take the difference in the date of collection of the second sample and subtract from the date of first sample. If the numerical value is more than or equal to 14 you report the second blood culture. If it is 13 or less, you do not report it because that blood

[2909] Mr Mookerjee Transcript, page 94 and 95
[2910] See Bundle 21, Vol 1, page 79
[2911] Mr Mookerjee Transcript, page 63 to 65

culture is still indicative of infection. Mr Mookerjee led on national reporting for the last 14 years. From a surveillance point of view, one is trying to work out how many episodes of infection patients have had nationally. He was applying the definitions to find out how many unique episodes of infection there were from 2015 to 2022.[2912]

352. Following his evidence Mr Mookerjee was asked by the Inquiry Team to double check that he had answered our questions in a manner consistent with practice in NHS England. He has confirmed that he believes he has, and the Inquiry Team will now need to decide whether to explore what does appear to be a difference of practice between Scotland and England on 14-day de-duplication in the Glasgow IV hearing. We would welcome specific submissions from NHS GGC on this issue.

353. In respect of the use of admissions and not occupied bed days as the denominator, Mr Mookerjee explained his understanding that an admission is defined by whether the patient has an admission date on the system. An outpatient appointment is not an admission. It was not an admission unless the patient is admitted for a particular procedure. There are more ways to care for patients other than moving them from A&E to a bed, particularly for the paediatric haemato-oncology cohort. In this cohort, day cases are used extensively to provide care. The care involves installing lines or there might be other minor procedures. These interventions require that there is an admission date on the system and admission dates are a good way to collect that activity.[2913]

354. It was pointed out to Mr Mookerjee that other authors of epidemiology reports and papers, such as Dr Kennedy and the authors of the HPS reviews, took the view that occupied bed days is the best measure of activity. Mr Mookerjee defended the use of admissions by stating that when one looks at the paediatric haemato-oncology cohort, you need to understand how these patients are presented to the hospital. His understanding of day admission is that these patients are managed so that they don't have to spend time in

[2912] Sid Mookerjee Transcript, page 160 to 164
[2913] Mr Mookerjee Transcript, page 42 to 43

hospital in a bed. They are in and out of the hospital a lot. The outcome of that is that they have an accumulation of risk. They have contact with the hospital, other patients, staff members, to water, to surroundings, to ventilation, antibiotics, other drugs, other interventions given. Admissions catches that, but occupied bed days will not.[2914]

355. Mr Mookerjee was asked if the risk of staying in the hospital for 10 days is more or less than for a patient who had 10 visits to the hospital. He stated that the risk for that is different than if a patient has repeated visits. The conclusion he came to is no. He stated that there is no evidence that one risk is more than the other. One is dealing with infections recorded through blood cultures taken during any part of the patient's stay in the hospital, which included cultures taken for day cases and inpatients. If you look at UKHSA and HPS guidance, both of these infections are termed as Healthcare Associated Infections. If a patient has repeated interactions with the hospital, the infection is termed as healthcare associated.[2915]

356. Mr Mookerjee stated that, in his experience, it is a simpler task to get admission information from hospital records, as you just tally up the number of admissions in a month and aggregate it for a year. It is easier for the hospital trust and there is less of a human element to it. The human element is where someone has to go onto the ward and all the wards that make up the paediatric haemato-oncology unit, and calculate the occupancy, how many beds in a given day are full, and come back the next day at the same time and look at how many beds are full and repeat that every day.[2916]

357. At this point it should be noted that Professor Stevens saw value in both admissions and occupied bed days as a measure of activity[2917] as did Dr Mumford[2918].

[2914] Mr Mookerjee Transcript, page 44 to 46
[2915] Mr Mookerjee Transcript, page 46 and 47
[2916] Mr Mookerjee Transcript, page 47 to 49
[2917] See the summary of his evidence in Chapter 3.10
[2918] Dr Mumford, Transcript, Day 1, Pages 144-145

Discussion of the NHS GGC Public Health Commentary

358. As the document appears to have assumed some significance in the Inquiry Mr Mookerjee was asked to look at the Public Health Commentary produced by Dr Crighton for NHS GGC in response to the draft of the Case Notes Review Overview Report that was shared with NHS GGC in February 2021[2919]

359. The third and fourth paragraphs of the Commentary were put to Mr Mookerjee. He explained that he thought two things were being suggested. One undertakes a piece of analysis that looks at time, place and person. You understand the trend of the infections and the outcome variable and exposure variable. You look at the trends and what Dr Crighton says is that you look at it along the timeline. Mr Mookerjee warned against showing crude numbers of patients, as you really need to look past the numbers of infections and weight it for the activity.[2920]

360. Mr Mookerjee explained that what one is doing is measuring the rate of infections per 1,000 something. He noted that, in the Commentary, Dr Crighton then goes on to say that you can compare these incident rates, and that you can standardise the infection rates for known confounders. Mr Mookerjee noted that the rates of infection in the Schiehallion unit for 2015-2022 have been compared to comparator units. He had not sought to standardise the infection rates for known confounders, but rather, he explained he had adjusted for the known confounders by comparing the rate of infection at Schiehallion Unit to as many like units as possible. He wanted to make sure in the comparison when it comes to comparator units you compile as much on admissions, patients, and the infections, so that what ends up happening is the more information that you have, the data itself, through it being a large set of data, adjusts for these confounders.[2921]

361. He confirmed that the size of the data set will balance things out, but that there is a caveat. It was not sufficient to compare a cohort of patients that is

[2919] See Bundle 27, Vol 6, Doc 29, page 310.
[2920] Mr Mookerjee Transcript, page 26 to 28
[2921] Mr Mookerjee Transcript, page 28 and 29

so specific to the population. For instance, one cannot compare this cohort to A&E, or an entire children's hospital or two combined together.[2922]

362. It was put to Mr Mookerjee that one thing that Professor Stevens said was that there is clearly a difference between different haemato-oncology units in England and Wales. Some are large, some small, some have treatment taking place off site. Mr Mookerjee said that, from his point of view, one is looking for a data set that is large, but which is specific to the population concerned with. That would allow one to take from it that regardless of how care is provided to these patients, because you consider two large units and two small units you have a good spread.[2923] That is what had occurred in his work.

The Schiehallion Number of Infections

363. Mr Mookerjee explained that in his Quantitative Report he had calculated the total numbers of infections for the organism in the list for each of the Schiehallion Wards. The results are set out in table at 8.1.15[2924] and has not changed through his various later reports. He stated that the calculation produced the number of unique infection episodes where the infection was linked to Wards 2A, 2B, 4B and 6A from 2015 to 2022.

364. Mr Mookerjee confirmed that 2015 is a half year. He noted that one can see that in the first full year, there are 18 infections, 46 infections in 2017 and 29 in 2018. He noted that 2018 was also a partial year for Wards 2A/2B and Ward 6A/4B because of the decant in September of that year. Regardless, he noted that you have to trust the numbers. He was provided this information from NHS GGC, and it was the only thing that he had in terms of being able to link the results to the Schiehallion cohort.

365. He did not ask for names of consultants who ordered each blood test because his experience is that ward location where the sample was taken is the version of the truth that can be most helpful and trustworthy. His task was to work out the infections and the activity for the Schiehallion cohort. He took the

[2922] Mr Mookerjee Transcript, page 29 and 30
[2923] Mr Mookerjee Transcript, page 31
[2924] Bundle 21, Document 1, Page 24

infections tied to the four wards and entered admissions for the four wards only. [2925]

The Schiehallion Infection Rate

366. Mr Mookerjee explained that in his Quantitative Report he had calculated a rate for each of the 4 wards by taking the number of infections and dividing by the admission data he had been supplied with[2926], but that it turned out the admissions data supplied by NHS GGC unexpectedly only contained overnight admissions and he required to re-calculate it using new admissions data provided by NHS GGC.[2927] In doing so he had excluded anything that didn't identify the ward as 2A, 2B, 4B or 6A as the infections in the numerator were only those tagged as 2A, 2B, 4B or 6A .[2928] He had therefor excluded admissions to RHC 1B day surgery. Clinical Decision Unit, RHC Paediatric Haematology/Oncology unit.[2929]

367. Mr Mookerjee had found the new admission data hard to understand. It seemed difficult to point to the wards that contained overnight patients. He proceeded on the understanding that 6A and RHC Ward 2A would definitely contain overnight patients. He did note that there were multiple names in the admissions data for Ward 2A. He took an aggregate and added them up. This included 'RHC Ward 2A', 'RHC Ward 2A Schiehallion' and 'RHC Ward 2A Clinical Decisions Unit'.[2930]

368. Mr Mookerjee had produced a new chart for the hearing.[2931] He explained[2932] that the chart was identical to Figure 2 from his Supplementary Report[2933] at para. 2.67[2934] with the addition of a purple line that shows the overall Schiehallion Infection Rate per 1,000 admissions where the numerator is the

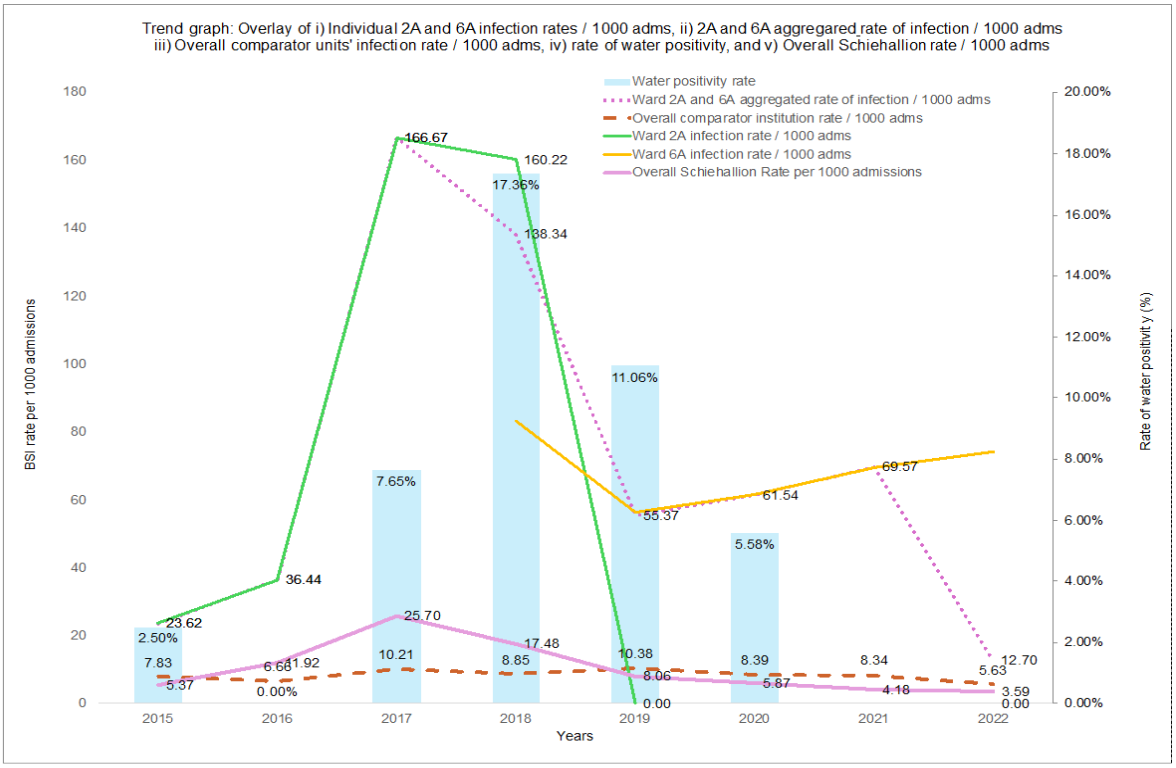
[2925] Mr Mookerjee Transcript, page 67 and 68
[2926] Presented in the table at paragraph 9.1 in Bundle 21, Document 1 at page 35 and set out in various forms from there until paragraph 9.10 including the solid blue line in the Chart at para 9.10 on page 38
[2927] Bundle 27, Volume 17, Document 45, Page 539
[2928] Sid Mookerjee Transcript, page 80
[2929] Sid Mookerjee Transcript, page 81 to 84
[2930] Sid Mookerjee Transcript, page 84 and 85
[2931] Bundle 27, Volume 18, Document 1
[2932] Sid Mookerjee Transcript, page 85 to 89
[2933] Bundle 21, Volume 1, Document 3, Page 71
[2934] Bundle 21, Volume 1, Document 3, Page 91

aggregate total of all admissions to Wards 2A/2B/6A and 4B in each year in the table at para 8.1.15 of his Quantitative Report[2935] and the denominator is all admissions that were linked to 2A, 2B, 4B and 6A taken from Table 3 in his Supplementary Report[2936] using the new admissions data provided by NHS GGC[2937] The calculation of that rate appears below it and is re-produced here for clarity.

Graphical comparison of the Schiehallion Infection Rate to the Comparator Units

[2935] Bundle 21, Page 24
[2936] Bundle 21, Page 88
[2937] Bundle 27, Volume 17, Document 45, Page 539

Overall Schiehallion rate per 1000 admissions rate, 2015 - 2022, added to the figure from the Supplementary report



Year	Cumulative Admissions from SR Table 3 Page 88	Cumulative Infections from Table 8.1.15 QR Page 24	Overall Schiehallion Rate per 1000 admissions	Overall compatator rate per 1000 admissions from Table 9.2 Page 35	Cumulative Incidence Rate Ratio (IRR)
2015	*1303*	7	5.37	7.83	1
2016	*2266*	27	11.92	6.66	2
2017	*2568*	66	25.70	10.21	3
2018	*2517*	44	17.48	8.85	2
2019	*2356*	19	8.06	10.38	1
2020	*1532*	9	5.87	8.39	1
2021	*1914*	8	4.18	8.34	1
2022	*1950*	7	3.59	5.63	1

369. The other parts of the chart remain unchanged from Figure 2 in the Supplementary Report. The dotted orange line is overall comparator institution rate. The Green line shows the Ward 2A infection rate strictly located to Ward 2A using the new admissions data for all admissions for Ward 2A. The yellow line is the ward 6A infection rate strictly located to Ward 6A using the new admissions data for all admissions for Ward 6A.[2938] The dotted purple line on the new graph is the line that follows the rate of infection from Ward 2A and continues to Ward 6A. It is the rate of infection for the patient cohort in Ward 2A who after the decant became patients in Ward 6A. The blue bars on the graph represent the rate of water positivity for each of the years from 2015 to

[2938] Sid Mookerjee Transcript, page 85 to 89

2022.[2939]

Comparator Infection Rate[2940]

370. Mr Mookerjee noted that 'positives' is a number which is made up of any blood culture that is positive for that year. The penultimate bullet point in paragraph 7.2.4. is the raw number that the comparator units had given to him. He stated worked out the gram-negative and fungal positives column himself from the data provided. Mr Mookerjee confirmed that, like the BSI data for the QEUH/RHC, the numbers provided for individual infections from the comparator units were de-duplicated.[2941]

371. Mr Mookerjee stated that he then created a rate of BSI per 1000 for each unit in each year. To reach this figure you divide the number of infections by the number of admissions for that year, and then you multiply it by 1,000 to get the rate of blood stream infections per 1,000 admissions. There was a big discrepancy between GOSH and Cardiff and the Vale. The number of admissions per year is a measure of activity. Mr Mookerjee stated that two of the units were larger and two smaller. The two larger units were seeing more admissions as compared to the two smaller units. However, he stated that, ultimately, what matters is the that he is using infections per 1,000 admissions to compare the bigger units to the smaller ones.[2942]

372. It was put to Mr Mookerjee that the rate for GOSH in 2019 was 16.01, and for Cardiff and the Vale was 5. He was asked if there was a risk that we have a group of comparators that are not a homogenous group. Mr Mookerjee stated that he understood that there are differences within these organisations. The number of admissions is a proxy marker for the differences we know to exist. What is important is that he had a sufficient spread in terms of the number of institutions and spread in terms of time over which he had the data. He noted that what that allows you to do is to take solace that you are conscious of the fact that they're different, but that the spread in terms of admissions adjusts

[2939] Sid Mookerjee Transcript, page 89 and 90
[2940] Bundle 21, Document 1, Page 21
[2941] Sid Mookerjee Transcript, page 68 and 69
[2942] Sid Mookerjee Transcript, page 70 to 72

for the bias.[2943]

373. Mr Mookerjee had been challenged by NHS GGC regarding the aggregation of the comparators and whether these differences were significant and undermined the utility of the single comparator infection rate he had produced. He was taken to Figure 2 in his Supplementary Report[2944], where he had tested the level of variability within the comparator units by plotting the coloured lines at the foot of the chart. Essentially, he had wanted to consider different the rate for GOSH is compared to Oxford to Cardiff and the Vale and Leeds. He noted that individual rates and aggregated rates are, regardless of institution, close by to each other for each of the years, so there is not much variability.[2945]

Comparison between the Overall Schiehallion Infection Rate and the Overall Comparator Infection Rate

374. Mr Mookerjee explained that it is proper to make a comparison between the change in the Overall Schiehallion Infection Rate (shown by the purple line on the new chart[2946]) and the Overall Comparator Infection Rate (show by the dashed magenta line) because they share the same denominator of admissions for the places the infections were connected. His opinion, with caveats, was it was still legitimate to compare the aggregated infection rate for Wards 2A and 6A (the dotted pink line) to the infection rate for the comparator units as the dotted pink line focuses on wards with patients. Having calculated the Cumulative Incidence Ratio in his opinion, there is a magnitude of difference that is substantial when comparing the Ward 2A/6A aggregated rate of infection to the comparator rate for each of those years.[2947]

375. Mr Mookerjee explained that whilst the size of the difference (the Cumulative Incidence Ratio) between the Overall Schiehallion Infection Rate (shown by the magenta line) and the Overall Comparator Infection Rate (show by the

[2943] Mr Mookerjee Transcript, page 72 and 73
[2944] Bundle 21, Document 3, Page 86
[2945] Mr Mookerjee Transcript, page 77 and 79
[2946] Bundle 27, Volume 18, Document 1
[2947] Mr Mookerjee Transcript, page 90 to 92

dashed magenta line) was smaller than the Ward 2A Infection Rate (the Green line) the trend remains similar, in that there is an escalation in terms of the rate of infection with, then, a drop-off with the changes being the magnitude of that escalation. In the Overall Schiehallion Infection Rate there is smaller peak over a shorter period of time.[2948] Later in his evidence Mr Mookerjee focused on what conclusions could be drawn by comparison between the Overall Schiehallion Infection Rate and the Overall Comparator Infection Rate and said:[2949]

> "… what stands out so bluntly is that something was happening in 2017 because that rate is an aberration as compared to the other rates on either side of that, both 2017 and 2018, but the eye is drawn to 2017. ... That, to me, would say that something was happening there, and I want to know why we had that peak. …"

376. He went on note that it would appear that something was corrected for because after the increase, the rates go back. Mr Mookerjee's hunch was that there was some sort of quality improvement programme.[2950]

377. Mr Mookerjee was asked whether anything could be made of a comparison between the Overall Schiehallion Infection Rate in a particular year and a peak infection rate in one of the comparator units. He explained that this is a wrong approach in epidemiological terms, as when comparing one rate to another that second rate - in this case a rate of infection-- needs to be made up of sufficient numbers both in terms of infections and admissions and that comes from aggregating the comparator data.[2951] You cannot cherry pick because you are not trying to do a selective comparison. The whole point is not to be selective regarding who he was comparing to.[2952]

378. Dr Mumford and Ms Dempster were asked about their answer to Question 33 in their Direction 5 response[2953] where they stated at 33.2 that there was 'a significant difference in the infection rates per 1000 admissions between the

[2948] Mr Mookerjee Transcript, page 99 and 100
[2949] Mr Mookerjee, Transcript, page 116
[2950] Transcript, page 116 and 117
[2951] Mr Mookerjee, Transcript, page 103
[2952] Sid Mookerjee Transcript, page 101 and 102
[2953] Bundle 21, Volume 6, Document 4 at page 133

Schiehallion unit and the four English comparator units' and note that the rate in 2A was more than 16 times the average for the comparator units." Dr Mumford explained that when they had written that they had not appreciated that the comparator units included both day and inpatient admissions and so looking at the new magenta line for the total Schiehallion Infection Rate[2954] she explained that in her opinion the new calculation shows multiplication of the risk by 2.5 at the peak and doubles it in 2018 which is probably still significant given the high-risk population involved. Ms Dempster agreed.[2955]

Calculation of Infection Rate using Occupied Bed Days

379. Mr Mookerjee produced his Addendum Report[2956] and in it sought to respond to criticism that he had not used Occupied Bed Days as a denominator. He noted that GOSH had not provided exact numbers for bed days, as they could only provide a proportion figure; Cardiff and the Vale could only provide bed days for those up to 14 years old; Leeds could not provide a figure for bed days and Oxford were able to send data for bed days. He felt it was not appropriate to do a comparison to one unit as that takes one back to the issue of comparing something big to something small. In his opinion the biases then get exaggerated and are not adjusted for in the same way as if you had four or five or six units.[2957]

380. However, Mr Mookerjee did calculate an infection rate for Ward 2A only with occupied bed days as the denominator and did so because he could be sure that Ward 2A was only made up of inpatients, so the numerator in terms of infections would match the activity he was using. He made the assumption that no outpatient would have a blood stream infection labelled as Ward 2A.[2958]

381. He noted in passing that it did not matter that in the first and last years of his data source[2959] they were only for part of a year because he took that into

[2954] See above and Bundle 27, Volume 18, Document 1
[2955] Dr Mumford and Ms Dempster, Transcript, Day 1, Page 146-148
[2956] Bundle 21, Document 10, Page 768
[2957] Sid Mookerjee Transcript, page 104 to 106
[2958] Sid Mookerjee Transcript, page106 and 107
[2959] Bundle 21, Document 10, Page 769

account by only taking infections for the same period. The numerator and denominator are both limited in the same way.[2960] The results were plotted in Figure 1[2961]

382. In explaining what Figure 1 showed, he noted that the factor driving the mathematical numbers in the graph to his addendum report was the magnitude of the difference from the rate in 2015 to 2016 to 2017 to 2018. He noted that this told him that regardless of how he cut the data, that both the Ward 2A rate of infections per 1,000 bed days (in Figure 1[2962]) and Ward 2A rate of infections per 1,000 admissions (the Green Line on the final chart[2963]) were saying the same thing.[2964]

The chance of getting a blood stream infection in the Schiehallion Unit

383. Mr Mookerjee worked out the percentage chance of a young person having a blood stream infection by admission or days spent in the unit. His opinion was that using the Green Line on the final chart[2965], it was valid to say that in 2017 a child admitted to Ward 2A was looking at a 16% chance of getting a blood stream infection.[2966] He was also able to make this calculation using occupied bed days, but felt that was harder to express and would only go as far as saying that from Figure 1 in his Addendum report that the 'risk' of infection of an inpatient in Ward 2A increases from 1.75 in 2015 to 6.86 in 2018. This would have concerned him were he a parent. He did note that, in 2022, there were 4,299 admissions and no infections.[2967]

384. Regarding the hypothesis that an inpatient stay gives rise to increased risk of infection, Mr Mookerjee stated that the infections in Ward 2A were inpatient infections, and one sees a similar increase in infection risk. What that told Mr Mookerjee was that, no matter how he cut the data, he could say that there is a risk whether you take a strict Ward 2A infection rate or take a broader cut of

[2960] Sid Mookerjee Transcript, page 107 and 108
[2961] Bundle 21, Document 10, Page 770
[2962] Bundle 21, Document 10, Page 770
[2963] Bundle 27, Volume 18, Document 1
[2964] Sid Mookerjee Transcript, page 109 and 110
[2965] Bundle 27, Volume 18, Document 1
[2966] Sid Mookerjee Transcript, page 111 and 112
[2967] Sid Mookerjee Transcript, page 113 to 116

data.[2968] From the context that broad cut would appear to be a reference to the Overall Schiehallion Infection Rate (shown by the purple line on the new chart[2969]).

Water Positivity and correlation

385. One of Mr Mookerjee's objectives had been to see whether there was some correlation between the changes in rate of infections in the Schiehallion Unit and the rate of positive results in water samples taken in the Schiehallion Unit. The data source for the water positivity rate is explained in paragraphs 7.1[2970] and 8.4[2971] and Chapter 10[2972] of the Quantitative Report. He explained that such an exercise would result in a number which would show the degree of association or the closeness of the relationship between two time series. First the exposure time series and in the foreground the time series that is made up of the rate of infection. In the case of water, Mr Mookerjee noted that there are a lot of water samples of those years and for most of those years a lot of positive samples. He rejected the notion that because the data was for only six years you could not do a correlation analysis.[2973]

386. Mr Mookerjee stopped the water positivity analysis in 2020 because he only had partial years' data for 2021. He only had one month. It was clear to him that the data had been compiled by different stakeholders. For instance, how the samples were taken, where they were taken, and the results, were incomprehensible for some years. One issue was that the variable names for each of the spreadsheets did not match, such as the names of the wards, the ways in which testing results had been input, the manner in which or language used to specify whether the result was positive, what it was positive for, or the manner in which the water positive test was indicated.[2974] 'He calculated Water Positivity Rate by dividing the number of positives by the number of

[2968] Sid Mookerjee Transcript, page 117 and 118
[2969] Bundle 27, Volume 18, Document 1
[2970] Bundle 21, Document 1, Page 20
[2971] Bundle 21, Document 1, Pages 30-33
[2972] Bundle 21, Document 1, Page 40 onwards
[2973] Sid Mookerjee Transcript, page 119 and 120
[2974] Sid Mookerjee Transcript, page 121 to 124

tests.[2975] The blue bars on the new chart for the hearing[2976] and Figure 2 in both of his Supplementary Report[2977] and his Addendum Report[2978].

387. Mr Mookerjee confirmed that in carrying out his correlation analysis he had only used the figures up to 2019. Expanding on paragraph 10.4 of his Quantitative Report[2979] he explained that he did not use the figure for 2020 because there was a considerable decrease in the number of water samples sent to the lab in 2020 as compared to earlier years. Covid was one reason for that. He drew a line between the pandemic and the pre-pandemic periods. He did not accept that it undermined the correlation because there was a lack of sufficient data points as the positivity numbers were calculated as results of thousands of water tests over the whole period. He had used the data he had been provided with.[2980]

388. With regard to his calculation[2981], he explained that he looked at the correlation by comparing the aggregated 2A and 6A rate of infection (the dotted pink line) to the water positivity figure for 2015 to 2019. The resulting figure for the correlation coefficient was 0.6. It indicated a moderate to strong association between infection rates and water positivity. He noted that he did not include the confidence intervals because that is normally a statistic that is used when comparing what is happening within a smaller sample to something larger. The confidence interval was tight, 0.59 to 0.61. If one has a wide confidence interval, then you do not have enough certainty for the statistic. Essentially, a wide margin of error. If one has narrow confidence intervals, it says that you can be sure that the value of 0.6 is firm and the underlying framework of that is that 0.6 is based on a lot of data.[2982]

Mr Mookerjee's Conclusion in respect of his hypothesis

[2975] Sid Mookerjee Transcript, page 127
[2976] Bundle 27, Volume 18, Document 1
[2977] Bundle 21, Document 3, Page 91
[2978] Bundle 21, Document 10, Page 772
[2979] Bundle 21, Document 1, Page 41
[2980] Sid Mookerjee Transcript, page 125 to 127
[2981] See Bundle 21, page 92
[2982] Sid Mookerjee Transcript, page 128 to 131

389. Referring back to the hypothesis he was testing[2983], Mr Mookerjee explained that he accepted the hypothesis on the basis that there is a strong association between the exposure variable (water contamination) and the occurrence of infections from environmental bugs in the Schiehallion cohort. He explained that it was clear from that data that there were unusual peaks that were not in line with either what the Schiehallion rate experienced before or after and was not in line with what the comparator units were experiencing at the time. Further, he stated the correlation coefficient showed a strong correlation.[2984]

Epidemiological work carried out at the time of events

390. The Inquiry also heard evidence from a range of witnesses with experience or expertise in the application of epidemiological frameworks in health care settings and particular in their application to question arising in IPC practice. The Inquiry has recovered and placed into evidence eight epidemiological reports or presentations produced between August 2018 and October 2019 (the Eight Contemporaneous Epidemiological Reports"). These are (in chronological order of publication or production):

- Presentation by Kathleen Harvey-Wood and Dr Christine Peters: Bacteraemia rates and Resistance Paediatric Haemato-oncology 2014-2018, 30 August 2018.[2985]

- Report by Dr Iain Kennedy: Descriptive Analysis of Trends in Bacteraemia Rates for Selected Gram-Negative Organisms, 1 October 2018.[2986]

- Draft report by C Peters and K Harvey-Wood: Bacteraemia rates and resistance patterns in paediatric haematology/oncology patients 2014-2018, 10 October 2018.[2987]

- Appendix 4 to the HPS Situational Assessment RHC Wards 2a 2b Draft –

[2983] See Bundle 21, page 13 at para 5.7
[2984] Sid Mookerjee Transcript, page 131 to 133
[2985] Bundle 27 Volume 6, Document 9, page 107
[2986] Bundle 6, Document 27, page 95
[2987] Bundle 19, Document 19, Page 143

5 June 2019.[2988]

- Report by Dr Iain Kennedy: Descriptive analysis of trends in bacteraemia rates for selected gram-negative organisms, July 2019.[2989]
- HPS SBAR: To support NHS GGC IMT Mycobacterium chelonae cases and the Incidence of gram-negative bacteraemia in the paediatric haemato-oncology, September 2019[2990]
- Draft HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019.[2991]
- HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019 - 29 November 2019.[2992]
- Presentation by Dr Iain Kennedy and Jennifer Rodgers: Paediatric Haemato-oncology RHC – Summary of Data, September 2019 - Presented at IMT meeting of 20 September 2019.[2993]

391. With the exception of Ms Rodgers (who gave evidence in Glasgow II) all authors of these papers spoke about their work in Glasgow III, albeit that the presentation made by Dr Kennedy and Ms Rodgers to the IMT of 20 September 2019 was not produced by NHS GGC until after Dr Kennedy gave evidence, so it was not in front of him when he gave evidence.

392. Now that the Inquiry has heard from Mr Mookerjee, Dr Mumford, Ms Dempster, Ms Imrie, Ms Rankin, Ms Harvey-Wood, Dr Kennedy, Dr Peters it is possible to look at these eight reports and propose some conclusions that will assist the chair in answering Key Question 4. These eight reports or presentations are grouped together by authors for the purpose of this discussion.

[2988] Bundle 7, Document 5, Page 205
[2989] Bundle 6, Document 28, page 104
[2990] Bundle 3, Document 16, Page 127
[2991] Bundle 7, Document 6, Page 214
[2992] Bundle 7, Document 7, Page 250
[2993] Bundle 27, Volume 13, Document 13, Page 77

Presentation & Report by Kathleen Harvey-Wood and Dr Christine Peters: Bacteraemia rates and Resistance Paediatric Haemato-oncology 2014-2018[2994]

393. Ms Harvey Wood explained how she and Dr Peters first presented this piece of work to haematology-oncology clinicians including the CLABSI group (for improvement of line infections) at their educational lunchtime meetings in July 2018. The presentation was produced for the paediatric haemato-oncology and not for the IMT. It appears it was mentioned at the IMT of 28 September 2018[2995] by Professor Gibson during a presentation by Dr Kennedy[2996] about what became his first report. He eventually received the version that was subsequently written up by Dr Peters and Ms Harvey-Wood as a Report in October 2018. Dr Kennedy took the view that at a high level this piece of work was attempting to achieve what his reports were trying to achieve.[2997]

394. In her evidence Ms Harvey Wood drew out what she thought were the key conclusions. These were: [2998].

- That in 2015 to 2016 the percentage of positive blood cultures (the number from the patient group that had a blood culture taken that grew an organism) was similar in the Schiehallion Unit to Yorkhill: 9%

- From 2016 to 2017 and then again in 2017 to 2018 there is an increase in positive blood cultures. In 2016 the rate had increased to 15.5% which she considered was quite an increase. There is an upward trend in the number of positive blood cultures and there were two peaks in April 2017 and March 2018 (when it was 27% positive blood cultures).

- She saw a drop in the rate of positive blood cultures in July 2018 to 3% which she saw as an effect of hydrogen peroxide vapor cleaning (“HPV”) which she knew was being used in Ward 2A.

[2994] Bundle 27 Volume 6, Document 9, page 107, Bundle 19, Document 19, Page 143
[2995] Bundle 1, Document 44, Page 194
[2996] Dr Kennedy’s Statement, Para.84, Statement Bundle w/c 23 September 2024, page 155
[2997] Dr Kennedy, Transcript, Page 129
[2998] Chart showing the rate of positive blood cultures at Bundle 27 Volume 6, Document 9, page 110, Kathleen Harvey-Wood, Transcript, Pages 33, 45, 49-51

- When looking at the actual organisms involved[2999] she noted that the types of environmental organisms during the peaks in April 2017 and June 2017 were enteric bacteria and environmental bacteria. The point she takes from the graph is that was an increase in environmental organisms in blood cultures.[3000]

- Other witnesses had raised concerns that calculation of a rate of positive blood cultures might be undermined if there had been an increasing rate of such blood culture, but Ms Harvey Wood explained that issue was considered. However, the presentation showed that there was no increase in blood cultures compared to previous years.[3001]

- In April 2016 Ms Harvey-Wood began to see things in blood cultures and noticed a diversity of organisms which are not what would usually be found in blood cultures.[3002]

395. The report summarised its conclusion as follows:[3003]

> There has clearly been an increase in the incidence of gram negative organisms in the haematology/ Oncology paediatric patients, most strikingly in unusual non-coliform environmental organisms which cannot be explained by increased number of at risk patients, laboratory practices or selection pressure of meropenem use.
>
> Overall, this data supports the hypothesis that environmental factors have been driving rates of bacteraemias in this cohort

396. Dr Kennedy agreed that this presentation showed a clear indication, particularly in 2017-2018 of a higher rate of positive blood cultures or bacteraemias occurring. Dr Kennedy also made the observation that if the purpose of the presentation was to provide a broader understanding of infections within this patient cohort, then it would cover gram-positive bacteria,

[2999] Chart at Bundle 27 Volume 6, Document 9, page 111
[3000] Kathleen Harvey-Wood, Transcript, Pages 51-54
[3001] Charts at Kathleen Harvey-Wood, Transcript, Pages 108 and 109 and Kathleen Harvey-Wood, Transcript, Pages 46-47
[3002] Kathleen Harvey-Wood, Transcript, Pages 59-60 referring chart at Bundle 27 Volume 6, Document 9, pages 113-115
[3003] Bundle 19, Document 19, Page 187

gram-negative bacteria, environmental bacteria and non-environmental bacteria. [3004]

397. Mr Mookerjee was asked about the PowerPoint presentation. He stated that the trend red line slanting upwards gives an overall feel in terms of what the positive blood cultures look like over the period from 2014 to 2018. This tells him that the rate of positivity was increasing. Mr Mookerjee did note that a caveat was that they could have been sending in more blood cultures because they were worried about the cohort.[3005]

Reports by Dr Iain Kennedy: Descriptive Analysis of Trends in Bacteraemia Rates for Selected Gram-Negative Organisms, 1 October 2018.[3006] [3007]

398. Dr Kennedy was keen for it to be understood that his two reports were attempts at 'descriptive epidemiology'. Both his papers considered the same list of bacteria[3008] on a list provided by Dr Inkster in early 2018, widened to include bacteria of the same genus. His view is that they represent bacteria species and genera matching the 'case definition' from the Water Incident IMT.[3009] He explained that the case definition is important as if you include infected patients then you may include irrelevant patients but if the case definition too restrictive then you may miss out on relevant organisms. He described doing his 2019 update report and using a 4-step process: all results from RHC, ward location, consultants of patients, and reason for clinical test. He conceded that he had greater access to the data than HPS or Mr Mookerjee and so could so this.[3010] Dr Kennedy used occupied bed days as the denominator, as in his view it best captured "person time at risk".[3011]

399. The Chair of the GNB IMT from 23 August to 14 November 2019, Dr Crighton, was unaware that Dr Kennedy's data produced to her IMT used the list of organisms that Dr Inkster had provided to match the case definitions of the

[3004] Dr Kennedy, Transcript, Page 148-149
[3005] Sid Mookerjee Transcript, page 134 to 137
[3006] Bundle 6, Document 27, page 95
[3007] Bundle 6, Document 28, page 104
[3008] Bundle 6, Document 28, Page 121
[3009] Dr Iain Kennedy, Transcript, Pages 130-132
[3010] Dr Iain Kennedy, Transcript, Pages 160-164
[3011] Dr Iain Kennedy, Transcript, Page 140

2018 Water Incident IMT.[3012]

400. There is some doubt whether the 2018 report was produced for the IMT. Dr Kennedy appears to think it was Dr Inkster did not ask for it. However, it is clear that in September 2018 it was decided that Dr Inkster, Dr Peters and Ms Harvey-Wood would work together with Dr Inkster to produce a combined report. This never happened, perhaps because of pressure of events

401. Both reports plot both a case rate and an organism rate. The significant conclusions drawn from the 2018 report by Dr Kennedy about this list of bacteria species and genera were:

- There had been a clear increase in selected gram-negatives infections in 2017 and 2018 compared to previous years, and that there was also an increase in 2016 with the magnitude less clear. The report stated: “The other obvious change over the time period is the increase in the number of blood cultures for multiple organisms. Again, consideration should be given to potential causes for this change.[3013]

- The rate at Yorkhill before the move to the RHC was fairly stable with a single peak event.[3014] Dr Kennedy did accept that it may well be a legitimate point that what could be achieved at Yorkhill is not the same as the legitimate aim in the RHC.[3015]

- After the move to the RHC the rate was lower than at Yorkhill until quarter two of 2016 there is an increase which is followed from 2017 by a series of spikes.[3016]

- These peaks in April 2017, June 2017 and March to May 2018 appear to match those that appear in broadly equivalent charts in the October/November 2019 HPS reports and in the Harvey-Wood/Peters

[3012] Dr Crighton, Transcript, Pages 59-61
[3013] Bundle 6, Document 28, Page 118
[3014] Bundle 6, Document 28, Page 114
[3015] Dr Iain Kennedy, Transcript, Page 200
[3016] Bundle 6, Document 28, Page 114

charts.[3017]

- The points (largely after May 2016) when the organism rate is higher than the case rate is most plausibly explained (given the immunosuppression of the patient cohort) by multiple infections in single patients.[3018]

402. The 2019 report was not produced at the request of Dr Inkster, but at the request of Dr Armstrong, following the 1 March 2019 SBAR by Dr Mathers which raised concerns about infections in 2017 and using the same list of species and genera from the 2018 Ward 2A IMT that was not the same 'case definition' of either the 2017 cases or the 2019 Gram-Negative Bacteria IMT. This was part of Annette Rankin's disagreement with Dr Kennedy at the 14 August 2019 IMT as she considered it was it was not representative of the unusual organisms that had been identified.[3019] It is striking that Dr Kennedy was not really able to answer the criticism that his 2019 report did not address the situation faced in Ward 6A and had to fall back on the point that later HPS showed that "all the different methodologies actually come up with the same results".[3020] When pressed Dr Kennedy went on to expressed concern that his reports have "gained a kind of totemic status for various people who've got different narratives, which would not be a position I would ever have wanted the reports to have got into because I think it overstates the certainty that something like this can give.[3021] Notwithstanding Dr Kennedy maintained that the key conclusion that could be drawn from his 2019 report was that[3022]:

- Since October 2018 there had been a "noticeable improvement in the incidence of gram-negative infections" in the Ward 6A patient cohort.

- It can be hypothesised that the decant, fitting of the chlorine dioxide system and POUFs will have contributed to the improvements. In oral evidence Dr Kennedy accepted that the fact that control measures work is added evidence that this hypothesis of the source of infection was

[3017] Dr Iain Kennedy, Transcript, Pages 156-159
[3018] Bundle 6, Document 28, Page 114
[3019] Annette Rankin, Transcript Page 3-5 and Anne Rankin Statement, Page 59 of Witness Bundle
[3020] Bundle 4, Document 36, Page 151 and Dr Kennedy, Transcript, Page 178-186
[3021] Dr Iain Kennedy, Transcript, Page 189
[3022] Bundle 6, Document 28, Page 111

correct.[3023]

- Enterobacter cloacae has remained higher than the historical baseline.

403. It seems to be the case that the 2018 report is a useful piece of contemporaneous descriptive epidemiology because it is (a) connected to the case definition of the 2018 'Water Incident' IMTs and (b) had access via Dr Kennedy's four step process which gives a very tight understanding of which patients to include. The conclusions should therefore be given weight when considering the epidemiology of the 'water incident'.

404. The problem with the 2019 report is that, despite Dr Kennedy's regrets, it has become a key piece of data in support of the view that significant reduction in risk had been achieved by the autumn of 2019. The value may be undermined by the lack of connection to the case definition in use in the 2019 GNB IMT.

405. The second Kennedy report from 2019 graph of selected gram-negatives[3024] was shown to Mr Mookerjee and he was asked what could be taken from the reports (like that one) that use data sets that start before the hospital opened. Mr Mookerjee stated that his view was that as the issue is whether there was a relationship between the environment in the new build and the rate of infection; then the consequence of that is to ignore everything that came before it because the setting is not the same.[3025]

406. In relation to Dr Kennedy's work that there were comparable rates of infection between Ward 2A and Yorkhill Hospital, Dr Inkster discounted this work by arguing that rates should be better for a new hospital, the water quality in Yorkhill was poor for some time (high Legionella counts, significantly higher than 1000), possible limited water sampling, and the absence of knowledge of the water system and environment in Yorkhill.[3026]

Appendix 4 to the HPS Situational Assessment RHC Wards 2a 2b[3027]

[3023] Dr Iain Kennedy, Transcript, Page 198
[3024] Bundle 6, Document 28 at page 107
[3025] Mr Mookerjee Transcript, page 137 to 140
[3026] Dr Inkster, Transcrpt, Day 2, Pages 21-24
[3027] Bundle 7, Document 5, Page 205

407. It was explained by Ms Imrie that in March 2018, a situational awareness report was instructed which should have only taken a couple of months to produce but because the outbreak in March 2018 never really ended then it was eventually issued in June 2019. The Board received a draft copy of the report in January 2019 and provided comments.[3028]

408. The data was extracted by HPS from the ECOSS system and therefore did not have the granularity of patient definition that Dr Kennedy could achieve with his four-stage process. The report sought to compare rates amongst the Ward 2A/2B patient group and patients in the rest of the RHC. Six different groups of organisms were considered, and data presented separately in different tables and charts. Ms Imrie explained that they had created an 'Environmental Bacteria' group from within the wider group of Gram-Negatives as some Gram-Negatives are not environmentally connected – such as E. coli.[3029] This group included all species isolated in water or drain samples taken from Wards 2A/2B.[3030] Dr Mumford and Ms Dempster considered this a close comparison to the list of infections used in Mr Mookerjee's work.[3031]

409. The notable conclusions for this an 'Environmental Bacteria' group presented I Figure 3 are that:[3032]

- In the 2A/2B Group, the SPC chart shows a shift below the centreline for 17 months from January 2015 to May 2016.
- There was then a shift above the centreline from April 2017 to December 2017 and the rate was higher than expected, in March and May 2018 and was above the UWL in November 2017 and June 2018.

410. When it is appreciated that, as discussed above, the baseline is an average of the whole period covered by the chart, it can be seen that, just as with Dr Kennedy's 2018 report, the rate in Yorkhill was largely stable, then lower in the new RHC until second quarter of 2016 when it begun to rise towards peaks in

[3028] Laura Imrie, Transcript, Pages 5, 33-35
[3029] Laura Imrie, Transcript, Pages 35-36
[3030] Bundle 7, Document 5, Page 210
[3031] Sara Mumford and Linda Dempster transcript day 1 p143
[3032] Bundle 7, Document 5, Page 210

2017 and 2018.

411. It appears notable that the Gram-Positive group[3033] appears to show some increase in infections in 2016 and 2017 followed by a possible decrease in 2018, which might well be consistent with the successful CLABSI work being done in Wards 2A/2B in this period.

412. This report contains a chart (Figure 4) that attempts to show a change in the nature of the infections with unusual micro-organisms emerging after the middle of 2016. This was spoken to by Dr Imrie[3034], by Dr Mumford and Ms Dempster[3035] and appears to show something that cannot readily by understood from case counts and organism counts as carried out in the work of Dr Kennedy and Mr Mookerjee. As Dr Mumford put it (in comparison with Mr Mookerjee's work)

413. "… you see the same pattern again of low levels in 2015, going into 2016, and then it's starting to rise, with higher levels in 2017 to 2018" [3036]

414. The change shown in this chart seems consistent with the parts of the Harvey-Wood/Peters presentation/report that dealt with the diversity of organisms found in blood samples.

HPS SBAR: To support NHS GGC IMT Mycobacterium chelonae cases and the Incidence of gram-negative bacteraemia in the paediatric haemato-oncology, September 2019[3037]

415. This report describes itself as using a 'refreshed data set' obtained on 8 August 2019 and uses a slightly differently defined 'environmental' group of bacteria from the previous report.[3038] The bed days denominator was 'bed days at hospital level'[3039]. In Figure 2 for Gram-Negative bacteraemia six of the nine data points are above the mean for the whole five year period where

[3033] Bundle 7, Document 5, Page 209
[3034] Laura Imrie, Transcript, Pages 41-43
[3035] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 150-151
[3036] Dr Mumford and Ms Dempster, Transcript, Day 1, Page 150
[3037] Bundle 3, Document 16, Page 127
[3038] Gordonia has been added as there was a single Gordonia case in March 2019 (see Figure 1 at page 129)
[3039] Bundle 3, Document 16 at page 128

before late 2016 all but one data point in the new RHC (out of 15) were below the mean.[3040] For environmental bacteria the SBAR notes that "the number of cases breached the UWL in March 2019, but not above the UCL.[3041] Dr Crighton accepted that these SPC charts cannot be used for a comparison between rates in Ward 6A and Yorkhill[3042] and do not show the background rate for bacteraemia.[3043]

416. This SBAR contains a comparison between the rate in the RHC and the combined Aberdeen and Edinburgh children's hospitals over the past five years.[3044] Just as with the later HPS reviews this is not a comparison between paediatric haemato-oncology units, but between whole hospitals.

417. The SBAR contains a small amount of data about Mycobacterium chelonae.[3045]

HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data[3046][3047]

418. Ms Imrie was the clinical lead for these reports.[3048] The primary aim was to compare various data sets for infection rates from a wide range of different sources compared with HPS ECOSS data from the national system, to review the environmental Gram-Negative blood cultures in the paediatric haemato-oncology population and to identify whether there was a change in the type of bacteria detected.[3049] In respect of the first task from Figure 1[3050] this demonstrated that rates for Environmental including Enteric (ENT) group infections were comparable over all sources. It is notable that it does not appear to have been one of the objectives of these HPS reports to provide a basis to conclude that the rate of infections in Ward 6A were lower than in

[3040] Bundle 3, Document 16 at page 130
[3041] Bundle 3, Document 15 at page 130 and Figure 3
[3042] Dr Crighton, Transcript, Page 73
[3043] Dr Crighton, Transcript, Page 76
[3044] Bundle 3, Document 15 at page 130
[3045] Bundle 3, Document 15 at page 131
[3046] Bundle 7, Document 6, Page 214
[3047] Bundle 7, Document 7, Page 250
[3048] Laura Imrie, Transcript, Page 5
[3049] Laura Imrie, Transcript, Page 8, Bundle 7, Document 6, Page 217
[3050] Bundle 7, Document 6, Page 223

2018 in Ward 2A or had reached a background level.

419. The grouping of micro-organisms was slightly different to that done in the earlier Appendix 4 report. The report notes the environmental group was extended to include selected enteric organisms such as species of *Enterobacter*; *Klebsiella* that were linked with drain contamination to create the Environmental including Enteric (ENT) group.[3051] As discussed by Dr Mumford and Ms Dempster both are close comparison to the list of infections used in Mr Mookerjee's work and the groups that need to considered.[3052] The principal observations from the case level data in the report about these two groups were: [3053]

420. The SPC chart for the environmental group (Figure 5) showed a breach in the upper warning limit in June 2018.

421. The SPC chart for the environmental including enteric (Figure 6), showed the UWL was breached in March 2018 and March 2019.

422. In respect of the Gram-negative case definition, the authors of the HPS report observed an upward shift with a run of ten data points above the mean from March to December 2017, with the upper warning limit (UWL) breached in August 2017, March 2018, May 2018 and again in September 2019 (Figure 4).[3054] Mr Mookerjee was asked about Figure 4 and explained that he could see that from 2016 to late 2018, there is a upward trend infections.[3055]

423. The reports also attempted a comparison between the overall hospital rate of positive blood cultures since the move to RHC (June 2015 to September 2019) to the combined rate of the other two Scottish children's hospitals (Royal Aberdeen Children's Hospital (NHS Grampian) and Royal Hospital for Sick Children (NHS Lothian).[3056] The conclusions in this report have been relied on by NHS GGC, but it was acknowledged by Ms Imrie that the Royal

[3051] Bundle 7, Document 6, Page 228
[3052] See Section 7.4
[3053] Bundle 7, Document 6, Page 228
[3054] Bundle 7, Document 6, Page 230
[3055] Mr Mookerjee, Transcript, Page 61
[3056] Bundle 27, Volume 13, Document 13, Page 231

Aberdeen Children's Hospital and Royal Hospital for Sick Children in Edinburgh were not suitable comparator hospitals when considering infection rates as they did not have a tertiary centre for haemato-oncology.[3057] A similar position appears to have been taken in the April 2023 NHS GGC Positioning Paper.[3058] As Professor Stevens and others observed, the value of this comparison is further limited as it is a comparison between the whole RHC and the combination of two other smaller children's hospitals.[3059]

424. Mr Mookerjee pointed out that such a comparison will not assist if the question is whether there is anything unusual going on in terms of the infection rate in the specific cohort which is the paediatric haematology-oncology cohort.[3060] Such a rate of infection will be diluted. Mr Mookerjee noted that, in contrast with his report, he had asked for infection data and activity data that was specific to the unit. What he had received was something that was not biased by him. He received information and then had to take what he perceived to be a complete set of data. In doing so, it was good that he ended up with a total aggregated admission number which was a high number. Similarly, he got a high number of infections. He noted that he was not comparing one hospital to another but was looking to contextualise what was happening in the Schiehallion unit and comparing it to an aggregate of 4 other hospitals. He stated that this adjusted for the biases and the confounders which, when comparing one to one will not.[3061]

425. A moment needs to be taken to draw out a repeated reassurance that NHS GGC seemed to take that the various HPS reports say (they assert) that rates of infections amongst Gram-Negative and Environmental bacteria were (as the SBAR of 10 October 2019[3062] puts it; "following the move in September 2018 the rates of positive blood cultures for both gram-negative and environmental bacteria in Glasgow Unit were no different when compared to the rates of the combined Lothian & Aberdeen units. This provides additional

[3057] Laura Imrie, Transcript, Page 18
[3058] Bundle 25, Document 10, Page 368
[3059] Professor Stevens, Transcript, Pages 95-96
[3060] Mr Mookerjee, Transcript, Page 157
[3061] Mr Mookerjee Transcript, page 158 to 160
[3062] Bundle 4, Document 46, Page 193

independent evidence (Appendix 4)." [3063] Dr Crighton was adamant that this short paragraph was in fact comparing a specific cohort of individuals no matter where they were.[3064]

426. None of the HPS reports including Appendix 4 to the first HPS Report and the September 2019 SBAR actually say that. In all cases the comparison is between whole hospitals, and this is definitively cleared up in the October and November 2019 HPS Reviews.

427. The CNR Expert Panel commented on the draft report in Section 8.2.3 of the Overview Report and concluded that:

> We do not see that this report would have provided any clear message of either reassurance or concern about past events. Nor do we see that it offered a clearly interpretable and favourable comparison with other Scottish children's hospitals (not least because the size of the paediatric haematology oncology services in these three hospitals varies very substantially – NHS GGC being easily the largest)[3065]

428. Ms Evans did not think it appropriate to take two small hospitals and put them together because the demographics are different. She felt it would have been better to look at a hospital with a similar patient cohort, possibly in another area, to consider where the hospital sits with its peers.[3066]

Presentation by Dr Iain Kennedy and Jennifer Rodgers: Paediatric Haemato-oncology RHC – Summary of Data, September 2019[3067]

429. Dr Kennedy gave evidence that at the IMT Teleconference on 20 September 2019[3068] he and Jennifer Rodgers gave a presentation. This IMT is significant as the final entry in the minute is that, after the presentation and other discussion, those present agreed with an IMT recommendation that Ward 6A be re-opened to new patients. This presentation had not been provided to the

[3063] Bundle 4, Document 46 at Page 196
[3064] Dr Crighton, Transcript, Page 94
[3065] CNR Overview Report, Bundle 6, Document 38, Page 1068
[3066] Transcript, Gaynor Evans, page 69 to 74
[3067] Bundle 27, Volume 13, Document 13, Page 77
[3068] IMT Minute, Bundle 1, Document 82, Page 370

Inquiry before the hearing and given the seeming importance of this presentation Dr Kennedy was asked to provide it which he did. In his evidence he described it as having "more data and .. the specific numbers for each species of infection" and that it extended further in time.[3069]

430. It was unfortunate that we could not ask Dr Kennedy to take the Chair through the presentation, but Mr Mookerjee was asked to look at it.

- From the chart entitled "CLABSI rate total and gram negative only. Bed occupancy on secondary axis"[3070] appeared to show to him in respect of all CLABSI and Gram-Negative CLABSI infections a period of escalation from January 2015 to May 2017, which thereafter settled until some mitigation (perhaps the CLABSI reduction plan) lead to a decrease in the rate of all CLABSI infections, but not such a change for the Gram-Negative CLABSI infections which tends to suggest that there are other causes for the gram-negatives that were not just the fact that some of them were linked to line-associated Blood Stream Infections.[3071]

- From the chart entitled "Crude rate of all gram negative blood cultures from RHC Schiehallion, RHC DCU, and RHC ward 2A/B, Ward 6A" [3072] he said:

  "What it is telling me is that the rates of gram-negative, the blood cultures, is on the way up. If you take into account where the data points are in September '15, November '15, Jan '16, and you compare it to where they end up in September '17, November '17, Jan '18, March '18, May '18, you know, and-- So if you take into account those two as the start of the pipeline and the end of the pipeline, and you sort of drew the line of best fit, it would be slanting upwards."[3073]

431. This presentation was clearly produced to contribute to the decision-making process around whether to re-open Ward 6A to new admissions in September 2019, but it does appear to contain features that are consistent with other reports and Dr Mookerjee's work. It is another source which suggests an

[3069] Dr Iain Kennedy, Transcript, Pages 114-115
[3070] Bundle 27, Volume 13, Document 13, Page 78
[3071] Mr Mookerjee, Transcript, Page 146-148
[3072] Bundle 27, Volume 13, Document 13, Page 85
[3073] Mr Mookerjee, Transcript, Page 149

increase in infection rates in or around the second quarter of 2016 from a low rate soon after the opening of the hospital, which then stabilises at a higher rate in 2017 and 2018 before falling to some extent drive by CLABSI work, but not to the extent that CLABSI issues can be seen as the only infections in Wards 2A/2B in 2017/2018.

Consistency of outcome between the Eight Contemporaneous Epidemiological Reports

432. It is submitted that it is of significance that when attention is paid to what these eight reports and presentations are saying about rates of positive blood cultures or infections rates in broadly similar groupings of bacteria are described as Environmental, Environmental with enteric or match the case definition for the 'Water Incident' IMT there is a common theme. That is:

- Rates of Gram-negative environmental infections start low after the move to the RHC.
- Initially rates either do not grow or grow slowly until some point in 2016.
- From the middle of 2016 we see an increase to a new higher level in 2017 and 2018.
- There are some signs of some reduction in infection rates 2018 that may to some extent be related to successful intervention on CLABSI rates of infection or it may be a consequence of interventions such as the Ward 2A decant, POUFs and the fitting of Chlorine Dioxide dosing.

433. Although not put to Mr Mookerjee, it is striking that this is precisely the changes shown in the quarterly rates of infections under various Gram-negative measures plotted by HPS in Figure 1 in their draft October 2019 report.[3074] This similarity across a wide range of different data sets is a compelling corroboration of the summary set out in the previous paragraph.

Other epidemiological evidence available

[3074] Bundle 7, Document 6 at page 223

434. As Dr Mumford and Ms Dempster report[3075], in October, Dr Inkster and Dr Peters produced an SBAR[3076] looking at the Ward 6A incident, data and epidemiology. This document argued that the proportion of environmental gram-negative organisms in blood cultures had increased since April 2016 and this was particularly noticeable from July to September 2019. Of note is a graph[3077] showing a sustained increase in Enterobacter blood stream infections.

435. The CNR Expert Panel concluded at Paragraph 4.3.5 based on simply the numbers of different infections they were examining in the Schiehallion cohort that "while it is not possible to state this with certainty, the frequency of [the Gram-Negative Environmental bacteraemia in the CNR cohort] appears to be higher than would be expected" and that "the cluster patterns identified .. occurring by chance is small".

436. Professor Wilcox was of the opinion that in the case of the 12 Stenotrophomonas cases in 2018 it was unlikely to be a coincidence that a relatively uncommon organism is present. Professor Wilcox noted that a lot of the 12 cases were clustered into one week or month. That is a red flag. With Stenotrophomonas, what one sees is a cluster.[3078]

Wider use of the Bradford Hill Guidelines by the Chair

437. It is submitted that not only should the Chair accept the conclusion of Mr Mookerjee in respect of his hypothesis, using (as it does) the principles set down by Hill, that in addition Hill's nine considerations are useful tools in promoting scientific thinking and common-sense deduction that the Chair should use to support his fact finding in respect of the determination of the Key Question 4 and related aspects TORs 1 and 8.

438. The nine guidelines (as taken from Mr Mookerjee's quantitative report at 5.12 are set out here:

[3075] Quantitative Report, Para 9.37, Bundle 21, Document 4 at page 146
[3076] Bundle 4, Document 44, Page 180
[3077] Bundle 4, Document 44, page 187
[3078] Transcript, Professor Wilcox, page 131 and 132

Index	Guideline	Explanation
1	Strength or degree of association	Larger the value of the relative risk (effect size) between the exposed and unexposed groups, the stronger the 'strength of association'
2	Consistency	The event or outcome of interest has been repeatedly observed, and these observations have been made in different circumstances and times.
3	Specificity	Disease outcome is seen in a specific population at a specific site with no other likely explanation, other than the hypothesised exposure.
4	Temporality (including spatial property)	Organism acquisition occurs where and when environmental contamination of present or does not occur where said contamination is absent. Recent additions to this guideline have included 'spatial', to account for the 'where' and 'when'
5	Biological gradient	Greater exposure generally leading to greater incidence, i.e. dose/stressor-response relationship
6	Plausibility	Is the association biologically plausible
7	Coherence	Do epidemiological and laboratory findings agree with each other
8	Experiment	When interventions are applied which reduce the exposure/trigger variable, does the outcome reduce too. OR Is organism acquisition eliminated or reduced when exposure to the environment is subjected to intervention
9	Analogy	Is a comparable association observed between the same outcome and an analogous exposure or the same exposure and an analogous outcome.

The need for further or additional epidemiological reports

439. In light of the desire of Chair, as expressed in Direction 5, to reach a conclusion on Key Question 4 after the leading of evidence in Glasgow III we must also address whether it is necessary for the Inquiry to look for or consider any other epidemiological reports.

440. The Inquiry came about because of concerns about numbers of infections amongst paediatric haemato-oncology patients in the Schiehallion Unit. Those are some of the most vulnerable patients in terms of risk of infection. A key question is whether the rates of infection in the Schiehallion Unit from 2015 were unusual.

441. There was a wide consensus amongst witnesses that the most appropriate comparison between the Schiehallion Unit was with other paediatric haemato-oncology units across the UK. It is clear that there are different ways to do this and HPS (as Ms Imrie explained) felt unable to carry out such a comparison given the sort of data they felt they could obtain from units in England and Wales. Mr Mookerjee did carry out a comparison exercise and it has clearly not been straightforward, but he did show that a comparison could be made between a rate of infections associated with the core Schiehallion Unit wards and a rate of infections in four comparator paediatric haemato-oncology units all using admissions as the measure of activity.

442. The evidence of Professor Stevens (who clearly has the expertise to know) was able to reassure the Inquiry that although the four comparator units were different in size and scope of activity taken together, they had some similarities and Mr Mookerjee explained that an aggregate total rate of infections for those units would smooth out any differences.

443. Whilst it must be acknowledged that that there are strong views held (particularly by Dr Kenndy and HPS/ARHAI witnesses) that the most useful measure of activity was occupied bed days, as the comparator units could not provide such data, the comparison between the Rate of Infection in the Schiehallion unit and the comparator units had to be done with admissions as the measure of activity, but reassurance should be derived from the similarity in rates of change between infection rates from 2015 to 2018 in Ward 2A whether measured with occupied bed days or admissions.

444. Whilst some NHS GGC witnesses derive comfort from the HPS comparison of infection rates between the whole of the RHC and the combined whole of the Aberdeen and Edinburgh children’s hospitals, such a comparison appears

flawed as small numbers of particularly vulnerable paediatric haemato-oncology patients in each hospital will have their risk of infections diluted by larger numbers of other patients.

445. The question now arises about whether there would be any value at seeking further epidemiological comparison with rates of infection in other hospitals whether in Glasgow or elsewhere. What would be the point of comparing infection rates in a relatively small unit, with small number of intensely vulnerable paediatric haemato-oncology patients in the Schiehallion Unit, and with the infection rates faced by large numbers of largely adult and less vulnerable patients in the sort of large teaching hospitals with A&E department, a regional cancer centre for adult patients or even some of the large district general hospitals that exist in Scotland.

446. Not only would such an exercise not involve a comparison of comparable things, but it seems significant that it was not proposed or carried out by HPS or NHS GGC in the autumn of 2019 when the question of whether infections were above 'background rates' were at the fore in the IMT and executive circles within NHS GGC, but also is clearly not proposed in the Public Health Commentary produced by Dr Crighton for NHS GGC in response to the draft of the Case Notes Review Overview Report that was shared with NHS GGC in February 2021.[3079]

447. The Inquiry has the epidemiological data analysis that it needs and there is no good reason to seek more.

[3079] See Bundle 27, Vol 6, Doc 29, Page 310.

7.4 Key Question 4 - Is there an infection link?

448. This section addresses Key Question 4 by reference to the evidential contributions of Dr Mumford and Ms Dempster, and insofar as they might offer expertise of specialist knowledge of a particular subject or subjects Dr Inkster, Professor Leonord, Professor Wilcox, Dr Peters, Ms Devine, Ms Rankin, Ms Imrie and Professor Stevens. The section relies upon the earlier section of this chapter that addresses the epidemiological reports that are available to the Inquiry

449. The approach taken is to first summarise the experience of Dr Mumford and Ms Dempster and their initial conclusions in their Quantitative Report of 24 May 2024[3080] and their Direction 5 response of 11 August 2024[3081]. That is followed by a review of key piece of evidence from persons of skill and expertise who gave evidence in Glasgow II and III on Key Question 4 and a summary of the opinions of Dr Mumford and Ms Dempster in their Addendum Report of 30 October 2024[3082] and their evidence in the two final days of Glasgow II: Tuesday 12 and Wednesday 13 November 2024.

450. The Section the proposes an answer to Key Question 4, that being:

- [4] Is there a link, and if so in what way and to what extent, between patient infections and identified unsafe features of the water and ventilation systems?

<u>The Inquiry's Appointed Experts</u>

Dr Sara Mumford

451. Dr Mumford is an experienced Consultant Microbiologist who was appointed Director of Infection Prevention and Control (DIPC) to Maidstone and Tunbridge Wells NHS Trust in November 2007 where she fulfils the statutory duties of the DIPC as laid down in the Health and Social Care Act 2015. She took the role of Medical Director at Maidstone and Tunbridge Wells NHS Trust

[3080] Bundle 21, Vol 1, Document 4, Page 96
[3081] Bundle 21, Vol 6, Document 4, Page 118
[3082] Bundle 21, Vol 1, Document 11, Page 773

on 1 January 2024 having previously held the positions of Associate Medical Director and Deputy Medical Director. She was appointed as an expert by the Inquiry in 2022.[3083] Dr Mumford had no contact with QEUH/RHC or NHS GGC prior to being instructed by the Inquiry.

452. She is clearly an expert in the field of IPC and Microbiology as it relates to the area of infection prevention and control and whilst her period in office as a Medical Director and Responsible Officer is short, she also has experience in the management of a hospital trust and its clinicians that is of assistance to the inquiry. She made a declaration of understanding of her role as an expert witness.[3084]

Ms Lynda Dempster

453. Ms Dempster is an extremely experienced retired Infection Control Nurse consultant with twenty-five years' experience in IPC at all levels in NHS England in acute hospital, community, and mental health sector of the NHS, having worked at both regional and national level within NHS England and NHS Improvement.

454. Ms Dempster led the national NHS England IPC team in the development and support of the delivery of the Gram-negative reductions and in supporting the development of the Chief Medical Officer's Antimicrobial resistance 5-year action plan and 20-year vision. She explained that the key focus in her later years in practice was around system leadership with the antimicrobial resistance agenda, including infection prevention and control, antimicrobial resistance stewardship, diagnostics, and the management of sepsis.

455. She was the IPC advisor to the Chief Nursing Officer for England and was a key member of UK wide groups and committees, including advising the Department of Health and Social Care. She was appointed as an expert by the Inquiry in 2022.[3085]

[3083] Dr Mumford, Transcript, Day 1, Page 5 and Quantitative Report, Section 2
[3084] Section 2.2, Bundle 21, Volume 1, Page 105 and Ms Dempster, Transcript, Day 2, Pages 37-42
[3085] Ms Dempster, Transcript, Day 1, Pages 5-6 and Quantitative Report, Section 2

456. Ms Dempster is clearly an expert in the field of IPC both as an ICN and in the management and leadership of IPC at the highest level in England. She made a declaration of understanding of her role as an expert witness.[3086]

457. In contrast with Dr Mumford Ms Dempster did have some connection to the QEUH/RHC GGC prior to being instructed by the Inquiry. She addressed this in some detail in paragraph 2.12 of the Quantitative Report[3087] and was asked detailed questions about the very small amount of work she did for the Independent Review and the larger piece of work she did for Case Notes Review.[3088]

458. Her work for the Independent Review was at the start of its work on the occasion of a site visit to the RHC (including Ward 2A and Ward 6A) in February 2020 to give general advice about the role of IPCT, what an IPCT team looks like, what would they do and what would they be expected to do. On that visit she met Professor Leonord and Ms Devine. She explained that, after the visit, she and the microbiologist who was also involved gave some very high-level feedback that it was clean, it was tidy, the staff were very competent in explaining the care of the children very well. On that visit she met the Estates team (including Professor Steele) who explained the work that had already been undertaken on the water system and on the ward and what they were doing in Ward 2A. Ms Dempster thought that later she had seen a draft of part of the Independent Review. and may have provided comments. but could not remember. She no longer has access to her NHS emails and so cannot check back.

459. Ms Dempster's work for the Case Notes Review was clearly more involved as it lasted a few months but can be summarised in simple terms. She was one of the clinicians who helped assemble summaries of data from medical records for the CNR Expert Panel so that they could then review those summaries in the Full Panel Meetings where the decisions were made about individual infections. She did not have a part to play in the decisions the CNR

[3086] Section 2.2, Bundle 21, Volume 1, Page 105
[3087] Bundle 21, Volume 1, Page 106
[3088] Ms Dempster, Transcript, Day 1, Pages 7-17

Expert Panel made about whether there was a connection between individual infections and the hospital environment.

Declaration of Independence

460. It was put to Dr Mumford and Ms Dempster that they both made a declaration of their independence in their report[3089]. Ms Dempster noted that they had been approached by the Inquiry and asked to do this piece of work. They considered everything they were asked to. If they found information that contradicted their initial thoughts, they were under an obligation to produce that. Information which they acquired from either their visit with the independent review or their work for Gaynor Evans did not impact on their conclusions because they were doing two different things. It helped her understand what had been going on quicker. It was contextual.[3090]

461. Dr Mumford explained that their duty to the Inquiry was to provide a report, study the evidence, and report their findings in an unbiased manner. They had to deal with other inquiry experts. They had little connection with Dr Bennett and Mr Poplett. They maybe had a couple of Teams meetings to talk about how they were getting on. With Mr Walker, they had discussions prior to him writing his report. Dr Mumford helped him proofread and edit his report to make it smaller. With Mr Mookerjee, she helped with his methodology and took his advice on the epidemiological process. They were initially doing a joint report, but it was eventually split to separate reports. It was intended that their report would be last one written, and they were asked to consider the other reports.[3091]

Submission on Ms Dempster's status as an independent witness

462. It is submitted that Ms Dempster's involvement with the Independent Review and the Case Notes Review were sufficiently far from the decision-making parts of those two reviews for it to be clear that she has no conflict of interest between her role as an expert witness for the Inquiry and her work for the two

[3089] See Bundle 21, Volume 1, page 105
[3090] Transcript, Dr Mumford and Ms Dempster, Day 2, page 125 to 127
[3091] Transcript, Dr Mumford and Ms Dempster, Day 2, page 127 to 129

reviews. It is however the case that Ms Dempster must have acquired knowledge and understanding of the events in the Schiehallion Unit from 2015 to 2020 as part of her work. There will be anxiety on the part of some Core Participants that she has been improperly influenced, but in reality, this is no different from the vast amount of information that she and Dr Mumford have reviewed and in particular such information (and any NHS GGC perspective) that they received from NHS GGC staff on their visit in March 2023 which is discussed below.

Expert Panel visit to the QEUH in March 2023

463. Dr Mumford and Ms Dempster explained that they attended a site visit at which they saw wards, plant rooms and public parts of the hospital and heard a series of presentations from NHS GGC staff at the QEUH/RHC in March 2023 (along with Dr Walker).[3092] They did not hear from Dr Peters and Dr Inkster.

464. It is submitted that neither Ms Dempster's acquisition of information through her work for the CNR and the Independent Review nor the opportunity that she, Dr Mumford or Mr Walker had to hear from NHS GGC outwith the formal hearings of the Inquiry are fatal to their role as witnesses. Firstly, no prejudice has been caused to NHS GGC by these events. The documentation that Ms Dempster and Dr Mumford have seen all came from and was provided ultimately by NHS GGC, they have always had access to those records and NHS GGC had an opportunity (not afforded to other Core Participants) to set out their position at an early stage.

465. Other Core Participants might feel that the decision of the Inquiry to arrange that site visit in March 2023 and to permit NHS GGC to present to Dr Mumford, Ms Dempster and Dr Walker in some way impacts on the independence of their reports and evidence. We submit that such a concern is not objectively justified. The decision as to what weight to give to their evidence falls to be made now, after they have reviewed a large proportion of the evidence and watched or listened to the evidence of a wide range of

[3092] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 18-27

witnesses (including Dr Redding, Dr Peters and Dr Inkster) and we can see their final conclusions. Given the views that they have expressed on the management of these events by the IPCT and the wider NHS GGC board response, and the opinions they have reached in respect of Key Question 4, there is no basis to consider that their independence as expert witnesses has been harmed. In fact, it is submitted, their early exposure to the approach taken by NHS GGC seems to have assisted them in reaching the conclusions they have eventually reached.

Conclusions on Key Question 4 in the Qualitative Report

466. In their Quantitative Report of 24 May 2024 Dr Mumford and Ms Dempster reached provisional conclusions on Key Question 4.

Direct Risk from Water Systems

467. In respect of the potential for infection risk derived from water system they observed that in respect of the various gram-negative environmental bacteria detected “To see these infections and also isolate them from an environmental source is, therefore, very strong circumstantial evidence that there is an association between them”[3093]. Their final conclusion on infection link addresses the risk posed by the water system. It reads:[3094]

468. 11.32 The measures taken by NHS GGC in response to the high infection rate, point of use filters on water outlets, major remedial works to wards 2A and 2B, with relocation of patients to 6A and 4B, air scrubbers fitted in 6A, chlorination of the entire water system and decontamination of the healthcare environment, suggest that there was some acceptance of the environmental risk.

469. 11.33. In addition, early indications from 2023 blood culture data show that the rate of infection with environmental organisms has fallen following the move of the Schiehallion Unit patients back to ward 2A/2B, suggesting that the

[3093] Bundle 21, Document 4, Para 11.11, Page 176
[3094] Bundle 21, Document 4, Para 11.32 – 11.34, Pages 178-179

remedial actions taken have resolved some or all of the sources of infection.

470. 11.34. On the balance of probabilities, it is our expert opinion that the cases of environmental gram-negative blood stream infections, Mycobacterium chelonae, cryptococcosis and aspergillosis seen in Schiehallion Unit patients were strongly associated with the contaminated water and waste water system and the inadequate ventilation system on wards 2A, 2B and 6A.

Risk related to the ventilation systems

471. In respect of Cryptococcus they were of the opinion that failing to provide HEPA filtered mechanical ventilation to the haemato-oncology (neutropenic) wards, minimal air changes per hour, poor air flow and lack of air-locks allowing air to flow from a general ward into the BMT unit (Ward 4B), reducing the effectiveness of protective isolation, and allowing pigeon ingress into plant rooms, resulted in unmitigated risks which, in their opinion, contributed to the risk of patients acquiring airborne infections whilst in QEUH/RHC.[3095] Their conclusion in respect of infection risk or linkage related to Cryptococcus was that several constituents of the commissioned ventilation system; the low air changes, the lack of positive pressure, the lack of HEPA filtration, the use of chilled beam units and the use of thermal wheels, individually and together created an avoidable risk of infection for the Schiehallion cohort of patients.[3096] In day 2 of their evidence they were asked further questions on the issue of Cryptococcus and infection risk and developed their conclusions further.

472. Entry of Aspergillus into a ventilated room can be prevented by HEPA filtration. The low ACH in both Wards 2A and 6A would reduce the clearance from the air by dilution of any fungal particles. In their opinion, the lack of positive pressure and HEPA filtration, allowing fungal particles to enter bedrooms, combined with the low ACH presented an avoidable increased risk of airborne infection such as Aspergillus.[3097]

[3095] Bundle 21, Document 4, Para 10.28 at page 172
[3096] Bundle 21, Document 4, Para 11.30. Page 178
[3097] Bundle 21, Document 4, Paras 10.44-10.46, Page 174

473. In respect of the need to remove droplets and aerosolised contamination by adequate ventilation and clean air flows:

> 11.19 This was not the case in the Schiehallion unit, or indeed in the rest of the hospital (apart from ward 4B) as the ventilation system did not meet the expected number of air changes per hour. The windows were sealed so there was complete reliance on the ventilation system which had been designed to save energy without regard to the other function of ventilation in healthcare settings, to dilute and remove airborne pathogens.
>
> 11.20. The Schiehallion unit patients were neutropenic and ward 2A should have had HEPA filtered ventilation throughout, with positive pressure of 10Pa in the bedrooms compared with the corridor, sealed ceilings and pipework in order to maintain the positive pressure and 10 air changes per hour with a clean air flow from the bedroom, out through the en-suite to the extract. Other features should have been pressure monitoring and an airlock entrance to the ward, and chilled beam units should not have been fitted.
>
> 11.21. The risk created by derogating the ventilation down to no HEPA filtration, neutral or negative pressure compared with the corridor, potential for mixing extract and supply air, unsealed suspended ceilings and just 2.5 air changes per hour with chilled beams fitted has proved to be unacceptably high as evidenced by the level of remedial work carried out in the ward since 2018.[3098]

474. They were of the opinion that the design and installation of the ventilation system was non-compliant to the SHTM standards at the time of commissioning and as a result caused an avoidable risk to patients.[3099]

Principles and Practice of IPC and Management

475. In addition to a detailed chapter on the principles and practice of IPC in their Qualitative Report at Chapter 3 the opportunity was taken in oral evidence to ask further questions about both IPC practice and, in Dr Mumford's case, her opinions on issues of wider hospital management.

[3098] Bundle 21, Document 4, Paras 11.18-11.21
[3099] Bundle 21, Document 4, Para 11.25

The role of a DICP in NHS England

476. Dr Mumford gave detailed evidence the role of DIPC, how they are requirement of the Health and Social Care Act 2015, the nature of the relationship between DIPC and Medical Director, how it is possible that a DIPC might not be an IPC 'subject matter expert' and how the DIPC would generally be member of the Executive Board. In light of the fact that at NHS GGC during the events the Medical Director was not an IPC expert, but held the role of HAI Lead, it is significant that Dr Mumford was of the view that in England it is essential that a non-subject-matter expert DIPC should have a strong subject-matter-expert deputy who can then be that channel between the rest of the team and the DIPC and advise them. It's that advice which is really important so that-- because it's the DIPC who is speaking to the Board. They have to be on top of the subject at that point, so they need a very strong relationship between them and their expert deputy. She went on to explain that if you hold a role like DIPC, you need to do some professional development on an annual basis related to that role.[3100]

Dr Mumford and Ms Dempster on the role of executive decision makers

477. Later on, in the first day of her evidence, Dr Mumford explained the importance of the formal governance route from the Lead ICD to the Medical Director should be direct and part of the formal governance route with an ability for rapid escalation. She was concerned that the reporting via the AICC and BICC does not lead itself to urgent action given the meeting cycles.[3101] She also took the opportunity to comment on the amount of expectation placed on Dr Inkster as chair of the IMT, without the associated authority to take action, and how there needed to be a better escalation route to allow the chair of the IMT to escalate in a much more formal way to something like the review group that decided that they would do the decant from Ward 2A/2B into 6A. That said, she was concerned that there was nobody from infection control at that meeting, as such a process needs the subject matter expert to come along, brief that meeting and make some recommendations in person

[3100] Dr Mumford, Transcript, Day 1, Pages 27-33
[3101] Dr Mumford Transcript, Day 1, Pages 180-183

so that they can be questioned. She felt that Dr Inkster and Professor Gibson should have been in the room.[3102]

478. Both Dr Mumford and Ms Dempster were very clear that Board was the ultimate decision maker on whether to decant or whether to close a ward to admissions. These are very big decisions and should not have been left to the chair of an IMT, but made at a higher level, so the executive seems to be the correct place, with the executive who has the HAI responsibility present for that decision.[3103]

479. In response to question proposed by Core Participants Ms Dempster was asked what the key learning points she would highlight in looking at the management responses of NHS GGC between 2015 and 2019. Ms Dempster highlighted moving into the hospital when there were unknown risks around the water and risk assessment. You would not want to be finding the holes months down the line. The ventilation was discovered when problems started to arise. Once cases happened, they appear to have been investigated individually, then they saw more linkage. The IMTs were then started and convened and were going through the cases. Ms Dempster struggled with the concept of how it was not taken as seriously as it should have been. Such as at the beginning of the water incident.[3104]

480. Dr Mumford would go back further. One of the frustrations that is common is that IPC is quite often presented with a drawing of the hospital and asked if it is ok. They are not involved in having proper input into what they want the building to do and what would be appropriate for each patient group. It should be done in a more structured way going forward with more specialist knowledge. There was a lot of IMTs even for a hospital the size of the QEUH/RHC. She would imagine if a board was faced with the number of IMTs in 2017 they would ask if that was normal. The Lead ICD was also chairing the IMTs, and the support was not there. She thought that the point at which the IMTs started to struggle, and they realised how big the water incident was,

[3102] Dr Mumford Transcript, Day 1, Pages 183-185
[3103] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 188-189
[3104] Transcript, Dr Mumford and Ms Dempster, Day 2, page 94 to 97

Dr Armstrong should have stepped in as HAI Lead to say an IMT was not the right process. That was the middle of 2018 when they first started to realise it was such a big incident. Dr Mumford would have hoped if she had been in that situation she would have said the IMT was not appropriate. It needed executive leadership. Dr Inkster suggested an executive support group. She wanted someone to report to. She did not suggest they would take over. Dr Mumford was suggesting that there should have been a takeover by the HAI lead and Director of Estates or the Operations Director. You need the Lead ICD to sit in and advise. Issues like a decant and stripping out a ward are too big for the Lead ICD to have responsibility for.[3105]

The Duties of a Responsible Officer

481. Given the evidence heard earlier from Dr Armstrong about her views of the behaviour of Dr Peters and Dr Inkster, Dr Mumford was asked about her understanding of the responsibilities of a Responsible Officer. She explained that the Responsible Officer is a statutory post with responsibility for ensuring that the doctors working in the organisation (not including those on training programmes) are fit to practise. That is done by an annual appraisal, multi-source feedback on a five-yearly cycle basis, and knowledge of complaints, incidents and any other intelligence and then, once every five years, the Responsible Officer makes recommendations as to whether or not the doctor should be revalidated.[3106]

The relationship between ICNs and microbiologists

482. In light of the evidence about whether IPC was a “nurse led service”, and evidence of tensions between some members of the NHS GGC IPC and microbiologists, Ms Dempster explained that in part because microbiologists often provide the only out of hours IPC service through their on-call duties the connection between ICNs and microbiologist requires good communication and respectful working with each other. A microbiologist will have certain expertise, and perhaps a nurse who has recently been working in a clinical

[3105] Transcript, Dr Mumford and Ms Dempster, Day 2, page 97 to 103
[3106] Dr Mumford, Transcript, Day 1, Pages 33-36

area will understand far more about the practicalities of a Hickman line than the consultant microbiologist who has never probably cared for one. She described the relationship about working jointly to get joint working and communication.

483. Ms Dempster felt that people see IPC as a nurse led service because, in any team, there's probably far more nurses than any other specialty. So, on a day-to-day basis, working, dealing with the issues, visiting the clinical areas, visiting patients, talking with patients, staff, probably the nurses are doing the bulk of that work. 'In all my roles, even in the acute trust, I've led the team working with microbiologists or pharmacists or Estates people'.[3107]

484. Dr Mumford described how there has to be a very respectful and close working relationship with a lot of trust, so that the microbiologists will tell the IPCT things, but also that the IPCT are able and competent to go and deal with that, because microbiologists don't go and "do the do". She saw microbiologists as getting involved where there's a tricky problem or something unusual in the case, but the ICNs going off the wards and "do the do", doing the audits, checking on people and then coming back to microbiologists and saying, "Actually, could you just go and have a look at this patient? I don't think they're doing very well, and I think they need your input."[3108]

Sources of Evidence

485. Dr Mumford and Ms Dempster discuss the various sources of information they have used in Chapter 6 of their Quantitative Report. Given the number of new documents and reports that had become available, or which had received greater attention since they produced their Qualitative Report, Dr Mumford and Ms Dempster were asked about whether they had considered specific pieces of evidence.[3109] These included:

[3107] Ms Dempster, Transcript, Day 1, Pages 39-43
[3108] Dr Mumford, Transcript, Day 1, Pages 43-45
[3109] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 45-

- Mr Poplett's Report on Water[3110]
- Mr Bennett's Report on Cryptococcus[3111]
- The Direction 5 response dated 11 July 2024[3112], Supplementary Report – 12 August 2024[3113] and Addendum – 16 October 2024[3114] and additional chart of Mr Mookerjee[3115].
- The report by C Peters and K Harvey-Wood, Bacteraemia rates and resistance patterns in paediatric haematology/oncology patients 2014-2018 - 10 October 2018[3116] and the presentation: Bacteraemia rates and Resistance Paediatric Haemato-oncology 2014-2018, 30 August 2018.[3117]
- The Presentation by Dr Iain Kennedy and Jennifer Rodgers – Paediatric Haemato-oncology RHC – Summary of Data – September 2019 - Presented at IMT meeting of 20 September 2019.[3118]
- Professor Evan's work on Whole Genome Sequencing[3119]
- The report by Professor Leonord and Mr Brown on Whole Genome Sequencing[3120]
- The report by Ms Lee in Bundle 8, Document 32, Page 134

486. Dr Mumford and Ms Dempster were asked what use they had made of the draft report of I Storrar and A Rankin, Report on the findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children water contamination incident and recommendations for NHS Scotland - 01 August 2018,[3121] as NHS NSS felt it important to

[3110] Bundle 21, Vol 1, Document 6, Page 354
[3111] Bundle 21, Volume 1, Document 9, Page 738
[3112] Bundle 21, Volume 6, Document 3, Page 104
[3113] Bundle 21, Volume 1, Document 3, Page 71
[3114] Bundle 21, Volume 1, Document 10, Page 767
[3115] Bundle 27, Volume 18, Document 1
[3116] Bundle 19, Document 19, Page 143
[3117] Bundle 27 Volume 6, Document 9, page 107
[3118] Bundle 27, Volume 13, Document 13, Page 77
[3119] Bundle 6, Documents 44,45 and 46
[3120] Bundle 6, Document 40, Page 1195
[3121] Bundle 19, Document 21, Page 174

emphasise that it was a draft report that was never finalised. Ms Dempster explained that they had used it for a summary of the background of what was going on in the organisation and had not relied on the draft opinions of Mr Storrar and Mrs Rankin expressed in it.[3122]

487. In their oral evidence Ms Dempster and Dr Mumford confirmed that they watched or listened to the evidence of the following witnesses[3123]:

Witness	Mumford	Dempster
Dr Armstrong	Yes	Yes
Dr Crighton	Yes	Yes
Dr David Stewart	Yes	Yes
Dr Deighan	Yes	Yes
Dr Inkster	Yes	Yes
Dr Lee	Yes	Yes
Dr Peters	Yes	Yes
Dr Walker	First hour	Yes
Karen Connelly	Yes	Yes
Mr Bennet	No	Yes
Mr Mookerjee	Most of his evidence	Yes
Mr Poplett	No	Yes
Mr Walsh	Yes	Yes
Ms Devine	Yes	Yes
Ms Evans	In part	Yes
Ms Joannidis	Yes	Yes
Ms Pritchard	Yes	Yes
Ms Rankin	Yes	Yes
Professor Dancer	Yes	Yes
Professor Leonord	Yes[3124]	
Professor Stevens	A small part	Yes
Professor Wallace	Was not sure	
Professor Wilcox		Yes

[3122] Dr Mumford and Ms Dempster, Transcript, Day 1, Page 49
[3123] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 50-54
[3124] Dr Mumford, Transcript, Day 1, Page 190

Witness	Mumford	Dempster
Susan Dodd		Yes

The different sorts of infections

488. In Chapter 7 of the Qualitative Report Dr Mumford and Ms Dempster described what was a relevant infection in some detail, but the opportunity was taken to ask questions in order to understand the relevance of various groups or classes of microorganisms that have been talked about in evidence.

Unusual micro-organisms

489. Ms Dempster considered an unusual micro-organism to be one she had not heard of before, in the sense that when working daily in IPC there would be certain organisms that you hear of regularly, would know what they were, what was the potential for infection and what you needed to do with them. In contrast an unusual one would be when the ICN needed to think, "I don't know what to do with that. What do I need to find out about it?" She accepted that this would be a subjective measure that would depend on the experience of the person involved.[3125]

490. Dr Mumford also saw an unusual micro-organism in a subjective sense, but this time from the perspective of a biomedical scientist who would come out of the lab and say, "Guess what we've got." However, she did explain that there are uncommon organisms that are not unusual in that sense and used the example of, Neisseria Meningitidis, which causes meningococcal meningitis for which children are vaccinated. For her an unusual micro-organism is one that you see growing, and which comes as a complete surprise, that doesn't attach itself to a recognised syndrome, and it's something that, as a microbiologist, would make you sit up and go, "I'm going to go and see that patient because that's an interesting one." She did feel that there was an aspect of this concept that might involve a micro-organism that is out of place, but that it would not be possible to write down a list of unusual micro-

[3125] Ms Dempster, Transcript, Day 1, Pages 55-57

organisms.[3126]

Environmental Gram-negative bacteria

491. Dr Mumford's explanation on the differences between Gram-negative and Gram-positive bacteria has been incorporated into Chapter 4 and their involvement in the selection process for the infections considered by Mr Mookerjee is set out in Chapter 7.3.

492. Dr Mumford was taken to the environmental bacteria group and the environmental including enteric group defined in the *Draft HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019*[3127]. She explained that[3128]:

> The 'Environmental Bacterial Group' are all known to be found in the environment and to flourish in that environment, so related to water, soil, etc. and whilst some of them are more unusual than others they are all organisms which have been seen in water contamination.
>
> The 'Environmental including Enteric (ENT) group' which adds in Citrobacter, Enterobacter, Klebsiella, Pantoea and Serratia, have the potential to be connected to water and ventilation systems to some extent, or even a large extent. That Klebsiella would be found in drains rather than in water supply, preferentially, but all of them could contaminate a water system. She explained that Citrobacter, the Enterobacter, Klebsiella and Serratia are not uncommon in clinical infections, but Citrobacter and Serratia are less common in bloodstream infections and are more common in urinary tract infections – but that Enterobacter and Klebsiella would be commonly found in blood cultures.

493. Dr Mumford was taken to in the HPS GGC Situational Assessment RHC Wards 2a 2b Draft – 5 June 20195 June 2019[3129]and observed that[3130]:

> The Environmental bacteria grouping it was very similar to the later HPS list discussed above. She considered that this list absolutely has the potential to be

[3126] Dr Mumford, Transcript, Day 1, Pages 57-60
[3127] Bundle 7, Document 6, Page 214 at page 219
[3128] Dr Mumford, Transcript, Day 1, Pages 75-77
[3129] Bundle 7, Document 5, Page 194, particularly Appendix 4 at page 205 at Page 205
[3130] Dr Mumford, Transcript, Day 1, Pages 81-

connected to the water and/or the ventilation systems and contains no microorganisms that are generally unconnected to the environment.

In respect of the non-environmental bacteria grouping that is correctly a list of non-environmental bacteria apart from the Mycobacterium – because some of the non-tuberculous Mycobacteria are associated with the environment – and the Raoultella and Roseomonas have been found associated with the environment.

Dr Kennedy's list of bacteria

494. Dr Mumford and Ms Dempster were taken to the two reports produced[3131] by Dr Kennedy in 2018 and then in 2019 and his evidence that it was used as a case definition in a list of microorganisms provided to him by Dr Inkster in early 2018 was put to her. This list can be found on Bundle 6, Page 121. They were each asked which of these bacteria were 'unusual micro-organisms'.

495. Ms Dempster was of the view that only Stenotrophomonas maltophilia, Serratia in general, Pseudomonas, Morganella Morganii, Klebsiella, Enterobacter and Acinetobacters at genus level would not be unusual micro-organisms'.[3132]

496. Dr Mumford was the asked whether these organisms had a background rate. She interpreted a micro-organism with no background rates as one a consultant microbiologist would see once, twice or three times in a career. She explained that in her opinion there was no background rate for the following organisms there listed: Achromobacter xylosoxidans, Acinetobacters Iwoffi, Burkholderia, Cedecea lapagei, Chryseobacterium indologenes, Commamonas testosterone, Cupriavidus gilardii, Cupriavidus pauculus, Delftia acidovorans, Elizabethkingia meningospetica, Pantoea agglomerans, Paracoccus sp, Pseudomonas chlororaphis, Pseudomonas fluorescens, Pseudomonas oryzihabitans, Pseudomonas putida, Pseudoxanthomonas Mexicana, Ralstonia picketii, Rhizobium radiobacter, Serratia fonticola, Shewanella puterfaciens, Sphingomonas species and Stenotrophomonas maltophilia. She explained that there is a background rate for Enterobacter

[3131] Bundle 6, Documents 27 and 28
[3132] Ms Dempster, Transcript, Day 1, Pages 84-86

cloacae, Klebsiella pnuemoniae, Morganella morganii, Pseudomonas as a genus, Serratia as a genus, Stenotrophomonas maltophilia. Dr Mumford accepted that there would be an association between this group and contamination in the water system. [3133]

497. It notable that this analysis was broadly similar to the evidence of Dr Inkster, except Dr Mumford saw that at genus level (but not at species level in the original list) there would be a background rate for Pseudomonas and Serratia and in contrast with Dr Inkster Dr Mumford considered that there is a background rate to Stenotrophomonas maltophilia.

The case definition of the CLABSI data set

498. It was helpful to have Dr Mumford and Ms Dempster to confirm that whether an infection is assessed as a CLABSI central line infection depends not on the species or genera of the micro-organism, but whether the patient has a blood stream infection with no other obvious cause and a central line. In light of the significance placed by NHS GGC on the reduction in rates of CLABSI infections after 2018, Dr Mumford's evidence that if there was to be a group of patients in a unit where you do not have any issues with the environmental infection risk, then you would see CLABSIs much more due to Staphylococci and other gram-positives rather than the gram-negatives. The gram-negatives would be less common in the group of CLABSI infections. [3134]

Understanding the diversity of microorganisms in the RHC

499. In light of evidence from many other witnesses about the extent of diversity in the types of bacteraemia in patients in the Schiehallion Unit Dr Mumford was taken to Figure 4 in Appendix 4 to *HPS GGC Situational Assessment RHC Wards 2a 2b Draft – 5 June 2019*[3135]. Dr Mumford interpreted it as showing that in the Schiehallion at Yorkhill there was a small number of environmental infections with environmental organisms which increased when services moved to the RHC. She was asked if there anything about the nature of the

[3133] Dr Mumford, Transcript, Day 1, Pages 86-92
[3134] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 92-96
[3135] Bundle 7, Document 5, Page 194, particularly Appendix 4 at page 211

population of these bloodstream infections that is interesting and responded at the figure shows a move to an increased number of the more unusual infections with unusual species withing genera that are not at that level unusual. She saw the Cupriavidus as particularly unusual.[3136]

500. Dr Mumford was taken to Figure 9 *Draft HPS Review of NHS GG&C Infection Outbreaks in the Paediatric Haemato-oncology Data October 2019*[3137]. Dr Mumford interpreted that the middle column was showing that in the RHC in Wards 2A/2B there was increased variation in the environmental organisms and that then (in the right hand column) in Ward 4A/6A there are more of the organisms that perhaps might have a background rate, but there are also some more unusual organisms creeping into that list as well including ones without a background rate like Achromobacter, Chryseobacterium, and Elizabethkingia.[3138]

Dr Walker and the meaning of 'contaminated water'

501. Dr Mumford responded robustly to any suggestion that their conclusions are undermined or unsupported because of their heavy reliance on the opinions of Dr Walker and particularly what NHS GGC would describe as him setting a rather impossible standard for water contamination. She explained (and Ms Dempster agreed) that:

> "Dr Walker is a renowned expert in the area of water and water systems. Part of our instruction from the Inquiry was to take into account, when we wrote our report, the other experts' reports because we're clearly not water experts to the same extent that Dr Walker is. So that's what we did, but I think, in doing that, I don't feel that it undermines our report in any way because we took expert evidence and used it, as we did with all the other evidence that we reviewed and considered and put together within our report"[3139]

502. In respect of the issue of water contamination Ms Dempster explained that they had seen other evidence that supported the conclusion that there was

[3136] Dr Mumford, Transcrpt, Day 1, Pages 98-100
[3137] Bundle 7, Document 6, Page 214 at page 233
[3138] Dr Mumford, Transcript, Day 1, Pages 96-99
[3139] Dr Mumford, Transcript, Day 1, Pages 100-101

water contamination. These included what was said in IMT minutes and the Water Technical Group from April 2018 and the report from the 'Water Incident' IMT that there was evidence of microorganisms in the water and a potential connection to the children and their bloodstream infections[3140].

503. Dr Mumford understood that water would be contaminated if it contains multiple bacteria to an extent that patients are at risk of infection[3141]. Ms Dempster considered it the case that NHS GGC did think the water was contaminated in 2018 because of the actions they took such as POUFs and fitting a Chlorine Dioxide dosing system.[3142]

504. Dr Mumford explained that whilst she accepted that exceedance of a standard or guidance threshold would be a means of deciding whether a hospital water system is 'contaminated' or whether that contamination is 'widespread' or 'systemic' if there was such a standard, but because there is not, the only approach is to have reporting systems and good governance systems, and to ensure that the water safety plan is in place and is followed, that reporting to the Water Safety Group and beyond is as it should be, that that Water Safety Group has the right membership of people who will be able to identify risk, whether that's actual risk related to the water itself or risk that is becoming evident within the patient population, and ensuring that there are appropriate escalation processes in place. If that was all in place she would expect to see evidence in the minutes of the Water Safety Group. Ms Dempster agreed and was the view that she would expect to see evidence in the minutes of discussion of compliance with L8.[3143]

505. Dr Mumford rejected the idea that the absence of standards for organisms other than Legionella and Pseudomonas would mean that it is not possible to say there are such contaminants. She was clear that if there isn't a standard, the conclusion still needs to be reached that patients are being put at risk and

[3140] Ms Dempster, Transcript, Day 1, Pages 101-103
[3141] Dr Mumford, Transcrpt, Day 1, Page 105
[3142] Ms Dempster, Transcript, Day 1, Page 109
[3143] Dr Mumford and Ms Dempster, Day 1, Pages 118-120

steps need to be taken with the Estates team to mitigate that risk.[3144]

Alert lists, surveillance the collection of data by hospitals

506. In light of Question 11 in their Direction 5 response[3145] Dr Mumford and Ms Dempster were asked if they could provide an example of a health board or an NHS trust which had, in 2016, set up "a proactive surveillance of environmental organisms may have acted as an early warning system and allowed correlation of different organisms which [would] have remained otherwise unconnected". Their evidence was that such surveillance is widespread in England and that it is not an unusual task.[3146]

507. Dr Mumford and Ms Dempster were asked to expand on their answer to Question 16 in their Direction 5 response[3147] and to what extent was the amount of water testing that in Dr Chaput's data from 2015 and 2016 comparable to the water testing rates expected in an English hospital at the same time. Dr Mumford was clear that because each single room had potentially three outlets the number of tests, maybe two or three for the whole Schiehallion unit at one time was not representative of what was going on when a single sample is only representative of its room. They did not feel that the numbers of tests that were done were representative of the large number of augmented care and risk units that they had in the hospitals. Ms Dempster was also expecting an ICP driven response to the risk identified in the DMA Canyon reports which did not come[3148]

<u>What would Dr Mumford and Ms Dempster have done in these circumstances</u>

Ms Dempster as an ICN

508. Given her profound experience as an ICN Ms Dempster was asked a series of questions designed to discover how she would have acted had she been standing in the shoes of ICNs and Nurse Consultants at various key points in

[3144] Dr Mumford, Transcript, Day 1, Page 108
[3145] Bundle 21, Volume 6, Document 4 at page 124
[3146] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 112-114
[3147] Bundle 21, Volume 6, Document 4 at page 127
[3148] Dr Mumford and Ms Dempster, Transcript, Day 1, Page 113-118

the events at the QEUH/RHC.

- She had no issue with the decision so proceed with paediatric BMT in Ward 2A in June 2015 and to return the adult BMT service to the Beatson.[3149]

- Ms Devine was right to be concerned about the discovery that there no HEPA filters, holes in the walls and ceiling tiles in the isolation rooms in Ward 2A.[3150]

- In respect of the meaning of 'neutropenic ward' in SHTM 03-01,[3151] from her perspective as an ICN and not a ventilation expert, Ms Dempster was of the opinion that a 'neutropenic ward' did not mean a ward where all of the patients were always neutropenic, because there will be groups of patients such as haematology oncology patients and transplant patients who, whilst nearly all of them are going to be immunocompromised or neutropenic for most of their stay will end up in other parts of the hospital for clinical reasons.[3152] Specifically her opinion was that Ward 2A would be a 'neutropenic ward' particularly because the children and young people on that ward would probably come out of their rooms as well and mix in different areas. She agreed with Dr Mumford that the whole of Ward 4B would be a 'neutropenic ward' for broadly the same reasons [3153]

- The SBAR produced by Dr Inkster in June 2016 after she learned that the whole of the hospital (outside specialist ventilation isolation rooms) was running at 3 ACH not the 6 ACH required by SHTM 03-01[3154] was put to Ms Dempster. She felt it important that it was focused only on patients who might have an infection and how they might pose a risk to others and does not address patients who do not yet have an infection. She would have wanted to see a proper patient placement exercise carried out to match

[3149] Ms Dempster, Transcript, Day 1, Page 121
[3150] Ms Dempster, Transcript, Day 1, Page 122
[3151] Bundle 15, Document 5, Page 483
[3152] Ms Dempster, Transcript, Day 1, Pages 127-128
[3153] Ms Dempster, Transcript, Day 1, Pages 129-130
[3154] Bundle 4, Document 11, Page 52

patients to the appropriate ventilation standards.[3155] Ms Dempster was specifically asked about how the first recommendation that all doors should remain closed would be implemented as a practical matter, and explained that it would be difficult as there are times when a door needs to remain open and so a blanket policy would not work. She agreed with the suggestion that it would be hard to implement such a blanket policy (other than in cases of patients with infections) without telling staff the reason.[3156]

Dr Mumford as an ICD and Microbiologist

509. Given her profound experience as an IDC, DIPC and now Medical Director Dr Mumford was asked a series of questions designed to discover how she would have acted had she been standing in the shoes of ICDs and senior clinicians at various key points in the events at the QEUH/RHC.

- She was of the view that once it had become clear that Wards 2A and 4B were not specified as clinicians expected, there should have been a full, multidisciplinary full risk assessment for those patients and a risk-benefit analysis of whether they should stay where they are or move, or, in the case of a child, whether the transplant should be done in Glasgow or somewhere else. Then once that had been done, she would have looked at the Estates issues and worked out how far the issues could be mitigated to get the best possible outcome going forwards and what that work would look like. This later task would be more than just a meeting, it would take weeks, if not a few months to get the detail to inform those future decisions.[3157]

- She had no issue with the decision to proceed with paediatric BMT in Ward 2A in June 2015 and to return the adult BMT service to the Beatson, because a risk assessment was done, and the necessary multidisciplinary team conversations had taken place.[3158]

[3155] Ms Dempster, Transcript, Day 1, Pages 132-134
[3156] Ms Dempster, Transcript, Day 1, Pages 136-138
[3157] Dr Mumford, Transcript, Day 1, Pages 122-124
[3158] Dr Mumford, Transcript, Day 1, Pages 124-125

- She was of the view that when asked to sign off the return of the Adult BMT service in December 2015, Dr Inkster was placed in a really difficult position because she was not given the information that would enable her to be confident about making that decision and taking the responsibility on behalf of the Board for making that decision. In her words it was "a lot to ask of an infection control doctor to make that kind of decision". It shouldn't be a decision that is made at ICD level.[3159]

- In respect of the meaning of 'neutropenic ward' in SHTM 03-01[3160] from her perspective as an ICD and not a ventilation expert Dr Mumford was of the opinion that a 'neutropenic ward' would be a ward where the majority of the patients were neutropenic for the majority of the time.[3161] Dr Mumford agreed with Ms Dempster that that Ward 2A would be a 'neutropenic ward' particularly because the children and young people on that ward would probably come out of their rooms as well and mix in different areas. She also considered that the whole of Ward 4B would be a 'neutropenic ward' for broadly the same reasons. [3162]

510. Dr Mumford was not so clear about Ward 4C. The email from Dr Alistair Hart to Dr Inkster on 6 December 2018 about Ward 4C[3163] we he described that ward as constantly having patients who are neutropenic was put to Dr Mumford and she explained that it would be a very high bar for Ward 4C to be a 'neutropenic ward' as neutropenic patients do go home, and the email did not apply to all patients on the ward. Ms Dempster agreed.[3164]

511. The SBAR produced by Dr Inkster in June 2016 after she learned that the whole of the hospital (outside specialist ventilation isolation rooms) was running at 3 ACH not the 6 ACH required by SHTM 03-01[3165] was put to Dr Mumford and she also felt it was incomplete as it needed supplementary work on vulnerable patients and the implications for them. The impression gained is

[3159] Dr Mumford, Transcript, Day 1, Pages 125-126
[3160] Bundle 15, Document 5, Page 483
[3161] Dr Mumford, Transcript, Day 1, Page 128
[3162] Dr Mumford, Transcript, Day 1, Page 129-130
[3163] Bundle 27, Volume 7, Document 19, Page 375
[3164] Dr Mumford and Ms Dempster, Day 1, Pages 131-132
[3165] Bundle 4, Document 11, Page 52

that it was not a sufficiently detailed response.[3166]

512. Dr Mumford was asked about the management implications of having a large hospital designed with thirty something PPVL rooms, and the rest of the rooms, all 3 air changes an hour, single rooms. Her opinion was that issue would arise as the hospital manager would have to have some sort of method of prioritising patients so that those with the greatest need end up in the better or the correctly ventilated rooms for their need. She described this as really complex, and you have to have a really good method of managing your beds in order to do it. She compared this to the problem in most hospitals of making use of side rooms but considered this task to be much more complex and one that became a great issue during the pandemic.[3167]

513. Dr Mumford was of the view that in respect of the decant from Wards 2A/2B to 4B/6A, the decision to decant the ward in order to really get a grip of what was going on was an absolutely understandable decision. She felt that if there was an idea that it was to be a short decant it would make the decision easier to make. Had they been thinking of a longer term decant it would have changed the risk profile and the decision makers would have had to think harder about it.[3168]

Consideration of the views of others

Mr Mookerjee's epidemiology work

514. The evidence of Dr Mumford and Ms Dempster about their involvement in the development of the methodology of Mr Mookerjee's epidemiology work is discussed in Section 7.3 of this chapter.

515. Dr Mumford was asked about the statement in the Qualitative Report where they suggested that the Schiehallion unit is, in effect, used as a proxy for the hospital and as a whole to identify the overall risk. She explained that what they meant was that as the Schiehallion Unit patients were the most

[3166] Dr Mumford, Transcript, Day 1, Page 131 to 135
[3167] Dr Mumford, Transcript, Day 1, Pages 139-141
[3168] Dr Mumford, Transcript, Day 1, Pages 183-187

vulnerable patients in the RHC, they are vulnerable for a long time and can be exceptionally unwell. In their opinion one can use that group to identify the risk, as one can be reasonably confident that the risk elsewhere is not going to be higher than that, so that gives you a kind of ceiling for your level of risk because these are your most vulnerable group of patients. She accepted the suggestion that their position amounts to the idea that, if there is a problem with the water supply, it will exhibit itself first in this cohort of patients.[3169]

The utility of Whole Genome sequencing ('WGS')

516. Dr Mumford and Ms Dempster address WGS in their report from paragraphs 9.130 to 9.149[3170]. Dr Mumford explained that their primary concern was that the amount of water testing was insufficient to exclude an environmental connection by the absence of close links via WGS. This because multiple different strains exist within water systems. It's not a static population with variation. In order to say there's no link, it would be necessary to identify all of those different strains and all of the different organisms and all the strains of those organisms, and then test them all. She drew attention to the limited numbers of water samples retained, inaccuracy of labelling and absence of information about why those samples were collected and retained.[3171]

517. Dr Mumford was asked about the numbers of 'picks' needed to obtain a sample suitable for work with WGS. This issue had come up in the evidence of Professor Leonord, and Dr Redding and had been addressed by supplementary statements by Dr Peters,[3172] Dr Inkster[3173], Ms Harvey-Wood [3174]and Dr Lee[OBJ][3175] and by Professor Wilcox[OBJ]. Dr Mumford explained that:

- For a patient sample given that one would have a suspicion that there was a particular micro-organism one pick would be sufficient for WGS.[3176]

[3169] Dr Mumford and Ms Dempster, Transcript, Day 1, Pages 154-155
[3170] Bundle 21, Volume 1, Document 4, pages 161-163
[3171] Dr Mumford, Transcript, Day 1, Pages 155-158
[3172] Bundle witness statements volume 12 document 5 page 23
[3173] Bundle Witness statements volume 12 document 4 page 14
[3174] Bundle witness statements volume 12 document 7 page 34
[3175] Bundle witness statements volume 12 document 6 page 29
[3176] Dr Mumford, Transcript, Day 1, Pages 162-163

- For a water sample – perhaps for Stenotrophomonas – one could expect multiple strains, and you would have to pick more. If you have a few colonies on the plate, you should take them all. If many – perhaps 100 - you should take a representative sample which based on the very limited literature she has seen, is probably somewhere around 30 colonies.[3177]

- It is possible that that when WGS shows that two samples from patients are connected to say that those two cases are not connected with each other, but you cannot prove a negative connection to the environment because it's very easy to miss something – and it may be that a biofilm was broken down and sent a shower of Pseudomonas down the pipe and then it stops again. You cannot say, "I've done a couple of water tests. I picked everything. It's not there. Therefore, there's no chance that this water has caused this infection."[3178]

- If there was a circumstance where there are four patients who are closely associated in time, place and person, but WGS show that their infections are not closely connected, they could all have acquired their infection from the water, but what they didn't do was acquire the same strain from the water or acquire it from each other. In her opinion you cannot exclude a connection using WGS because of the diversity of organisms in the water.

518. The critique of laboratory procedures in paragraph 9.132 of the Qualitative Report[3179] is critique of Professor Leonord's report into WGS and not the whole NHS GGC laboratory system. The criticism being of the absence of a sampling methodology or even to refer to the fact that there were SOPs in place.[3180] The hyperbolic attack on Dr Mumford and Ms Dempster in the NHS GGC Direction 5 response[3181] was unjustified.

519. Evidence from Dr Inkster, Dr Peters and Professor Wilcox on WGS and the diversity of biofilm appears relevant here along with Mr Watson's evidence on

[3177] Dr Mumford, Transcript, Day 1, Pages 163-164
[3178] Dr Mumford, Transcript, Day 1, Pages 165-166
[3179] Bundle 21, Volume 1, Document 4, Page 161
[3180] Dr Mumford, Transcript, Day 1, Pages 168-172
[3181] Bundle 21, Volume 4, Document 5 at paras 26-27

difficulties in sampling biofilm water. This can all be found in their section of Chapter 3.

520. Dr Mumford was of the view that Professor Leanord is effectively working with the material he's got, created at a point in the past, and he has to do the best he can, but it was not possible to reach the conclusions he had from the samples available.[3182]

Selection Pressure by Meropenem

521. Dr Mumford had produced the section of the Addendum Report, 30 October 2024[3183] that dealt with the issue of potential Selection Pressure by Meropenem. She had watched Prof Leonord's evidence on this issue and had read the paper provided by the Professor[3184]. She explained she had drawn support from and Article by Massip et al from 2020[3185]. She explained that everybody agrees that Meropenem overuse produces a risk that it will start to select out meropenem-resistant organisms. What you tend to see, if you start increasing the amount of Meropenem in use, is that, over time – and there is always a lag period – that Meropenem resistance will creeping. Then if you reduce the amount of Meropenem you're using because it can't be used as much because you've got a higher percentage of resistance, and then after a lag, you will start seeing normal service being resumed and the resistance levels going down again. But that happens over a long period of time, so going up and coming back down. And, actually, the coming back down again is usually longer than the going up.

522. When taken to the Harvey-Wood graph from which Professor Leonord got his idea[3186] she explained that she had recalculated it to work out resistance rates and that new graph was in their addendum report.[3187] It is possible to see that the percentage rate of resistance is fluctuating quite a lot and the number of

[3182] Dr Mumford, Transcript, Day 1, Pages 173-174
[3183] Bundle 21, Vol 1, Document 11, Page 773
[3184] *Alterations of the Oral Microbiome and Cumulative Carbapenem Exposure Are Associated With Stenotrophomonas maltophilia Infection in Patients With Acute Myeloid Leukemia Receiving Chemotherapy* by Atkins et al which is in Bundle 27, Volume 18, Document 4 page 32
[3185] Bundle 27, Volume 17, Document 29, Page 336
[3186] Bundle 19, Document 19 at page 161
[3187] Bundle 21, Document 11 at page 775

Stenotrophomonas isolated[3188] is skewing the results because they are always resistant to Meropenem. There doesn't seem to be a problem with the meropenem resistance that is driving the organisms and in effect the meropenem resistance is being driven by the number of meropenem-resistant organisms that are there because there's a water problem.[3189]

Role for Root Cause Analysis

523. Ms Dempster was asked what a root cause analysis was. She explained that it was a process commonly used in England that was introduced on the back of infection prevention and control looking at cases of MRSA. It is a structured process to look at a patient's journey. It involves first defining the problem. Then getting the right people together such as the clinician, ward sister/manager, antimicrobial pharmacist, ICD, and ICN. You would then start with the notes and develop a timeline of the care of the patient. Then you look at the different interventions. For instance, if the patient had a Hickman line, you would look at where it was put in, why, and the procedures that followed. Then you look at why you think they got the infection. You may think it was a line infection, but you must ask why it may be a line infection. You must ask the 5 why's. If the infection happened because there was no staff on the ward, you ask why there was no staff on the ward. You keep pushing down to find the root of the problem.[3190] The exercise can be done retrospectively, but it may lose the depth of information. It is about identifying best practice.[3191]Dr Mumford felt a root cause analysis needed to be done as close to the event as possible, and to involve as many of the people who dealt with the patient's care as possible. Environmental testing results would be used if you thought that was an issue. You would also include other patients on the ward who had similar infections, and audits of the guidance to ensure that practice was up to scratch. Epidemiological data would not routinely be used unless the root cause analysis concerned an individual patient within a period of increased incidence. You may look at other patient's pathways to see if there was cross-

[3188] From the CNR Overview Report Table 4.5: 2016: 1, 2017: 6, 2018: 12 (Bundle 6, Document 38, Page 1028
[3189] Dr Mumford, Transcript, Day 1, Pages 192-198
[3190] Transcript, Dr Mumford and Ms Dempster, Day 2, page 1 to 5
[3191] Transcript, Dr Mumford and Ms Dempster, Day 2, page 5 and 6

over or shared equipment. You would not typically use typing technologies because if you waited for that you would lose a lot of the richness of the process. That would be done as a confirmatory process later. Dr Mumford considered that if you ask why five times you get to a sufficient level of granularity. If you keep asking the whys, and cannot ask another, that is the root cause.[3192]

524. Dr Mumford considered that it was possible for two root cause analyses to come up with different answers on the same facts depending on the knowledge that each group had and the information they had access to. It was put to Dr Mumford that the Inquiry had heard evidence about exercises that were said to be root cause analyses. She considered these to be more like case notes reviews. Dr Mumford explained that in a case notes review, you have the case notes and data, but you do not have the people who can provide the additional information. The root cause analyses she had seen through the Inquiry did not have the detail of the patient journey. One should not go into a root cause analysis with a hypothesis outside of needing to find out how the patient acquired the infection. If you have a hypothesis, you bias the process.[3193]

525. Dr Mumford explained that a case notes review was purely an exercise in data. To some extent if it was not documented it did not happen. However, you might not have the patient's journey. You might not know if they changed room, or if they left the ward for imaging. It might not bring it all together in the same way.[3194]

526. Dr Mumford also explained that there is a new process in England called a Patient Safety Incident Review Framework based on an 'after action review'. This considered something that happened, such as a patient had a new hip put in the wrong side, then you ask what should have happened. You consider how it should have gone from the patient being brought into the hospital, to having surgery, and all the processes in between. The second question is

[3192] Transcript, Dr Mumford and Ms Dempster, Day 2, page 6 to 8
[3193] Transcript, Dr Mumford and Ms Dempster, Day 2, page 8 to 10
[3194] Transcript, Dr Mumford and Ms Dempster, Day 2, page 10

what happened. You do both of those things by continually asking the same question of every person in the room to get a richer picture from different perspectives. You look at each stage and identify what should have happened, what happened, what the differences were, and if it was preventable. It is important have everyone involved in the room at the same time.[3195]

527. Ms Dempster considered that a root cause analysis, and the Patient Safety Incident Review Framework, were distinct processes from an IMT. She explained that in her view an IMT is not doing a root cause analysis.[3196]

Lack of clarity or room for discretion in the National Infection Prevention and Control Manual

528. In light of evidence that infections that now seem important had not, at the time been reported to HPS/ARHAI Ms Dempster was referred to the National Infection Prevention and Control Manual[3197]. Ms Dempster was referred to the definition of 'Exceptional Infection Episode' in the third line of paragraph 3.1. Ms Dempster was asked if was unreasonable to imagine that there may be weaknesses in the definition by having words like severe in it. Ms Dempster considered it was quite clear. It told you how serious it was.[3198]

529. In respect of the definition of 'Healthcare Infection Exposure Incident', Ms Dempster was asked if the use of the words 'near miss' created a level of uncertainty. Ms Dempster considered that to be open to interpretation. There might be a risk if something was assessed and not escalated, you might lose the knowledge that goes with that.[3199]

530. Regarding a 'Healthcare Associated Infection Outbreak', it was put to Ms Dempster that a time period was not specified. It was also put to Ms Dempster that 'linked' might cause an issue because one is making the decision at the beginning of an investigation before one knows if things were linked. Ms

[3195] Transcript, Dr Mumford and Ms Dempster, Day 2, page 10 to 14
[3196] Transcript, Dr Mumford and Ms Dempster, Day 2, page 14 and 15
[3197] See Bundle 27, Volume 4, page 178
[3198] Transcript, Dr Mumford and Ms Dempster, Day 2, page 15 to 17
[3199] Transcript, Dr Mumford and Ms Dempster, Day 2, page 17

Dempster explained that there are different incubation times for different infections. It is hard for the manual to set out a period. She would rather escalate and then de-escalate than prove that the cases were linked. You escalate at the time of suspicion. It was common for an organisation to think there may be a link. You would say internally that the cases might be linked and start investigating assuming they are linked.[3200]

531. In respect of the reference to a 'higher than expected' number of infections in a 'given healthcare area', Ms Dempster explained that the expected number depends on how one sets limits internally. If you had one case, it would not meet the definition. However, one case of an unusual infection should trigger this.[3201]

532. Regarding the definition of 'Healthcare infection data exceedance', Ms Dempster was asked if it was right to be suspicious of the inclusion of 'greater than expected' or 'usual background rate'. Ms Dempster explained that it was open to interpretation. You could have a high rate that is not acceptable. It could be that a Trust had ten of a particular type of infection each month and would not report them, whereas another Trust that had zero might be worried.[3202]

533. Regarding a 'Healthcare Infection Near Miss', Ms Dempster was asked about the reference to 'potential to expose'. Ms Dempster thought that was open to interpretation. It was put to Ms Dempster that it may be that there is one case of an unusual infection in Year 1 and a second in Year 2, and that there was a risk it could fall between the categories. Ms Dempster said there was a risk. Dr Mumford explained that some of the things they investigate do not come into any of these categories. For example, there may be a patient with measles who sat in A&E waiting to be seen. That would be an infection incident you would need to investigate but did not fit into the categories. It is not a fully comprehensive list. Judgment must come into it.[3203]

[3200] Transcript, Dr Mumford and Ms Dempster, Day 2, page 17 to 20
[3201] Transcript, Dr Mumford and Ms Dempster, Day 2, page 20 and 21
[3202] Transcript, Dr Mumford and Ms Dempster, Day 2, page 21 and 22
[3203] Transcript, Dr Mumford and Ms Dempster, Day 2, page 22 to 24

534. It was put to Ms Dempster that in the English system, hospitals you might report and then de-escalate. In the Scottish system, all infections that go to a PAG now must be reported. She was asked if the system creates a reluctance to have a PAG. Ms Dempster explained that talking to colleagues in HPS is helpful because they might have a wider view. Reporting should be seen as being good. Dr Mumford agreed. Dr Mumford had reported two infections that were tied together with infections in other hospitals. It was an outbreak. Dr Mumford considered that going through an internal process and then deciding to step something down was important. Local autonomy was important. You must have an open and transparent way of reporting. You can manage most things without needing external advice.[3204]

Role of epidemiologists in IPC

535. Regarding the use of epidemiologists in IPC, Dr Mumford explained that she had not worked with Mr Mookerjee before. She did not have an epidemiologist in her IPC team. However, it was useful to know the phone number of one. She would ask Mr Mookerjee to do work for her in future if needs be. She did not think it was feasible to have one involved in every team.[3205]

536. Dr Mumford was asked if the level of comparative epidemiology carried out by Mr Mookerjee was needed for hospital outbreaks. She explained that if you are concerned if your levels are higher than others the comparative data was valuable. Benchmarking is important as it gives you a reality check. The best comparator is not being able to compare with yourself in the past. How does one know your previous performance was good enough.[3206]

537. Dr Mumford was asked when a full epidemiological report was needed. She explained that she was brought into her role to manage outbreaks. 80 patients were thought to have died of C. diff in the organisation. That is of a scale where you would get epidemiological support.[3207]

[3204] Transcript, Dr Mumford and Ms Dempster, Day 2, page 24 to 27
[3205] Transcript, Dr Mumford and Ms Dempster, Day 2, page 27 and 28
[3206] Transcript, Dr Mumford and Ms Dempster, Day 2, page 28 to 30
[3207] Transcript, Dr Mumford and Ms Dempster, Day 2, page 30 and 31

538. Dr Mumford was asked if, in the scenario the Inquiry was investigating, 2018 was the right time for epidemiology work to be carried out. Dr Mumford said that Ms Harvey-Wood had described collecting cases over several years. The data is no good if it is just data and it sits there. You need to analyse it and ask what it means. Dr Mumford thought the time to have done it would have been as the increase in cases was noticed in mid to late 2016. A biomedical scientist was noticing the increase at that point. Ms Dempster agreed. She explained that a lot of bigger organisations have epidemiologists. They are typically connected to hospitals undertaking research. Most microbiology departments can produce the date produced by Ms Harvey-Wood.[3208]

539. It was put to Dr Mumford that one of the steps that Dr Armstrong took in 2018 was to seek help from public health. Dr Mumford was asked if that was the right place to go for support. Dr Mumford said it could be. However, one problem with public health professionals is their knowledge base is outwith the acute hospital service. You would not expect them to tell you what to do or how to resolve an outbreak. You would probably need to go to HPS if you do not have someone internally.[3209]

Cryptococcus

540. In light of their views in Chapter 10 of their Qualitative Report[3210] Dr Mumford and Ms Dempster were referred to Allan Bennett's report on Cryptococcus[3211] which had been produced subsequent to their report. They had both read it. They were asked if there was anything within Mr Bennett's report that caused them to change their conclusions. Dr Mumford said no. She thought his report supported their view that the failure to provide adequate isolation through ventilation was a likely cause. Mr Bennett went through each hypothesis in Dr Hood's report and gave his view on each one and why. Ms Dempster agreed.[3212]

[3208] Transcript, Dr Mumford and Ms Dempster, Day 2, page 32 and 33
[3209] Transcript, Dr Mumford and Ms Dempster, Day 2, page
[3210] See Bundle 21, Volume 1, page 172, paragraphs 10.27 and 10.28
[3211] See Bundle 21, Volume 1, page 738
[3212] Transcript, Dr Mumford and Ms Dempster, Day 2, page 35 to 37

541. Dr Mumford and Ms Dempster were referred to Sandra Devine's take on the expert Cryptococcus sub-group and Dr Hood's report[3213]. They were asked if, considering that analysis, they recognised Dr Hood's conclusions. Dr Mumford thought it was an accurate statement of the conclusions of Dr Hood's report. She considered that it was very difficult to prove acquisition and the timeline to symptomology.[3214]

542. In respect of their report, it was put to Dr Mumford that there had clearly been two deaths. She was asked to what extent does the question of whether it is determinable that the two deaths were caused by Cryptococcus that came into ventilation relevant to whether there were HEPA filters and proper air change rates. Dr Mumford said that they are independent from each other. The rooms they were should have been provided with HEPA filters. The fact that they cannot prove where the patients acquired the infection from is immaterial. The risk posed to both of them was unmitigated.[3215]

543. Dr Mumford was asked if Ward 2A had been built as a neutropenic ward, would it have had HEPA filters for the whole ward space. Dr Mumford would like to think so because the guidance says ward not rooms. However, it is open to interpretation. Ward 6A was, by contrast, never going to be a neutropenic ward. There were no other HEPA filtered wards in the hospital.[3216] It was put to Dr Mumford that the only HEPA filtered spaces were a small number of isolation rooms. Then, there are two patients who end up in non-HEPA filtered spaces. Ward 6A was never going to have HEPA filtered spaces. Dr Mumford was asked if there was a connection between the limited HEPA filtered spaces in the hospital and the fact that these two patients ended up in those spaces. Dr Mumford said it was significant. The more HEPA filtered spaces you have, the more flexibility you have. If patients cannot take prophylaxis, you want them to be in a protected space when they are neutropenic. Ms Dempster agreed.[3217]

[3213] Bundle 25, page 371
[3214] Transcript, Dr Mumford and Ms Dempster, Day 2, page 37 to 39
[3215] Transcript, Dr Mumford and Ms Dempster, Day 2, page 39 and 40
[3216] Transcript, Dr Mumford and Ms Dempster, Day 2, page 40 and 41
[3217] Transcript, Dr Mumford and Ms Dempster, Day 2, page 41 to 43

Non reporting of recent Cryptococcus cases

544. It was put to Dr Mumford and Ms Dempster that in the spring and summer of 2024, the Inquiry asked NHS GGC for information on the total number of Cryptococcus cases or infections in patients in the health board area with any connection to the hospital between 26 January 2015 to date. In this regard, Dr Mumford and Ms Dempster were referred to a new document containing information on Cryptococcus infections[3218]. They had both seen this and the detailed RFI that sits behind it.[3219] It was put to Dr Mumford and Ms Dempster that the Inquiry learned this year that there were four cases with some connection to the hospital. At least three were not reported to HPS/ARHAI. The Inquiry had obtained an explanation from NHS GGC for the decision not to report. NHS GGC said that Cryptococcus cases were not rare and are an acknowledged risk for patients who have organ transplant or are immunocompromised. It did not pass from patient to patient, and the incubation period was wide and largely unknown. NHS GGC said it did not meet the definition of a HAI because there was more than a single case, so it did not meet the requirement that there were no previous cases.[3220]

545. Ms Dempster was asked if she had any concerns about the decision not to report given the cases were in patients who had organ transplants or were immunocompromised. Ms Dempster said she did have concerns. She considered that even if you are not totally sure if it is a HAI or not, it is better to have raised it. The incubation period is uncertain, so she was not sure how one would say with certainty that the infection was not acquired in the hospital given some had long stays. There is a potential link to the environment. She would have thought it would be in NHS GGC's in interests to let ARHAI know.[3221]

546. Dr Mumford agreed. Cryptococcus is very rare and when you have a rare infection, which most sources tell you there are 100 cases or less in the UK each year, and you have four in a year in one place, then there is a potential

[3218] See Bundle 24, Volume 2, Document 208, page 216
[3219] Transcript, Dr Mumford and Ms Dempster, Day 2, page 43 and 44, and 65 and 66
[3220] Transcript, Dr Mumford and Ms Dempster, Day 2, page 66 to 68
[3221] Transcript, Dr Mumford and Ms Dempster, Day 2, page 68 and 69

public health interest in that. For that purpose alone, she would have reported it. There is no harm in over reporting. Saying there were two cases does not mean you do not need to report because it is rare. She thought it was a data exceedance and would expect it to be reported.[3222]

547. Dr Mumford was asked why it was a data exceedance as Mr Bennett found it hard to work out the national rate because the national laboratory only had what was reported to it. Dr Mumford agreed that there was a lack of certainty. It was sufficiently rare where biomedical scientists would tell microbiologists that they had a Cryptococcus. The microbiologists would always send those to the lab. There are 100 cases across the UK per year. In a small geographical area compared with the rest of the UK, there was potentially a cluster. It is worth looking into from a public health point of view.[3223]

548. Dr Mumford would take it more seriously. She would want clinical reviews on the cases to see if there was anything that would pre-dispose them to Cryptococcus, or if there was anything in or out of the hospital that might be a cause.[3224] It was put to Dr Mumford that the RFI response from NHS GGC contained a patient who kept a pigeon. Dr Mumford explained that curiosity is important. That is the approach she would have taken.[3225]

Sandra Devine's Appendix to the NHS GGC Positioning Paper

549. Dr Mumford and Ms Dempster were referred to Sandra Devine's Appendix to the NHS GGC Positioning Paper[3226]. They were asked if the issue that they were asked to deal with for the Inquiry was about patient outcomes on the campus. Dr Mumford said that their work focused on the patients in the Schiehallion cohort in Ward 2A, Ward 2B and subsequently 6A, and Ward 4B.[3227]

[3222] Transcript, Dr Mumford and Ms Dempster, Day 2, page 69 and 70
[3223] Transcript, Dr Mumford and Ms Dempster, Day 2, page 70 and 71
[3224] Transcript, Dr Mumford and Ms Dempster, Day 2, page 71 and 72
[3225] Transcript, Dr Mumford and Ms Dempster, Day 2, page 72 and 73
[3226] See Bundle 25, page 364
[3227] Transcript, Dr Mumford and Ms Dempster, Day 2, page 44 to 46

550. Regarding the heading 'Social Deprivation'[3228], it was put to Ms Dempster that Ms Devine had stated that areas, such as Glasgow, that are more socially deprived have poorer health outcomes and may also have higher rates of healthcare associate infection. Ms Dempster had seen this analysis before. Deprivation plays a role, but if you are running a national service (as this was), you are taking kids from all kinds of areas. It was put to Ms Dempster that if the author was looking at the campus, what role would deprivation play in HAIs. Ms Dempster had not come across that type of consideration in NHS England. She was not aware of suggestions that areas of England that have similar patterns of deprivation to Glasgow have higher levels of HAIs.[3229]

551. Dr Mumford considered that there was a link between deprivation and ill health leading to poorer outcomes in general in hospital treatment. Whether that includes higher rates of HAIs, she would question that. Extremes of age have much higher rates whether they are deprived or not. It was correct to note that neutropenia represented a higher risk than any from social deprivation.[3230]

552. It was put to Dr Mumford that Ms Devine also discussed various external datasets across the campus that she said are relevant to the outcomes across the whole campus[3231]. She was asked if the national point prevalence study was relevant to the issues that she and Ms Dempster were asked to investigate. Dr Mumford explained that Point Prevalence is an important phrase because it is a point in time. Each clinical area is looked at for one day. What it does not do is present a longitudinal study of HAI's or environmental infections. It is one day on a ward.[3232]

553. Dr Mumford was asked about the relevance of the Point Prevalence Study referred to by Ms Devine that showed that the overall prevalence of HAI was 4%, and the national rate was 4.5%[3233]. Dr Mumford noted that this was a one

[3228] See Bundle 25, page 365 and 366
[3229] Transcript, Dr Mumford and Ms Dempster, Day 2, page 46 to 48
[3230] Transcript, Dr Mumford and Ms Dempster, Day 2, page 48 to 50
[3231] See Bundle 25, page 367
[3232] Transcript, Dr Mumford and Ms Dempster, Day 2, page 50 and 51
[3233] See Bundle 25, page 368

day per ward study. It depended on what patients were in the ward. It is a whole hospital result, and they were not looking at the whole hospital. It was put to Dr Mumford that it also notes that comparisons between children's hospitals in Scotland is less meaningful. She considered the difference in rates could be explained by the fact that it is a point prevalence study. It was not a different position taken from some witnesses when they read the HPS report. It is looking at the whole hospital and the global rate. It is not looking at a speciality or patient group. When dealing with the whole hospital it is useful. It tells you where you might need to focus.[3234]

554. Regarding the Annual Operational Plan targets[3235], Ms Dempster noted this sort of result is not relevant to the exercise they were asked you to carry out because it is for the whole health board.[3236]

555. Dr Mumford was asked what relevance C. diff, E. coli, and staphylococcus aureus[3237] had to what they were asked to do. Dr Mumford said they had no relevance as they were not environmental organisms.[3238]

556. Dr Mumford and Ms Dempster were referred to the HPS Reports of October 2019[3239]. Dr Mumford was asked if the 2019 report said that one-third of cases had a poly-microbial episode, was that reassuring. Dr Mumford said it was not relevant to their conclusions. It was interesting that if one-third of the cases were polymicrobial there was a risk of having an environmental organism that was higher than you would normally see in a blood culture. Ms Dempster did not think there was a single point of exposure in the hospital. They knew that the issues with the water were widespread across the whole unit. Ms Dempster considered the points of exposure in the Schiehallion unit were the water, drains, wash hand basin, ventilation, and mould. Regarding mould, there were cases of Aspergillus and air sampling was undertaken.[3240]

[3234] Transcript, Dr Mumford and Ms Dempster, Day 2, page 51 to 54
[3235] See Bundle 25, page 368
[3236] Transcript, Dr Mumford and Ms Dempster, Day 2, page 54 and 55
[3237] See Bundle 25, page 369
[3238] Transcript, Dr Mumford and Ms Dempster, Day 2, page 55 and 56
[3239] See Bundle 7, Documents 6 and 7
[3240] Transcript, Dr Mumford and Ms Dempster, Day 2, page 56 to 60

557. It was put to Dr Mumford and Ms Dempster that the third bullet point noted that all patients within the cohort were at risk from developing gram-negative bacterium due to comorbidities and treatment plans. Dr Mumford stated that any clinician working with a group of patients could tell you that.[3241]

558. Dr Mumford and Ms Dempster were referred to the conclusions of Ms Devine's document[3242]. Her summary notes that the data presented shows the hospital has lower rates of hospital acquired infections than other hospitals in Scotland, that has whole genome sequencing that does not support links to the environment. Ms Dempster thought that did not provide assurances about the environment. She did not agree with the proposition that NHS GGC provided new, innovative, national services that require more creative, complex, aggressive or invasive techniques that have as an unintended consequence an increased risk of infection. Ms Dempster read that as saying people get infections and it was ok. If she read that and it was her child or relatives, she would not like to read that. There are specialist children's hospitals in England that do not have similar cases of high levels of infections.[3243]

559. Dr Mumford did not agree with the summary either. She did not think it answered the question. It did not discuss the estates issues and the impact that there was a suspicion those estates issues were having on patients.[3244]

Alternative explanations for the infections

560. Dr Mumford and Ms Dempster were asked if as proposed by NHS GGC there is no evidence of an increased rate of infection because of the environment, what is the cause of the bacteraemia considered by Mr Mookerjee and the CNR. Dr Mumford considered that it was hard to think of another viable source. Enterobacter and Klebsiella could be translocated, but the IMTs did not discuss if they could be translocated. It did not fit the clinical picture better than an environmental source. If clinicians thought it was gut translocation it

[3241] Transcript, Dr Mumford and Ms Dempster, Day 2, page 60
[3242] See Bundle 25, page 372
[3243] Transcript, Dr Mumford and Ms Dempster, Day 2, page 60 to 64
[3244] Transcript, Dr Mumford and Ms Dempster, Day 2, page 64

would have come out in the IMT.[3245]

561. If the source of the infections was not the hospital, Dr Mumford would expect to see similar sorts of infections in other units around the UK. She did not think you would see the pattern of increasing infections unless it the entire water supply was contaminated. Dr Mumford was asked if the cause of infections was not the environment, would you expect to see a change in rate over time. Dr Mumford explained that you potentially could if a new treatment like a new form of chemotherapy influenced the gut.[3246]

562. Dr Mumford was asked to what extent her view involved an acceptance of the idea that patients were bringing infections into the hospital. Dr Mumford explained that you cannot make that assumption of all these patients. A lot were in the hospital for a long time. They were not going outside. A HAI is an infection on the day of or after admission. Anything beyond that is healthcare associated.[3247]

563. Dr Mumford explained that she could not think of a scenario that would cause the upturn in infections. Regarding the possibility of bacteria getting into the bloodstream if you exclude environment, Dr Mumford explained that you must think about pharmacy and if medication has been contaminated, or if the outside of the medication packaging is contaminated. She did not think that had been looked at. The other option might be equipment in the ward that had been wet or damp or dirty. However, those are tenuous arguments. Ms Dempster considered that there were other environmental sources. The actual environment of the room like the mattress or near patient equipment, or if the room was cleaned after the last patient left.[3248]

564. Ms Dempster was asked if there was any evidence of moves to enhance the cleaning regimes in Ward 2A. Ms Dempster explained that there was talk about upping the cleaning and concerns about dust and cleaning the chilled beams. There were discussions where it was assumed cleaning was not done

[3245] Transcript, Dr Mumford and Ms Dempster, Day 2, page 80 and 81
[3246] Transcript, Dr Mumford and Ms Dempster, Day 2, page 81 to 83
[3247] Transcript, Dr Mumford and Ms Dempster, Day 2, page 83 to 85
[3248] Transcript, Dr Mumford and Ms Dempster, Day 2, page 85 to 91

with a chlorine-based product. You would be seeing more of a single problem if a room was contaminated.[3249]

565. Dr Mumford was asked if one was looking for the totality of possibilities, was it right to add the possibility of infection from another human source like staff or a visitor. Dr Mumford said this was theoretically possible. The hands of staff are the key source of cross infections, but it would be an unusual organism to pick up in the quantity needed to transfer it to another patient.[3250]

Mycobacterium Chelonae

566. Dr Mumford and Ms Dempster were referred to their report[3251]. It was put to them that they say that one case of Mycobacterium Chelonae was not escalated to a PAG. The source for that was the bloodstream infection database. The case was in a blood culture. It was not in Ward 2A.[3252]

567. It was put to Dr Mumford that there were then two tests in 2016 regarding the same patient. Dr Mumford noted that the second case which had two episodes was recorded, but not as Mycobacterium Chelonae. The 2016 case was a bloodstream infection in Ward 2A and was described as Mycobacterium Chelonae. It was put to her that neither was recorded as Mycobacterium Chelonae and that one was recorded against a different ward and the other against Ward 2A. Dr Mumford noted that the 2019 case was not in the database because it was not a blood culture. The sample was taken from the patient by a swab from skin around where the Hickman line entered the skin.[3253]

568. It was put to Dr Mumford that it seemed she was the first person to spot the 2016 case. Dr Mumford confirmed there was no reference in the CNR, Independent Review or Oversight Board. The 2016 case was not in their chronology because it did not come up in the search. It was described in an IMT in 2019. Of the 2018 infections, one was on Ward 2A but was not

[3249] Transcript, Dr Mumford and Ms Dempster, Day 2, page 91 and 92
[3250] Transcript, Dr Mumford and Ms Dempster, Day 2, page 92 to 94
[3251] See Bundle 21, Volume 1, page 139
[3252] Transcript, Dr Mumford and Ms Dempster, Day 2, page 109 and 110
[3253] Transcript, Dr Mumford and Ms Dempster, Day 2, page 110 and 111

described as Mycobacterium Chelonae. It was a gram-positive bacillus. The other 2018 case was on Ward 3B. It was described as presumptive mycobacteria.[3254]

569. It was put to Dr Mumford that the patient who had the 2018 infections gave evidence. In her statement she described that she was only in Ward 3B for a day or so before the blood test. She had previously been in Ward 2A. Dr Mumford explained that if a patient had a blood culture on admission or the next day, it was community acquired. After that, it was hospital acquired. If the patient moved to Ward 3B and had a blood culture on that day or the next it would be reasonable to label it as Ward 2A.[3255]

570. Dr Mumford was asked if Mycobacterium Chelonae was found in the water in Ward 2A. She believed that it was. She did not know when any tests were done.[3256]

571. Dr Mumford explained that Mycobacterium Chelonae was not in Mr Mookerjee's dataset because it is a mycobacterium, not a gram-negative. Of the four infections, only three were blood stream infections. They thought only one of those was from Ward 2A. She thought it would have been consistent for one infection to be added to Mr Mookerjee's list, had they known about the four infections. The one to be added would be the one from Ward 2A.[3257]

572. Regarding the 2016 case, it was put to Ms Dempster that the Inquiry heard evidence from Dr Inkster about why it was not reported. Ms Dempster was asked if the 2016 case had gone to a PAG or an IMT or was discussed, could that have caused a series of understandings that might have prevented further infections. Ms Dempster explained that if it had been investigated, she would have expected the IPC team to have gone to where the patient was and investigated. They could have ordered water sampling. There would have been a potential for interventions that may have identified some risks for that patient. This was in January 2016, before there was a realisation there was a

[3254] Transcript, Dr Mumford and Ms Dempster, Day 2, page 111 and 112 and 117 and 118
[3255] Transcript, Dr Mumford and Ms Dempster, Day 2, page 119 and 120
[3256] Transcript, Dr Mumford and Ms Dempster, Day 2, page 112 and 113
[3257] Transcript, Dr Mumford and Ms Dempster, Day 2, page 113 and 114

problem with the water system. She did not know if this one case would have changed anything, but she would have investigated it. Dr Mumford said it was a sufficiently rare organism and known to be associated with water sources including within medical equipment. As such, you are almost duty bound to investigate to ensure none of the equipment was associated with the infection.[3258]

573. Dr Mumford was asked what she thought the guidance should be in Scotland regarding water testing once Mycobacterium Chelonae or atypical mycobacteria was confirmed in a hospital. For Mycobacterium Chelonae, it should be part of the investigation to do water testing at the earliest opportunity. For other atypical mycobacteria, not all are water related. Ms Dempster agreed. Dr Mumford did not think the policy or guidance in England covered this.[3259]

574. Dr Mumford thought that after the 2016 case in Ward 2A the water should have been tested in the ward. She thought that after the 2018 positive tests the water in Ward 2A should have been tested. She recalled that in 2019, Mycobacterium Chelonae was found in theatre from a scrub sink. She did not recall if it was found in showerheads. She could not derive any information about there being Mycobacterium in the water in previous years from the finding that there was Mycobacterium Chelonae in Ward 6A in June 2019 in the water inside the filters.[3260]

575. Dr Mumford was referred to their report[3261]. Regarding paragraph 10.28, it was recorded that there was a lack of air locks allowing air to flow from a general ward into the BMT unit in Ward 4B. Dr Mumford explained that there was an investigation within the Cryptococcal report. There was an examination of air flows at the entrance to Ward 4B. If a door to Ward 4B was opened the air flowed from the other ward into 4B.[3262]

[3258] Transcript, Dr Mumford and Ms Dempster, Day 2, page 114 to 117
[3259] Transcript, Dr Mumford and Ms Dempster, Day 2, page 120 and 121
[3260] Transcript, Dr Mumford and Ms Dempster, Day 2, page 121 to 123
[3261] See Bundle 21, Volume 1, Section 10 and 11, page 172
[3262] Transcript, Dr Mumford and Ms Dempster, Day 2, page 123 and 124

576. Dr Mumford was referred to the section of their report on Aspergillus and paragraph 10.31[3263]. It was put to Dr Mumford that there was a reference to Aspergillus biofilms causing disease and rendering diseases resistance to anti-fungals. It could not necessarily be inferred that the anti-fungal resistance was due to the treatments. Dr Mumford explained that organisms can develop resistance, but it was not as common as with antimicrobials.[3264]

Role and Actions of the IMT Chair/Lead ICD

577. In light of her professional experience Dr Mumford was asked for her assessment of the level of authority granted to the then Lead ICD in 2016 after Dr Inkster took over. Dr Mumford noted that the Lead ICD appeared to have the authority to order testing, ask for additional information, and to form an IMT to influence the outcome. The level of authority was appropriate. Regarding 2017, Dr Mumford thought the Lead ICD had appropriate authority. Regarding 2018, she did not think the level of authority changed, but maybe the level of expectation about Dr Inkster's ability to carry on as normal and manage the same way as she had previously managed. The expectation was that a large incident would be managed in the same way without additional resource such as sessions, people or support.[3265]

578. Dr Mumford was asked if she had any issue with the number of more senior managers, sector managers, associate medical directors, and heads of estates that went to the meetings. Dr Mumford thought it was a factor of what was going on and the complexity of it. Ms Dempster explained that it must have been incredibly difficult for one person to sustain the momentum. You need somebody close to the IMT to be a deputy chair to provide support. Ms Dempster was asked if she would you agree with Dr Mumford's comments about the need for a management structure above the IMT. Ms Dempster explained that when there is a big incident, it needs to be managed by the executives.[3266]

[3263] See Bundle 21, Volume 1, page 173
[3264] Transcript, Dr Mumford and Ms Dempster, Day 2, page 124 and 125
[3265] Transcript, Dr Mumford and Ms Dempster, Day 2, page 129 to 133
[3266] Transcript, Dr Mumford and Ms Dempster, Day 2, page 133 and 134

579. Dr Mumford was asked if she noticed any change in the relationship between the IMT chair and the rest of organisation from the start of the water incident and the end of July 2019. Dr Mumford thought there were some frustrations building because of the complexity and the pressures. She read reports of people behaving badly at IMTs. She saw stress coming to the fore when Dr Inkster was removed as chair. Ms Dempster agreed. She saw people from HPS attending in pairs as significant.[3267]

580. Dr Mumford thought Dr Inkster acted reasonably in setting up the expert sub-group for Cryptococcus. They needed to take away some of that work to a defined group. Regarding the decision on 18 January 2019 to decant patients to the CDU, Dr Mumford considered that if you have a situation where you need to do work on a ward and there are vulnerable patients you need to protect, it is reasonable to move them temporarily to allow that work to go ahead. It is safer for patients.[3268]

581. Regarding the decision by the IMT at start of August 2019 to cease new admissions to Ward 6A and divert patients to Aberdeen and Edinburgh, Ms Dempster thought that was reasonable because people were concerned. The risks of creating a disturbance to the patients would have been considered by the clinical team. Dr Mumford slightly disagreed. She considered the decision involved service provision and she would have expected it to be taken at a higher level.[3269]

582. Dr Mumford thought that declaration by Professor Leanord and Professor Jones at the IMT on 18 September 2019 that Ward 6A was microbiologically safe was unreasonable. They did not have enough data to prove the ward was safe. It was not recorded in the IMT minutes. She thought they were trying to re-open they ward as quickly as possible. HPS and ARHAI were right in saying they were not comfortable with the assurances at the time in September. It might have changed by November, but it would have been helpful if they had done work and tested and checked as Dr Inkster had done

[3267] Transcript, Dr Mumford and Ms Dempster, Day 2, page 134 to 136
[3268] Transcript, Dr Mumford and Ms Dempster, Day 2, page 137 and 138
[3269] Transcript, Dr Mumford and Ms Dempster, Day 2, page 138 to 140

previously on particle counts.[3270]

583. Regarding November 2019, after the HPS report was published, and the decision had been made to re-open the ward to new patients, Dr Mumford thought it was then reasonable to re-open the ward. Dr Mumford was referred to the 2019 HPS report[3271]. Dr Mumford said the report did not answer the question. It was put to Dr Mumford that the evidence of Dr Crighton and Professor Leanord was it was the combination of Dr Kennedy's work on the numbers of infections and Professor Leanord's work on whole genome sequencing that was important. Dr Mumford noted that at that time they had Chlorine dioxide and point of use filters. It should have been safe. Chlorine dioxide takes some time to have effect. The IMT minutes do not record the full debate.[3272]

584. Dr Mumford was asked for her views of how the IPC team should deal with a sequence of IMTs dealing with matters that may or may not be related. Dr Mumford thought there comes a point where you need to do a stock take. If they had done a stock take and gotten information on the IMTs and done a review, they may well have identified the connections. and how what was done in each IMT affected what happened next. Ms Dempster agreed.[3273]

585. It was put to Dr Mumford that Dr Armstrong gave evidence that she formed the view that the decision to stop new admissions was wrong. Dr Mumford explained that if she disagreed with a decision, then as an executive, you should challenge it. The worst thing you can do is make the person feel bad about the decision they have made. Before being medical director, Dr Mumford was associate medical director dealing with doctor discipline and patient safety. She came up against issues where she needed to talk to people in difficult circumstances.[3274]

586. Dr Mumford and Ms Dempster were referred to a section of their report on

[3270] Transcript, Dr Mumford and Ms Dempster, Day 2, page 140 and 141
[3271] See Bundle7, page 271
[3272] Transcript, Dr Mumford and Ms Dempster, Day 2, page 141 to 145
[3273] Transcript, Dr Mumford and Ms Dempster, Day 2, page 145 to 148
[3274] Transcript, Dr Mumford and Ms Dempster, Day 2, page 148 to 150

potential issues and areas for failure[3275]. Ms Dempster noted this was a list of potential problems. She noted that they considered they would have reported more often than happened at NHS GGC. They did not identify a lack of honesty. Dr Mumford noted they had not seen evidence of how learning was shared. Regarding examples of mistakes reoccurring in IPC regarding cases in the Schiehallion unit, Dr Mumford noted that there are a few themes looking through the IMTs. Cleaning appears as an issue. There were repeated issues about water and ventilation.[3276]

587. Dr Mumford was asked how she would respond to the suggestion that a doctor was entitled to write their own appraisal as part of the formal appraisal process. Dr Mumford considered it was a two-way process. It was for the appraiser to write their comments, which are based around the conduct documents of the GMC. There should be no opportunity for the doctor to write the Appraiser's comments for them. If the doctor wants to disagree, they write in a box provided. The Appraisee should not write their own appraisal. The Appraisee choosing the Appraiser is an accepted practice in a lot of organisations. There is a movement in some hospitals to move to a split process whereby in a certain number of years you can choose your Appraiser, and a few years where someone is nominated. The Appraiser is not there to do the bidding of the medical director. It is a conversation that is partly coaching. It is a supportive process.[3277]

588. Considering the history of Dr Peters and Dr Inkster, Dr Stewart and Dr Cruickshank gave evidence about a report Dr Stewart produced in 2015[3278]. Dr Mumford was asked if it was reasonable to think the concerns about an ICD would make it into their appraisal process. Dr Mumford considered if a report was prepared with the ICD concerned, she would expect them to take it to their appraisal. They could not do it if it was not shared with them. In the formal process of appraisal an Appraiser could not bring something up if it was provided to them by someone other than the Appraisee. If there is an incident

[3275] See Bundle 21, Volume 1, page 115
[3276] Transcript, Dr Mumford and Ms Dempster, Day 2, page 150 to 154
[3277] Transcript, Dr Mumford and Ms Dempster, Day 2, page 154 to 156
[3278] See Bundle 14, Volume 1, Document 41, page 463

you want to discuss, you can ask the Appraiser and Appraisee to discuss it.[3279]

589. Dr Mumford and Ms Dempster were referred to Dr de Caestecker's Stage 2 Whistleblowing report about Dr Redding[3280]. Regarding the critique of Dr Peters, it was put to Dr Mumford that Dr Green was interviewed for the report and was Dr Peters' appraiser. Dr Mumford said she could not take it into the appraisal if it had not been shared with Dr Peters. The Medical Director could only direct them to discuss it if it was shared with both of them. As Medical Director, Dr Mumford's approach would have been to sit down with Dr Peters informally and discuss the comments and ask her how she reflected on it and have a coaching conversation about how she could adapt her behaviour to not run into similar issues going forward. It potentially should have been delegated to Dr Green. Dr Mumford was surprised that six years on these issues have not been ventilated with Dr Peters, at least informally.[3281]

590. It was put to Dr Mumford that Dr Armstrong had said in her evidence that neither Dr Peters nor Dr Inkster put patients' interests first but were more interested in being right. Dr Mumford said that any such concern should have been dealt with by initial informal conversation. If she had evidence that a doctor was putting their interests before the patient's, she would have to take disciplinary action and put the doctor through a maintaining high professional standards process. That involves appointing a case investigator with terms of reference. They work with someone from the HR team and speak to witnesses. They prepare a report and then the Medical Director acts as case manager and decides what further action to take. That is a standard practice in England which may not have an equivalent in Scotland. The other approach is to speak to the GMC who can advise of the best approach to follow. Dr Mumford had seen evidence of where the behaviours of almost everyone involved had not been what you might want them to be. She had not seen any documented evidence to support Dr Armstrong's view that Dr Inkster and Dr

[3279] Transcript, Dr Mumford and Ms Dempster, Day 2, page 156 to 158
[3280] See Bundle 27, Volume 4, Document 6, page 83
[3281] Transcript, Dr Mumford and Ms Dempster, Day 2, page 158 to 162

Peters were putting their interests above that of the patients.[3282]

591. Regarding Dr Peters asking nurses to wear a face mask in December 2015, Ms Dempster was referred to a relevant e-mail thread[3283]. It was put to Ms Dempster that Dr Peters advised that a face mask should be worn. There was some pushback. Dr Inkster said that it was a good idea, but there was a view it should have gone through a process. Ms Dempster explained that if face mask was needed it was needed on the day not after a process. You cannot wait for the process. She had come across a doctor having a view she was suspicious of but had to follow their advice. She always starts from the notion that the person on call made the best decision based on the information they had. She would follow it initially. Then you can look at it in the cold light of day, later.[3284]

592. It was also put to Ms Dempster that the issue of Dr Peters asking for a mask to be worn was mentioned in the Whistleblowing report and a letter from the CEO to Professor Stevens in March 2021[3285]. Ms Dempster was asked in what circumstances would it still be relevant six years later. She did not think there would be any. If it was a real problem, you would take it up with the Medical Director and it would be dealt with. Regarding if Dr Peters sent a lot of e-mails, the way to handle that was to speak to Dr Peters.[3286]

Response to criticisms of their work

593. Regarding the role of mitigations in their decision making, Dr Mumford maintained the view that some of their decision making involved assessing that the taking of certain mitigation measures, such as fitting point of use filters, was supportive of the conclusion that there is a link between the environment and the infections. Dr Mumford noted that the decrease in the number of infections because of the work undertaken on Ward 2A and 2B also supported that conclusion. Regarding the suggestion that they should not do

[3282] Transcript, Dr Mumford and Ms Dempster, Day 2, page 162 to 165
[3283] See Bundle 27, Volume 11, Document 11, page 70
[3284] Transcript, Dr Mumford and Ms Dempster, Day 2, page 165 to 168
[3285] See Bundle 25, Document 3, page 153
[3286] Transcript, Dr Mumford and Ms Dempster, Day 2, page 168 to 170

that because some of the measures were just best practice, Dr Mumford explained that point of use filters was not best practice. They are a secondary measure. Chlorine Dioxide, in building that size where it is difficult to control the water purely by temperature, is a useful primary control. Regarding the decant, Dr Mumford noted that it was initially done so that the issues could be investigated. It does not really play into the best practice argument.[3287]

594. Dr Mumford and Ms Dempster were taken to the NHS GGC direction 5 response[3288]. It discusses the selection with Mr Mookerjee of the organisms included in the dataset. Dr Mumford noted that the selected organisms were based on organisms that grew from blood cultures. To say any are absent from the data was wrong. Dr Mumford was asked, given the number of questions asked about Mycobacterium Chelonae, how she thought other families would have reacted if they had excluded Klebsiella or Enterobacter. She considered they would be rightly upset. However, they set out to do what they did without bias. Enterobacter and Klebsiella are found in water systems, and they were included. Dr Mumford was asked if the reference by NHS GGC of there being few or no case reports of human disease accurate. She explained that there are few case reports of Cupriavidus. Either that occurs and it is not identified, or it is not reported in literature, or there are very few events where Cupriavidus is a problem. Dr Mumford considered that you would find articles in the literature about investigations into single rooms and single sinks. She did not know if one would find articles about whole hospitals with potentially contaminated water systems over a period of three or four years. She thought it would be both a lack of papers and a lack of infections. Dr Mumford explained that the primary driver of inclusion of the organisms in the dataset was a positive blood culture.[3289]

595. Dr Mumford noted that it was only recently that they had the technology to identify all these organisms on a routine basis in a hospital laboratory. In the past many of them would go unrecognised. Dr Mumford and Ms Dempster were asked how they would respond to the suggestion that their conclusions

[3287] Transcript, Dr Mumford and Ms Dempster, Day 2, page 170 to 173
[3288] See Bundle 6, Volume 4, page 21
[3289] Transcript, Dr Mumford and Ms Dempster, Day 2, page 173 to 177

are undermined by reliance on the conclusions of Mr Mookerjee. Dr Mumford said they are not undermined. They can see the evidence for themselves. Ms Dempster agreed.[3290]

Conclusions of Dr Mumford and Dr Inkster on Key Question 4

596. Regarding the balance of probabilities, Ms Dempster considered that was looking at what you must see if it was probable to be the outcome of what you were seeing. Probably meant they had not seen any other explanation for the infections. So, the probable position is they were caused by the environment. Probable was it could happen. Possible was it may happen. Probable was synonymous with the idea of more likely than not. Dr Mumford considered that more likely than not is probable.[3291]

597. Regarding Key Question 4, it was put to Dr Mumford and Ms Dempster that they gave an answer in chapter 11 of their report[3292]. Dr Mumford noted that Ward 4B never reached 10 air changes. It did not meet the expected air change rate. It was put to Dr Mumford that in paragraph 11.34, they only give their answer in respect of Ward 2A, 2B and 6A. Dr Mumford explained this was because she thought Ward 4B was HEPA filtered. She stated that they could not have made an assessment along the lines of paragraph 11.34 for Ward 4C given the work they did. They had not examined the infections within that ward. They were not asked to. Ward 4C didn't contain the Schiehallion cohort.[3293]

598. In 2015 Ms Dempster was confident there was no link then between the hospital environment and infections. Dr Mumford agreed. However, by 2016 Dr Mumford was very confident that a link was beginning to emerge. There was a case of Cupriavidus. The Mycobacterium Chelonae case was not investigated. There was Aspergillus. It shows the beginning of problems. Ms Dempster agreed. Ms Dempster was confident that the link between the hospital environment and infections existed in 2017. There were cases of

[3290] Transcript, Dr Mumford and Ms Dempster, Day 2, page 177 to 179
[3291] Transcript, Dr Mumford and Ms Dempster, Day 2, page 179 to 182
[3292] See Bundle 21, Volume 1, page 177
[3293] Transcript, Dr Mumford and Ms Dempster, Day 2, page 182 to 184

Aspergillus. Patients were on anti-fungals. Other infections were coming through. Dr Mumford noted a step-change in the number of environmental infections in 2017. Regarding Ward 2A and the first nine months of 2018, Dr Mumford noted that they were still seeing a higher number of environmental organisms. There were also drain related infections. If you take the water system, she was confident you could say the link continued. Ms Dempster agreed. Ms Dempster was very confident there was a still a link through the rest of 2018. Chlorine Dioxide may have reduced the risk, but they still saw cases. Dr Mumford agreed. In late 2018 there was also the Cryptococcus and Aspergillus risk.

599. Regarding 2019, Dr Mumford noted a link to the environment with Cryptococcus with the ventilation which persisted into 2019. There was a risk of Aspergillus around the bathrooms that needed to be refurbished. There was still some water related organisms found in blood cultures albeit not at the same level as in 2018. She considered the question of whether there was an infection link from the chilled beams in 2019 was harder to prove. They know dust was accumulating on them and some unusual organisms were isolated from the dust. She was not sure the IMT had established a link between the chilled beams and a particular infection. They are difficult things to manage. She was clear that chilled beams should not be in hospitals. Ms Dempster agreed.[3294]

600. Turning to the question of whether an infection link remained now that Ward 2A/2B had been rebuilt and re-opened, Dr Mumford explained that in respect of Ward 2A, she did not think there was any evidence the risk was continuing. The levels of infections have dropped, Ms Dempster pointed out the data shows there has been a significant improvement. There were two patients that had infections with organisms in 2022. Both were in Ward 2B rather than 2A. She thought the work done on the Schiehallion unit had mitigated the risk and brought it in line with other units across the country. Ms Dempster agreed.[3295]

601. Regarding the discussion of NHS GGC considering the removal of POUFs, Dr

[3294] Transcript, Dr Mumford and Ms Dempster, Day 2, page 184 to 191
[3295] Transcript, Dr Mumford and Ms Dempster, Day 2, page 191 to 192

Mumford explained that it was difficult because once you have them on then it is natural to take a risk averse approach and keep them on. However, that is not ideal. You should be able to just use the taps. One approach would be to experiment with a vacant room and test regularly and see if anything threw up suspicion. You might have to go through that process with more than one room before you had confidence. The other approach might be to take a less risk averse approach and take them off, but that is a really difficult thing to do. Dr Mumford agreed that another approach would be to test in vast quantities over the whole hospital over several years and reduce the exceedances to near zero. She explained that once the management have got the water system under control, once the chlorine dioxide is fully functional, POUF should not be needed. Because once the system is safe, you should be able, to some extent, to revert to testing your augmented care areas and not everywhere and doing a much more targeted approach with some central testing as well. [3296]

602. Dr Mumford and Ms Dempster were asked if they had any advice as to how one would carry out that decision making process to reduce anxiety. Dr Mumford explained that you must share data. It is not enough to say you have tested it and it is safe. You need to share data in accessible form to show the level of contamination has come down. The more communication you can do, the better, particularly by describing in advance the steps that are contemplated. This is needed to give people confidence that, going forwards, they know that if there is a problem it will be detected early, and action will be taken. Ms Dempster agreed and added that it would be easier to start with the lower risk areas first.[3297]

Discussion of proposed answer to Key Question 4

603. Key Question 4 remains in the form set out in Direction 5

> [4] Is there a link, and if so in what way and to what extent, between patient infections and identified unsafe features of the water and ventilation systems?

[3296] Transcript, Dr Mumford and Ms Dempster, Day 2, page 192 to 194
[3297] Transcript, Dr Mumford and Ms Dempster, Day 2, page 194 and 195

604. At one level this is the sort of question that requires a single answer, but the Inquiry has heard and read a considerable amount of evidence that the understanding of potential for risk to patients from the water and ventilation systems evolved over time and therefore it seems important that the Inquiry attempt to answer the question both overall and, in respect of key phases.

605. NHS GGC helpfully set out their response to the earliest version of Key Question 4 in a positioning paper in April 2023[3298]. Their position – as summarised from paragraph 56 - appears to amount to a series of propositions:

- It must be accepted that such infections will always occur in hospital environments from time to time and that there will be a recognised "background rate" of infection.
- There is little published scientific literature which demonstrates the level of genetic diversity that exists within hospital built environments.
- Without WGS it would be difficult to conclude on the balance of probabilities that any particular infection may be linked to the built environment.
- That if WGS shows that two samples taken from patients are not closely related in genetic terms then it is more likely than not that any such infection was unconnected to the built environment.
- There is no evidence to demonstrate any increased rate of infections within QEUH from micro-organisms related to the built environment. When looked at properly and scientifically, the evidence demonstrates that the QEUH and RHC campus provides a safe environment for its patients

606. The first problem with this approach is that it fails to appreciate that the remit of the Inquiry is not, unlike the CNR, to look at whether individual cases of infection in the QEUH/RHC are connected to deficient features of the hospital environment, but to look 'top down' at the whole span of events from June

[3298] Bundle 25, Document 10

2015 and as whether such a link exists. This is why we have not held public hearings which have discussed the medical records and impacts on patients in fine detail. Quite apart from such an exercise being something that would likely cause great distress to patients and families it is not within the Chair's remit. This inquiry does not set out to conclude on the balance of probabilities that any particular infection may be linked to the built environment; it appears the NHS GGC position is built as a critique of that 'straw man'.

607. The suggestion that there it can be said that there is recognised "background rate" of infection for the paediatric immunocompromised patients the Schiehallion Unit and the smaller number of adult immunocompromised patients in the QEUH requires to be explored. When asked about the concept of background rates Ms Evans from the CNR Expert Panel explained that people sometimes get complacent, but one should be looking to reduce the background rates all the time. However, if one sees a novel organism, that should ring alarm bells.[3299] There was a vast amount of evidence that many of the micro-organisms that were found in patients were 'unusual micro-organisms' in the sense that in this population of patients they were rare or that an experienced ICN or ICD who hardly see them in a career. The discussion of the background rates for infections used in Dr Kennedy's 2018 report and based on the case definition from the 'Water Incident' IMT was illuminating. You cannot have a 'background rate' for infections like Mycobacterium chelonae, Stenotrophomonas or Cupriavidus. These rare infections were still being found in 2019 as Dr Kennedy records in his 2019 Report[3300] even rates of an infection that does have a background rate like *Enterobacter cloacae* were above their historical baseline (even if that might be a weighted baseline). In simple terms you cannot have a 'background rate' that is an aggregate of rare 'unusual micro-organisms'.

608. However, more fundamentally, it is submitted that the scientific basis of this enthusiasm for WGS has been fatally undermined by the evidence of Professor Wilcox, who convincingly demonstrated that Professor Leonord's

[3299] Gaynor Evans, Transcript, page 59 to 61
[3300] Bundle 6, Document 28 at page 111

work actually established that there was not a single strain of organisms in each group of samples analysed and that in any event the idea that there would be a single strain responsible for all the infections and the contamination is naïve. As he explained (and Dr Inkster, Dr Walker, Dr Mumford and others all agreed) biofilms are effectively collections of organisms. It is much more likely that if a water system is colonised and if that contamination went on to cause infections, you would see a wide range of organisms causing the infections, both genus and species. As Professor Wilcox put it there will be “a microbiological zoo in the water” and you will find a variety of different organisms across genera and species. Such a conclusion is also supported by the evidence of Mr Watson and others about the difficulties of sampling biofilm. How can one hope to pick up all the different species, strains and genera of the different species of bacteria and fungi in a whole building biofilm of the sort that NHS GGC allowed to grow in their hospital from its opening until active management and treatment started in 2018?

609. There is also the real question of the lack of respect in the case-by-case judgement of their own staff and in particular treating clinicians that seems embedded in the approach of NHS GGC. As many have noted these infections whilst aggregated in this inquiry into large cohorts of infections were all individual infections of single children or adults. Hard working and dedicated clinicians employed by NHS GGC worked with microbiologists to treat these patients. If their professional judgment was that a particular Klebsiella infection (for example) was enteric in cause and had broken through to the patient’s bowel from their gut due gut translocation brought about by treatment, they would have said so and such an infection would not have been on the agenda of the next PAG or IMT. Whenever the narrative in Chapter 5 discusses an infection, we should presume that it was the subject of a PAG, IMT or report to HPS/ARHAI because their patient’s treating clinicians were looking for answers away from endogenous infections.

610. Over and above the scientific flaws of seeking to use WGS to exclude, a link there is also a real question of burden of proof in an epidemiological sense.

There was an unanimity of view – importantly expressed by NHS GGC in their response to the CNR draft Overview Report – that the Bradford Hill postulates are useful tools that should be used to assess epidemiological questions. With the approval of Mr Mookerjee, we propose that they should be used by the Chair to reach his conclusions. If the NHS GGC approach is correct, then all of those postulates must fall away before the 'power' of absence of proof by WGS. For example NHS GGC did accept that there was a link in the Full Incident Management Team Report covering the IMTs from 2 March 2018 to 13 April 2018 dated 5 June 2018[3301] and seemingly in the briefing to their Chair in December that the source of exposure to infection was contaminated water supply throughout the QEUH and the RHC, and that contamination took place during installation, leading to development of a thick biofilm. It would be a strange world indeed if NHS GGC could now turn round and say, in effect, "ignore all the other evidence, there is no proof of a connection via WGS". The correct approach when looking at the infections as a whole is to consider all the evidence and see where the circumstances take us.

611. We have a lot of evidence from the various epidemiological analyses (as discussed in Chapter 7.4) that the increase in numbers of Gram-negative environmental or Gram-negative environmental and enteric bacteraemia from the second quarter of 2016 was real and sustained until the decant of Ward 2A which removed the most vulnerable patients from that ward's water system. That evidence of such a change is there whether the denominator is occupied bed days or admissions, is independent of the commendable success with CLABSI rates, and **consistently** appears in the work of Mr Mookerjee, HPS, Dr Kennedy and Ms Harvey-Wood.

612. There was a **strong degree of association** and **temporality** between water positivity and infections before decant. The hard fact that infections only really fell after decant and have dropped away in the new ward is a further strong association. **Specificity** is there because HPS demonstrated that these increased infection rates were not being seen in the rest of the RHC and Mr Mookerjee's work on comparators, whilst laboured due in no small way to the

[3301] Bundle 27, Volume 5, Document 19, Page 46

strange way NHS GGC keep data, shows a strong difference in rates of infections between the Schiehallion Unit and those other paediatric haemato-oncology units that were able to help. We have not had a lot of evidence around **biological gradient**, but it can be said that there are more infections the longer after filling of the water system during which the microbes in the water have had time to grow.

613. We have had a vast amount of evidence on how the association is biologically plausible for all these Gram-negative environmental or Gram-negative environmental and enteric bacteraemia and the only way that there is a lack of **coherence** between the epidemiological and laboratory findings is if the Chair was to accept that the sampling and retention of both environmental and patient samples for WGS was complete enough to ensure that every different strain in the millions of litres of water in the domestic water system of the QEUH had been caught and analysed.

614. Many interventions were imposed as the IPCT tried to react to infections. That response only became effective once the realisation was reached (tragically independent of the DMA Canyon reports) of whole system contamination. The greatest **experiment** of all was the closure of Ward 2A in September 2018 and its eventual re-opening years later. That is to our mind the greatest and most convincing argument that water was a cause of infections to many of the most vulnerable patients in the RHC in 2016 to 2020.

615. In terms of whether the link was present in some years and not present in others it is submitted that the opinions of Dr Mumford and Ms Dempster, matching as they do what can be seen in the epidemiology, should be preferred. In 2016 a link was beginning to emerge, it persisted through 2017 and 2018, and it persisted to some extent well into 2019.

616. Finally, we would point out that if NHS GGC are right that this is all a terrible mistake, and there is no link between the water system, then there has been no convincing evidence of an alternative explanation for many infections caused to their patients. For the reasons explained by Dr Mumford and Professor Stevens, the idea that the cause was Meropenem resistance just

does not stack up. The answer to Key Question 4 is therefore “Yes”.

Cross check to the conclusions of the CNR Expert Panel

617. The conclusions of the CNR Expert Panel are consistent with this proposed answer to the Inquiry’s Key Question 4 in that: In just under 30% of infection episodes involving Gram-Negative Environmental Bacteria in the Schiehallion Unit of the RHC from 2015 to the end of 2019 there is more likely than not a link between those patient infections and aspects of the hospital environment where such bacteria might grow.

8. COMMUNICATIONS AND THE EXPERIENCE OF PATIENTS AND FAMILIES

1. Communications are key to parts of ToR8 and ToR4. These Terms of Reference ask, respectively,

> '…. Whether communications with patients and their families supported and respected their right to be informed and to participate in respect of matters bearing on treatment'; and
>
> … whether any individual or body deliberately concealed or failed to disclose evidence of…. failures in performance or inadequacies of systems whether during the life of the project or following handover, including evidence relating to the impact of such matters on patient outcomes….'

2. The Inquiry's Terms of Reference focus on communications concerning patients. Some evidence was heard about communications with parties other than the Board, but no submissions are made on these.

3. There is considerable material in the Closing Submissions for Counsel to the Inquiry from Glasgow II in respect of the Cancer Journey for Schiehallion Unit patients (Chapter 2) and Impacts (Chapter 5) which are not repeated here but are adopted as part of our submissions. There was also a large amount of material on impacts on patients in Glasgow I, much of which can be found in Themes 4-10 of Counsel to the Inquiry's Closing Submissions following that Hearing. A significant number of passages touching on this subject can be found in the Narrative in Chapter 5. However, as indicated below, the opportunity has been taken to add to the fund of family experience evidence. by hearing from witnesses each of whom lost a family member in the adult hospital.

4. The balance of this chapter should be seen as following on from and developing Chapter 6 (Communications) of the Closing Submissions from Glasgow II.

5. This chapter also addresses Duty of Candour in general (and the specific incident involving the Cuddihy family), the key aspects of the evidence of Mrs

Slorance, Mrs Dynes and Beth and Sandie Armstrong, and proposes overall conclusions on the approach of NHS GGC to communications.

8.1 Duty of Candour

6. Previous Counsel to the Inquiry suggested a focus on the duty of candour.[3302] While there are connections between that topic and the wider topic of communications, the duty of candour is dealt with separately - and only briefly - here. The only exception to that approach is to deal first with one matter where the overlap is very clear.

The 'Duty of Candour incident' – 8 August 2019

7. In the Narrative of Events, material is set out which in turn refers back to evidence in Glasgow II about a meeting between Professor Cuddihy, Mr Redfern and Dr Inkster and to an extensive discussion in Counsel to the Inquiry's Closing Submissions following that hearing[3303].

8. The narrative refers to what has been described as 'the duty of candour incident'. At the risk of what would be repetition (for the second time). that narrative describes an unhappy communication story which originated in a communication thought to be required under a duty of candour. Information about an incidence of Mycobacterium chelonae was to be communicated to Professor Cuddihy. The conclusion on the issue was – at the end of Glasgow II – to await the direct evidence of Dr Inkster. That has – as the Narrative of Events notes – now been heard.

9. Whether the overall incident is ascribed to incompetence or mishap (or something more sinister), no doubt depends on the take which any reader has on the material. What appears to have occurred is that (a) Professor Cuddihy was in touch with the NHS GGC Chairman (b) so that the view was taken that this would be the logical route for communication with him and this was recorded in the IMT minutes, but (c) when there was communication about the

[3302]Paragraphs 374 to 376 and 426 to 436 of the Closing Submissions from Counsel to the Inquiry after Glasgow II
[3303] Paragraphs 437 to 459 of the Closing Submissions from Counsel to the Inquiry after Glasgow II

incident from the NHS GGC Chairman it did not provide all of the information it should. That was then compounded when (d) Mr Redfern tried to give to Professor Cuddihy explanations as to why communication had not taken place which were simply untrue. The true position was that Kevin Hill had told Dr Inkster and Mr Redfern not to talk to Professor Cuddihy. Although that was presumably due to the assumption that the Chairman would communicate, the overall effect was unfortunate, to say the least.

10. There is no reason not to accept Dr Inkster's account of what occurred at the meeting of 8 August 2019, not least because it is consistent with the evidence of Professor Cuddihy and Mr Redfern. Insofar as it differs from any version recorded in subsequent reports[3304] it can be concluded that these reports are inaccurate given the lack of engagement of Dr Deighan with Dr Inkster.

11. In subsequent apologies to Professor Cuddihy, NHS GGC describes its communications as' poor' and 'sub optimal'. These are relatively kind descriptions for a very unhappy incident. Taking an overall view, (and subject to exploring why Mr Brown did not tell Professor Cuddihy what the IMT and others clearly thought he was going to about the second Mycobacterium chelonae case[3305]) these events can probably appropriately be ascribed to incompetence, rather than any attempt to prevent an exercise of a duty of candour which was thought necessary. It is accepted that, if one adopts the approach suggested by Dr Mathers and Professor White and views this tawdry tale of communications from the perspective of the recipient, the picture is even less satisfactory.

Duty of Candour for Clinical Staff

12. This arises on two separate bases. Firstly, healthcare professionals have a professional responsibility to be honest with patients when things go wrong. This is set out in detail in joint guidance issued (in 2015, refreshed in 2022) by

[3304] See e.g. Bundle 27, Volume 6, Page 91.
[3305] We know that it was, in fact, the third in the RHC.

the General Medical Council and the Nursing and Midwifery Council.[3306] Repetition of the detailed terms is unnecessary Clearly a large number of the participants in the events considered by the Inquiry have that duty incumbent upon them. Many participants had that duty in mind throughout the difficult circumstances which prevailed.

13. In summary, it is submitted that it would be difficult for the Inquiry to conclude that any individual member of the clinical staff had failed in a duty of candour in a specified way. There may be circumstances in which something has not been said which, with the benefit of hindsight, might have been said, but it would be unfair to retrospectively label any such failure as a breach of duty.

14. Can the same be said of those medically qualified members of hospital management who also bear the same duty (notwithstanding they are not directly involved in clinical activity)? The answer to that question may be less certain. For instance, any such individual giving significant prominence to the Board's reputation or to structuring a communication in such a way as to restrict the exposition of the truth, might be said to be in breach of the duty. However, there is not sufficient evidence to ascribe any a particular breach of duty about a particular patient to any named individual. Whether there has been a higher-level breach of any duty of candour arising from the unusual infection incidents in the QEUH/RHC from its opening until the start of the pandemic is discussed below.

15. Given the Inquiry's interest in making recommendations, we would welcome submissions from Core Participants about proposed recommendations designed to ensure that those with clinical registration (whether doctors, nurses or other regulated health professionals) who climb the managerial ladder, are held to the standards of their regulatory bodies in respect of their duty of candour directed to individual patients and their families.

[3306] Guidance on the Professional Duty of Candour, General Medical Council and Nursing and Midwifery Council, March 2022 (See: https://www.nmc.org.uk/standards/guidance/the-professional-duty-of-candour/)

Organisational Duty of Candour

16. The second use of the phrase 'duty of candour' arises from the deployment of that concept in Part 2 of the Health (Tobacco, Nicotine etc and Care) (Scotland) Act 2016, which came into force on the 1st of April 2018. The Act - together with its associated regulations (The Duty of Candour Procedure (Scotland) Regulations 2018 - prescribes a procedure involving an apology (insulated from any assumption of acceptance of legal liability), communications, the offer of a meeting and a review of the incident. Section 21 of the Act requires such a process where an unexpected incident results, or (critically) could result, in harm. Harm is defined as including impact on treatment, distress etc. (Professor White had been involved in the preparation of the legislation).[3307]

17. Those who have listened to the harrowing accounts of events in the QEUH from 2015 onwards may have been surprised, to put it politely, to hear, not that the statutory duty of candour procedure had been operated on innumerable occasions by NHS GGC from April 2018, but that during this period it had never been operated at all.

18. Professor White explained[3308] that, in discussion with the Board, in his capacity as the appointed Oversight Board lead on communications, he had discovered that the NHS GGC policy on statutory duty of candour had been written to impose a number of hurdles as a requisite of its operation above and beyond what was required by the statutory provisions (including a requirement of causation[3309]). He described this, somewhat kindly, as the policy not 'fully reflecting' the statutory requirements[3310]. Much stronger phrases could have been used. He also explained that one of the arguments put forward in discussion by the Board was that, after all, infections were not 'unexpected' in immunocompromised patients.[3311]

[3307] Professor White, Transcript, p75
[3308] Professor White, Transcript, p82
[3309] Professor White, Transcript, p88
[3310] Professor White, Transcript, p79
[3311] Professor White p 84

19. Whatever the rights and wrongs of these exchanges, Professor White went on to confirm that, after discussion, the Board had revised its duty of candour policy. He was satisfied[3312] that the revised version complied with the statutory requirements. How this came about is an issue which the Inquiry will address in Glasgow IV with Mr Brown, Mr Calderwood and Ms Grant.

8.2 Patient Experience

Louise Slorance

20. Mrs Slorance had concerns about her husband being admitted to the QEUH for a stem-cell transplant during Covid. Mr Slorance was admitted to Ward 4B in the QEUH on 26 October 2020. Difficulties arose from Mr Slorance being moved from the BMT unit, and then between other rooms in the hospital, after testing positive for Covid. She had difficulties in communicating with Mr Slorance and his doctors whilst he was in hospital. This restricted her ability to provide emotional support.[3313]

21. All of this was very distressing to both her and her husband. She was not being given updates on the room moves and general situation, and even Mr Slorance was being provided with updates in an ad hoc manner. Mrs Slorance later discovered that her telephone number had been input into the hospitals' systems incorrectly, which provided some explanation as to why she was not being notified.[3314]

22. Unfortunately, Mr Slorance then tested positive for Covid a second time. She found this situation concerning as he was immunocompromised, given the pre-treatments that he had received for the stem-cell transplant. Of more concern was that Mr Slorance had been moved to Ward 4A, which she described as a general 'Covid ward'. Mrs Slorance worried that the room which Mr Slorance was in would not provide protection from the ingress of organisms. The day before Mr Slorance died, she was told of the possibility

[3312] Professor White, Transcript, Page 93
[3313] Transcript, Louise Slorance, page 3 to 5
[3314] Transcript, Louise Slorance, page 6 and 7

that he had contracted a second infection - but was not told what.[3315]

23. After Mr Slorance had contracted Covid, Mrs Slorance had a general sense that she was not being properly kept up to date on his movements and his general condition. For instance, when he was moved to the High Dependency Unit, she was concerned as the room did not have specialist ventilation. She was also told that the critical care team was now in charge of his care, but she had not met with or spoken to that team. On a visit to the hospital, Mrs Slorance noted hospital staff holding open doors to single rooms, contrary to Covid guidance.[3316]

24. Mrs Slorance gave evidence of the challenges which she faced when trying to recover all of Mr Slorance's medical notes after he had died. The first set she received were clearly incomplete and she required to request the complete notes again. During the process of procuring the medical notes, she learned for the first time that Mr Slorance had been treated for Aspergillus. Mrs Slorance now understood that if an autopsy had been carried out, it would have been possible to ascertain if Aspergillus had been part of the cause of death. She also had difficulties in getting agreement from NHS GGC to a meeting to discuss the death of Mr Slorance.[3317]

25. Mrs Slorance was told that there was to be a review by NHS GGC, a review by a director of NHS Lothian, and Healthcare Improvement Scotland were to carry out a review into Aspergillus at the QEUH. The review by NHS GGC was not initiated by the death of Mr Slorance, but rather, she thought, due to other publicity or because of the involvement of the First Minister. The review came 11 months after Mr Slorance's death, and she had been written to in February 2022 by NHS GGC to state that they did not feel there had been any issue with the care provided to Mr Slorance.[3318]

26. She reiterated that no investigations were carried out at the time of Mr Slorance's death. However, a case review by Dr Clark stated that Mr Slorance

[3315] Transcript, Louise Slorance, page 7 to 10
[3316] Transcript, Louise Slorance, page 20 and 21, and page 25
[3317] Transcript, Louise Slorance, page 32 to 34
[3318] Transcript, Louise Slorance, page 35 to 38

likely had a co-infection of Covid and Aspergillus on his death. The report by Dr Clark was not referred to in the review by NHS GGC. She also noted that the basics, such as the rooms where Mr Slorance had been moved to, were not referenced in the review.[3319]

27. Mrs Slorance struggled to secure a meeting to discuss Mr Slorance's death. NHS GGC refused to meet her with a lawyer or a politician present. She was due to meet with Dr Peters, but Dr Peters had been told that the meeting could not go ahead because a complaint had been made. Mrs Slorance had not made a complaint. NHS GGC wrote to Mrs Slorance in April 2022 referring her to the complaints procedure and withdrew all offers of a meeting.[3320]

28. Mrs Slorance also told of the Scottish Government, NHS GGC and Healthcare Improvement Scotland monitoring her social media accounts. She explained that a particular social media post which she had made instigated briefings to Ministers, and meetings of directors with special advisors. She considered this to be intimidating and invasive.[3321]

29. She described the impact on her and her family. By the time of his death, their three children had not seen Mr Slorance for six weeks. Their children were not allowed into the ICU on the night that Mr Slorance died. Only Mrs Slorance's two stepchildren were able to be in the room with her. Even Mr Slorance's parents had to say goodbye to him by way of a mobile phone on speaker. She noted that ICU knew on 3rd December that he was likely to die. He died nearly 48 hours later. If this had been communicated to her, more family members could have had time to say goodbye in person.[3322]

30. The discoveries which she had made through the medical records after Mr Slorance's death had eroded her trust in the QEUH. This had a psychological impact on Mrs Slorance.[3323]

[3319] Transcript, Louise Slorance, page 40 and 41
[3320] Transcript, Louise Slorance, page 45 and 46
[3321] Transcript, Louise Slorance, page 49 and 50
[3322] Witness Statement, Louise Slorance, paragraphs 159 to 166.
[3323] Witness Statement, Louise Slorance, paragraphs 168 to 170.

Maureen Dynes

31. Mrs Dynes explained that if she had known about concerns with the ventilation and water systems at the QEUH, she would have questioned the admission of Mr Dynes to Ward 4B in September 2020. The risks were never explained to her.[3324]

32. Mr Dynes was unwell during admission. He developed a cough which the medical staff had difficulty explaining. Mrs Dynes recalled hearing reference made to Aspergillus. She was not aware of what that was at the time. Mr Dynes was then discharged to Hairmyres Hospital as an outpatient. The team at Hairmyres tried to ascertain the cause of Mr Dynes' cough.[3325]

33. Mr Dynes was then re-admitted to the QEUH for CAR T-Cell therapy. His cough kept him confined to bed because of Covid, which caused muscle wastage. Mrs Dynes was eventually advised that Mr Dynes had the common cold and Aspergillus. The junior doctor who advised Mrs Dynes of this also mentioned that Mr Dynes had- Aspergillus the previous time he had been in the QEUH for his bone marrow transplant. Mrs Dynes was surprised when a consultant subsequently told her that Mr Dynes did not have Aspergillus, given what she had been told previously.[3326]

34. There was a discussion about Mr Dynes being discharged, but quickly following that his condition deteriorated rapidly. Mrs Dynes was then told that Mr Dynes had an infection. She subsequently found out that the CAR T-cell therapy had not worked, and his cancer burden had increased.[3327]

35. Mrs Dynes also gave evidence about the difficulties which she had in accessing Mr Dynes' medical records following his death, and the lack of a post-mortem examination to investigate the cause of death. The medical records which she did receive also disclosed a positive test result for Stenotrophomonas. Mrs Dynes considered that this had been purposefully

[3324] Transcript, Maureen Dynes, page 7 to 9
[3325] Transcript, Maureen Dynes, page 109 to 113
[3326] Transcript, Maureen Dynes, page 114 to 119
[3327] Transcript, Maureen Dynes, page 119 to 123

withheld from her because the hospital was already under scrutiny. In essence, Mrs Dynes felt that she was not told about the infections which Mr Dynes had suffered from, and the impact that they may have had on his death.[3328]

36. Mrs Dynes explained that this all had a significant impact on her and her family. The staff at the QEUH were excellent and did everything within their power. However, when Mr Dynes started to take a downturn, he wanted to go home. If he had, his family members would have been able to say goodbye. Mrs Dynes noted that she was allowed in, but they were not. Then when Mr Dynes took a downturn, he said he wanted to stay because he felt safe. She considered that, with hindsight, the irony of that was 'mind-blowing'.[3329]

37. Mr Dynes death certificate listed fungal chest sepsis with indication of two months. It did not mention which fungal infection. It did not mention Stenotrophomonas and indicated that no post-mortem would be carried out.[3330]

38. Mrs Dynes explained that the loss of her husband had a significant emotional impact on her. Her health has been impacted as a result. She lost the love of her life and her best friend. It has been made more difficult by finding out that Mr Dynes died of an infection which could have been prevented.[3331]

Beth and Sandie Armstrong

39. Beth and Sandie Armstrong stated that their mother tested positive for Cryptococcus Neoformans in the QEUH whilst she was there being treated for Lymphoma. Their mother had been admitted to the QEUH in November 2018. They were told that it was a serious infection which their mother should not have caught. They had not heard of Cryptococcus Neoformans previously.[3332]

40. At one stage, they were told that Mrs Armstrong's bloods had cleared

[3328] Transcript, Maureen Dynes, page 123 to 131
[3329] Transcript, Maureen Dynes, page 131 to 133
[3330] Transcript, Maureen Dynes, page 134 and 135
[3331] Witness Statement, Maureen Dynes, paragraph 76
[3332] Transcript, Beth Armstrong, page 74 and 75

following treatment for Cryptococcus Neoformans. However, Mrs Armstrong's condition then began to deteriorate. It was explained to them that there was an issue with whether the deterioration was due to the lymphoma, or the infection. They discovered years later that their mother had still been antigen positive for Cryptococcus Neoformans, despite their being told that her bloods were clear. Mrs Armstrong was released from hospital for Christmas but returned to the hospital a day later.[3333]

41. They met with Dr Inkster and Dr McDonald on 1, 3 and 4 January 2019. Another patient had also been diagnosed with a Cryptococcus infection at the same time. Sandie Armstrong had not received an answer to a question about whether the whole hospital was affected by Cryptococcus. Dr Inkster confirmed that there would be an investigation, which she would lead, given that there had been more than one instance of Cryptococcus.[3334]

42. Beth and Sandie Armstrong also gave evidence about the Significant Clinical Incident Report of 28 April 2020, and a meeting they attended with Dr Davidson, Jonathan Best, Dr Inkster, Dr Hood and Dr Hart on 30 September 2020. The report had stated that there was no link between Cryptococcus and pigeons. They also noted that there was a dispute concerning the minutes of the meeting, as they had been expanded after the fact, with further thoughts by Dr Hood, and some of what had been said by the family was left out.[3335]

43. They had been frustrated with their communications with the hospital. When they sought to ask questions, they were instead referred to a complaint handler for NHS GGC. They had been very complimentary of the care which their mother had received in the hospital but felt that there had been a shift in the behaviour of NHS GGC staff following their mother's death. They thought the aim was to disprove the hypothesis that there was a risk of Cryptococcus in the hospital. They also objected to use of the word 'elderly' to describe their mother in press-releases following her death.[3336]

[3333] Transcript, Sandie Armstrong, page 2 to 4, and Beth Armstrong, page 77 and 78
[3334] Transcript, Sandie Armstrong, page 4 and 5, and Beth Armstrong, page 78 and 79
[3335] Transcript, Sandie Armstrong, page 6 and 7, and Beth Armstrong, page 89 and 90
[3336] Transcript, Beth Armstrong, page 87 and 88, and 101 and 102

44. It was exhausting trying to deal with the hospital. NHS GGC were wearing them down with indirect answers. They were being fobbed off and were never going to get to the bottom of what had happened. They were trying to grieve at the same time as searching for f answers. They had expected the NHS to help them find answers rather than obstructing them. It became too stressful, and they decided to step back because they just wanted to grieve for their mother.[3337]

45. They believed that their mother's life was shortened by her contracting Cryptococcus. They found communications with the QEUH, and contacts from the media, very stressful.[3338]

Earlier Evidence in Glasgow I and II

46. Most of the evidence on communications was heard during Glasgow I and Glasgow II. This is summarised in Theme 11 of submissions from Counsel to the Inquiry after Glasgow I and in Chapter 6 after Glasgow II. In the interests of brevity these submissions are not repeated. In summary, parents and patients complained of what they perceived to be inadequate, incomplete, disingenuous or even untrue communications. A contrast was drawn between communications on clinical matters, about which attitudes were generally positive, and those relating to the hospital environment, where the response was very different. Most criticism was aimed not at clinical staff[3339] but elsewhere in the Board structure. As this submission works through some of the issues, the question will return to whether these criticisms were justified.

47. Purely to give a flavour of what was said –

> Molly Cuddihy: "Dysfunctional. I'd say disjointed. …. Sometimes you hear it on the news before you hear it from them, and majority of the time you don't hear what's actually going on[3340]"

[3337] Transcript, Beth Armstrong, page 101 and 102
[3338] Transcript, Sandie Armstrong, page 20 and 21
[3339] Se e.g. Transcript of the evidence of Professor White at p61
[3340] Transcript, Molly Cuddihy, page 48

Charmaine Lacock: “I mean, there was no communication. It was just, you know: drink the bottled water and don’t use the tap water.” [3341]

Denise Gallagher: “There was no communication; and if it was, it was always directed through the medical and nursing staff, which is completely inappropriate. It’s not their job role. …. And they …. often …. weren’t transparent.”[3342]

Professor Cuddihy: “...it was reactive. It was not proactive. And even when it was to be proactive, it was not considered about the audiences they were speaking to.”[3343]

Professor Cuddihy: “...what it is that they were communicating was fundamentally at odds with what they knew.”[3344]

James Gallagher: “...if the hospital management team had just spoken to the parents involved when it first started, I’m sure plenty of people could’ve sat down, we could have worked a few solutions, we could have talked through solutions, and we’d have never had to go down this route. But, instead, they decided they wanted to lie, hide, and downright just not acknowledge the problem in the first place”.[3345]

More Evidence?

48. In their closing submissions following Glasgow II our predecessors raised the possibility that the Chair might be able to reach conclusions on the communications evidence at that point. However, the Inquiry was persuaded that it would be useful first to hear from additional witnesses to give the perspective of NHS GGC and the Scottish Government. Professor Craig White was proposed as a witness by the Scottish Government and NHS GGC proposed that the Inquiry hear from Sandra Bustillo and Jennifer Haynes.

49. In the course of evidence focussed on other issues, some Glasgow III witnesses also commented on communications. In addition, the four witnesses whose evidence is summarised above and whose focus was on

[3341] Transcript, Charmaine Lacock, page 101
[3342] Transcript, Denise Gallagher, page 97
[3343] Transcript, John Cuddihy, 27-10-21 (PM), page 33
[3344] Transcript, John Cuddihy, 27-10-21 (PM), page 34
[3345] Transcript, James Gallagher, page 54 and 55

adult patients (Mrs Louise Slorance, Mrs Maureen Dynes and Ms Sandie and Ms Beth Armstrong) were able to give the Inquiry their perspective of both communications and wider issues within the remit and Terms of Reference.

8.3 Issues

50. It is not, it is submitted, necessary to revisit or rework the assessment of NHS GGC's communications by the Oversight Board. (Professor White – whose evidence is touched on later -chaired the Communications and Engagement subgroup of that Board). The main criticisms were[3346] that NHS GGC should -

> '...pursue more active and open transparency….in line with the person-centred principles of its communication strategies,
>
> make sure that there is a systematic, collaborative and consultative approach in place for taking forward communication and engagement with patients and families,
>
> embed the value of early, visible and decisive senior leadership in its communication and engagement efforts, and,
>
> review and…. take action to ensure that staff can be open about what is happening and discuss patient safety events promptly, fully and compassionately.'

51. In evidence Sandra Bustillo accepted these criticisms [3347]. In fairness to her, she also agreed that, though her witness statement might, at times, seem to paint a positive picture of communications, there were failings.[3348]

<u>Is Communications everyone's business?</u>

52. One of the points which seemed to emerge in evidence at Glasgow III was that 'infection control was everyone's business'. It was not just for IPC specialists. It is submitted - and for what it is worth Ms Bustillo agreed[3349] - that 'communications are (also) everyone's business'. It is difficult to criticise those charged with making, or helping to make, the communications, if they

[3346](Interim Report, Summary p6). Also discussed at length by Professor White e.g. at transcript 69-70
[3347] Transcript of evidence of Sandra Bustillo p 161
[3348] Transcript of the evidence of Sandra Bustillo p130
[3349] Transcript of the evidence of Sandra Bustillo p139

have not been provided with material by others and, accordingly, they do not have all the information to do so.

53. So, to take an example, if Mr Purdon or Mr. Powrie or Mr Gallacher had told the IMT in March 2018 of the contents or even the existence of the 2015 DMA Canyon L8 Risk Assessment Report, investigations might have taken a different turn and – more importantly for this chapter - communications to staff and patients might well have been improved. That may not be the responsibility of a department such as Ms Bustillo's, but it remains the responsibility of NHS GGC.

54. Other examples are not difficult to find. Someone in NHS GGC knew what ventilation specification Wards 2A and 4B were being built to. Yet the details of how each had been built came as an unpleasant surprise to both infection control staff and clinicians when they arrived at the new hospital. Again, had the information been shared the position would have been different.

55. Interestingly, as recently as the June 2022 HIS Inspection Report [3350] a 'more robust system' was required for real-time communication by estates to IPC of any issues arising from ventilation reports. That suggests the point is understood by NHS GGC, but performance - at least at that date - was not yet perfect.

Use of the Complaints Process

56. A new issue to emerge during Glasgow III was the 'weaponisation' (Counsel to the Inquiry's phrase) of the complaints system. Evidence from the Armstrong sisters[3351] suggested that they felt they were being deflected from their understandable aim of obtaining information and answers, by what appeared to be an insistence on instead operating the NHS GGC complaints procedure. Mrs Slorance mentioned it in a slightly different context.[3352]

57. It was not necessarily easy to understand attempts to explain why operating

[3350] Bundle 18, Volume 2, Document 129, Page 151
[3351] Transcript, Beth Armstrong, pages 85 and 86, and 100 to 102; Transcript, Sandie Armstrong, page 18 and 19
[3352] Transcript of the evidence of Mrs Slorance pp48-49, 51-52

the complaints procedure would produce what the families were looking for, but Ms Haynes[3353] vehemently denied any intention to use the process to shut down patient enquiries. There seems no reason not to accept that evidence. It was supported by Professor Wallace.[3354] Challenged with the question of whether the use of the complaint service was a means of diverting patients and shutting them up, her answer was that the intention was absolutely the opposite.

Open and transparent – or defensive?

58. It is difficult to avoid being drawn back to Professor Cuddihy's quoted perception that Board Corporate Services were, '… duplicitous, overly defensive, devoid of emotional intelligence and lacking in integrity with concern more for their reputation than patient safety'[3355]. Strong words. Are those words justified?

59. In an Inquiry where at least part of the background appeared to be of attempts by NHS GGC to deflect any suggestion that 'something unusual' had been happening by saying there was no evidence, it is – recognising the differing context – nevertheless interesting to note in passing the discussion by the Infected Blood Inquiry of why, 'a phrase like 'no conclusive proof' is liable to be misunderstood.[3356]

60. It has been suggested elsewhere[3357] that instead of simply transparency one should add 'and forthcoming' to the objective of healthcare communications. 'Candour is more than being open and transparent, valuable though both qualities are'. Certainly, Dr Mathers agreed with that notion.[3358]

61. The evidence of NHS GGC's chosen communication spokesperson, Ms Bustillo, is illuminating. She revealed in her witness statement[3359] that she had described what had transpired as a 'battle', a comment which she later

[3353] Transcript of the evidence of Jennifer Haynes page 22
[3354] Transcript of evidence of Professor Wallace page 86
[3355] Witness Statement, Professor Cuddihy, Paragraph 318
[3356] Infected Blood Inquiry at Vol 1 p215
[3357] Infected Blood Inquiry at Vol1 p233
[3358] Transcript of evidence of Dr Alan Mathers p 75
[3359] See Transcript of evidence of Sandra Bustillo at 160

accepted was inappropriate. That it was made at all, suggests an internal perception of warring parties, NHS GGC on one side and patients and families on the other.

62. That tends to be confirmed by what turned out to be the full quotation, which referred to Professor Cuddihy, and said, 'he may have won the battle, but he will not win the war'. [3360]Perhaps all of the debate over the NHS GGC's approach to communications should be read against the background of that comment.

63. To add to the picture, Ms Bustillo appeared to find it challenging to provide a direct answer to the question of whether it was part of her job to defend the Board's reputation. Ultimately, she seemed to accept it was, but objected only to the word 'defend'.[3361] The challenges of those exchanges seem all the more remarkable, when, later in her evidence,[3362] (in the course of a complaint about the way NHS GGC was treated after the appointment of the Oversight Board and Scottish Government involvement) Ms Bustillo readily accepted that there was 'a corporate NHS GGC position' that it was her job to get across.

64. Again, these exchanges in the witness box do lend support to the argument that the reputation of the Board was indeed in the minds of NHS GGC and its communications team.

Transparency

65. The issue of whether putting more information in a press release than was given to patients, risks creating the impression that there was a lack of transparency, or something is being concealed, has already been conceded by Mr Redfern. Ms Bustillo argued[3363] that that risk would not arise because press releases were also given to patients. Whether that is a complete answer is open to question.

[3360] Transcript of the evidence of Sandra Bustillo p161
[3361] Transcript of the evidence of Sandra Bustillo pp113-115
[3362] Transcript of the evidence of Sandra Bustillo p156
[3363] Transcript of the evidence of Sandra Bustillo p134

Transparency and accuracy – or spin?

66. That question can be approached by looking again at two of the most controversial communications examined by the Inquiry. First, at the time of the Ward 4B problems a press release[3364], including Q & A, said, in effect, that there were no problems in the children's BMT ward. That was plainly not correct, it is submitted.

67. It is argued for NHS GGC - and Ms Bustillo maintained[3365]- that the contrary was the case -that the nature of the issues on Ward 2A was not known, and the circumstances were very different. The defence of the narrative is more difficult to sustain when Professor Williams had sent an extensive note, contemporaneously with the press release, which spelled out a whole series of problems on ward 2A[3366]. That had gone to, among others, Dr Armstrong, who was, Ms Bustillo accepted, one of the senior management responsible for the press release.[3367]

68. The second example is what was said about the Ward 2A ventilation works around the time that that ward was decanted to Ward 6A[3368]. The ‘opportunity’ was being taken to ‘upgrade’ the ventilation, it was said. Ms Bustillo sought to defend both ‘opportunity’ and ’upgrade’. Having given very careful consideration to all of her attempts to explain that wording, none are, unfortunately, convincing.

69. Senior board officials well knew before that date that the ventilation system on Ward 2A was - to be kind - sub-optimal, in a number of significant ways. In an options appraisal document from the NHS GGC Acute Service Committee in respect of ventilation systems of Ward 4B[3369] it is clearly recorded that “the BMT Unit in NHS GGC's Royal Hospital for Children does not meet the standard either however, the rooms do have a positive pressure of 10 PA HEPA filtration and have anterooms. It has been agreed to upgrade four of

[3364] Bundle 5 p22
[3365]Transcript of the evidence of Sandra Bustillo p164
[3366] Bundle 27 Vol9 p411
[3367] Transcript of the evidence of Sandra Bustillo p163
[3368] Bundle 5 p157
[3369] Bundle 27, Volume 7, Document 6, Page 158

these rooms to meet the full standards."[3370] After that report the external reports confirming that work was needed (e.g. from Mr Leiper and from Innovated Design Solutions[3371]) did not come as a shock. The Inquiry can form its own view on the use of language. However, the notion of an 'opportunity' suggests something that would not have otherwise happened. Clearly, that is not correct. It cannot seriously be suggested that the ventilation works would not have been done if the ward had not been decanted for other reasons.

70. So far as an 'upgrade' is concerned, no doubt it is true that any improvement can be described as an upgrade. However, radical works to produce a very much-changed ventilation system for Ward 2A, involving stripping out the existing systems and replacing them, and requiring major building works, do not, it is suggested, naturally fall within the usual meaning of the word.

71. It is perhaps, a matter of speculation as to why a health board wishing to be open and transparent did not simply state, for instance, that (1) they accepted that the ventilation system in Ward 2A was not what was required for the patient cohort (whose fault that was not being of concern to the reader) (2) acknowledge they had been very slow to fully recognise this since the opening of the hospital in 2015, but (3) state now they intended to take major steps at very significant cost to put things right and to produce a truly world class environment? Would a statement of that kind have been more readily accepted by patients and families?

The challenge of differing opinions and puzzling events

72. It is of course acknowledged that, if a problem identified on a ward is one on which opinions differ, and the precise cause (or likely cause) is unknown, that will make clear and definitive communications much more challenging. In addition, it should be recorded here that some of the criticisms made of communications have been readily acknowledged[3372], and efforts made to rectify them. These include that they were reactive rather than proactive, and

[3370] Bundle 27, Volume 7, Document 6 at page 172
[3371] Bundle 6, Documents 33 and 34
[3372] Sandra Bustillo transcript at p136

that in the early stages the outpatient cohort was not adequately serviced. There was also confusion caused by a mismatch between messaging e.g. 'the water is safe' and steps in the ward e.g. the use of bottled water. Fortunately, these have not been as dramatic an example as that in the Infected Blood Inquiry of healthcare workers in Hazmat suits telling patients 'Nothing to worry about'[3373]. Due credit must be given both for the challenging circumstances and the recognition of needed improvement.

Media First?

73. What about timing, and the connected suggestion that communications to the media were prioritised over communications to patients? Careful narratives were given - particularly by Ms Bustillo - to explain those instances where, as matters turned out, some patients heard about critical events through the media before they had been communicated to directly (it being at all times accepted by NHS GGC that this sequence was undesirable). On the evidence it is not possible to conclude that there was any policy of prioritising the media over patients. The NHS GGC position was that the reverse was true.

74. A question remains over timing. From the written and oral explanations tendered in response to criticism about the time it took to release communications, it is clear that' senior management' were involved - and that this explained some of the delay. Why they were involved remains unclear, notwithstanding detailed exploration of the topic with Ms Bustillo.[3374] No delay would be involved if 'senior management' simply had to be told that the communication was being issued, as she seemed at one point to suggest.

75. The clear implication must be that it was thought necessary for management to scrutinise the wording being deployed. If so, that could hardly have been for factual or clinical accuracy. It does suggest a determination to ensure that the best picture was being presented from the NHS GGC perspective. Perhaps a glimpse at the truth of the matter was revealed by Ms Bustillo's – unprompted – comment that one had to be sure the communication was 'reflective of the

[3373] Infected Blood Inquiry Vol 1 at 204
[3374] Sandra Bustillo Transcript at p126

organisation'.[3375] That will, no doubt, simply be translated by some readers as acceptance of 'spin.' This is not a novel topic – the Infected Blood Inquiry commented that, 'Care needs to be taken that presentation does not override substance'.[3376]

Means of Communication

76. There was criticism of the use of Core Briefs to communicate to staff. The limitations of that medium have been acknowledged by the Board (though Ms Bustillo defended them[3377]). It is difficult to conclude other than that they were precisely that – a medium of limited value for the communications at the heart of this Inquiry.

77. There remains the broader question of who should communicate at all, on issues which were linked to the hospital building, rather than clinical treatment. The NHS GGC primary position is that this is best done through the clinicians and nurses in whom the patient places their trust. The alternative view is that such an approach risks destroying that trust, because, unlike medical treatment on which clinicians and other staff have expertise, they do not necessarily have expertise in ventilation systems, for instance. There may be, it is submitted, value in removing that burden from the already very busy clinical teams and leaving it fairly and squarely with hospital management. The analogy between this and Dr Inkster's evidence that at the start of the 'Water Incident' she wanted to see a sort of executive control group sitting above the IMT to make key decisions[3378] is of assistance.

78. That issue was brought into focus when Ms Bustillo was asked about whether the Board – having discovered at least by June 2018 a very serious failure (with potentially serious consequences) in its handling of the 2015 DMA Canyon L8 Risk Assessment Report, should have openly issued a statement about it. According to Ms Bustillo, that should have been for the IMT looking at

[3375] Sandra Bustillo transcript p128
[3376] Infected Blood Inquiry at Vol 1 p215
[3377] Transcript of the evidence of Sandra Bustillo p125
[3378] Transcript, Professor Wilcox, page 162 to 164

water issues.[3379] Having had it put to her that these failures were nothing to do with the IMT, she was unable ultimately to assist the Inquiry further on the point. Given the establishment of a review group led by Mr Best to work through the consequences with Mr Walsh as primary contact with HPS and HFS,[3380] the idea that the communications consequences of the 'emergence' of the DMA Canyon reports was somehow the responsibility of the IMT is at best fanciful.

Information on prophylaxis

79. There is also a narrow issue of whether families were told the reason, when additional prophylactic medication was being prescribed, not for their condition, but due to the state of the building environment (or possible state). Some families complained that they were not given that information. Almost universally, clinicians maintained that they would have told families. This emerged mainly in evidence in Glasgow I and II.

80. At the Glasgow I hearing, a small number of witnesses raised concerns that they were not kept informed about the use of prophylactic medication. Overall, the concerns related to a lack of transparency about the rationale for prescription of these medications and of their potential risks. Some witnesses formed the impression that preventative medications were part of their child's treatment for cancer. Others recalled vague reference to "protection from water" or "protection from the environment". On the whole, witnesses did not recall being fully informed of the purpose of prophylactic medication or its potential side effects[3381].

81. Some witnesses indicated agreement, in hindsight, with the rationale behind the prescription of preventative medications: the protection of their child from risks present in the environment[3382]. These witnesses separated concerns about the existence of those environmental risks and the steps taken by

[3379] Transcript of the evidence of Sandra Bustillo p140
[3380] Bundle 14, Volume 2, Page 257
[3381] See, for example, the transcript of evidence of Charmaine Lacock, tat p.75; transcript of evidence of David Campbell, at p.67.
[3382] See, for example, the transcript of evidence of Denise Gallagher, at p.45; evidence of David Campbell at p.69.

clinicians to mitigate against them. Ms Lacock recalled her alarm on discovering the nature of Posaconazole on the internet. She understood it to be a powerful medication usually prescribed for only short periods at a time. However, even with that understanding, Ms Lacock said that had the reasons for its prescription and its risks been explained clearly at the outset, she would probably not have objected to it[3383].

82. There was also positive evidence of families being informed about the use of preventative medications for reasons linked to the environment. Some witnesses recall being informed in March 2018 by clinical staff that immunocompromised children were being prescribed medication to "protect them from the water"[3384]. Similar communications were reported in May 2018 and June 2018 about medications to protect children from "the environment"[3385]. Reports of similar communications continued through 2019.[3386] What appears to have been considered lacking from those communications was a full explanation of the nature of the environmental issues[3387]. It was that perceived lack of transparency which led to suspicion and distrust.

83. As set out above, clinicians gave evidence that families were informed about prophylaxis, both as part of a discussion at the outset of treatment and as and when additional prophylaxis was prescribed. They recalled informing families that additional prophylaxis was being used to guard against infection and that, where they had information to give about the environment, it was given[3388]. That families were told something about the use of additional prophylaxis for reasons connected to the environment finds support in the written communications issued to patients and families in which the use of

[3383] Transcript of evidence of Charmaine Lacock, at p.78.
[3384] See, for example the witness statements of Sharon Ferguson at para. 63; and Lynn Kearns at para. 54.
[3385] Witness statement of Denise Gallagher at para. 70; witness statement of Leann Young at paras. 24 and 75.
[3386] David Campbell recalls a leaflet being produced in January 2019 (witness statement at para. 82); witness statement of Karen Stirrat at para. 113. Ms Stirrat recalled that parents were called to a meeting and provided with a leaflet relating to preventative medication.
[3387] Witness statement of Denise Gallagher at para. 70.
[3388] See, for example, transcript of evidence of Professor Brenda Gibson, p.152.

prophylaxis is referenced[3389].

84. Against a background of the generally high esteem in which clinical staff were held by patients and families, it seems inherently unlikely that this same group were deliberately omitting the information. The truth may lie somewhere between the two extremes. Perhaps in some cases additional prophylactic medication was prescribed and for one practical reason or another nothing specific was said. That may now be interpreted by some as a as a failure, but that seems unduly critical, and if the prescription of prophylactic medication was a reaction to the concerns about unusual numbers and types of infection in the context of reports of infections to HPS, the burden of communication also falls on NHS GGC corporately.

Emotional Intelligence

85. Professor Cuddihy[3390] mentioned 'emotional intelligence'. While that is a colourful phrase, it is more readily understandable when the Inquiry heard [3391]of a proposed communication which intended to use the words 'acceptable level of infection'. It is difficult to understand why anyone would have thought that was appropriate. Ms Bustillo accepted it would 'jar'[3392]. In a different context, telling Mrs Slorance that there were no concerns over her late husband's treatment, when it seemed at least strongly arguable that he had acquired both COVID and aspergillosis while in hospital, does suggest a lack of sensitivity.

The correct aim

86. That ties in with very helpful evidence given by Professor White. While his role was to be the 'voice of the families[3393], much of his focus was on the mistrust that existed and on what he perceived to be the Board's failure to consider its communications from a patient-focused perspective[3394] . It was necessary to

[3389] See, for example, Bundle 5, pp.100; 142; 169; 331.
[3390] Whose assistance was welcomed by Professor White transcript p26.
[3391] Transcript of evidence of Professor White p70
[3392] Transcript of the evidence of Sandra Bustillo p165
[3393] Transcript of evidence of Professor White e.g. at 26
[3394] Transcript of the evidence of Professor White at e.g. p50

look at things 'through the lens of those people who were having the experience'[3395]. There had, he accepted, been a recognition at the top levels of NHS GGC of a need to improve.

87. Professor White had been struck [3396]by the similarities between what he encountered when he first took up his role and what he read in Mrs Slorance's first witness statement – particularly the feeling of not being heard and not being involved. He also deployed the phrase 'compounded harm'.[3397]That is interesting in the context of the Inquiry's investigation. It means 'that the harm and distress that's experienced by the index incident is compounded by the response of the organisation to the index incident and its consequences'.

88. Also of interest is that Professor White's perspective in turn chimed with communications evidence from an unexpected source, Dr Mathers. He suggested[3398] that, when considering communications effectiveness, one should not view that question from the perspective of the drafter or sender but from the perspective of the recipient. It was that perspective which ought to be critical. Again, Ms Bustillo did not demur, albeit it took a number of questions to get to that position.[3399] Jennifer Haynes agreed[3400]. (That suggestion was also put to Sandra Devine. She described it as 'a point well made'.[3401]) Borrowing unashamedly from elsewhere, communication is, 'more talking with, than talking to'.[3402]

Communications on airborne infections

89. It is necessary to consider a question which emerges from the evidence of Mrs Slorance, Mrs Dynes and the Ms Armstrongs. Was the possible impact of an airborne infection, either Aspergillus or Cryptococcus, properly explained and disclosed to the families? The potential significance of such an infection is graphically indicated by the use by Mrs Slorance of the phrase 'dead man

[3395] Professor White, Transcript, Page 71
[3396] Professor White, Transcript, Page 122
[3397] Professor White, Transcript, Page 123
[3398] Alan Mathers, Witness Statement, Page 24
[3399] Sandra Bustillo, Transcript, Page 124
[3400] Jennifer Haynes, Transcript, Page 30
[3401] Sandra Devine, Transcript, Page 151
[3402] Infected Blood Inquiry Vol 1 p215

walking', to describe her husband after he was moved from the protective ventilation environment of Ward 4B.[3403] (That Mrs Slorance did not have at an early date, a transparent and adequate explanation of aspects of her late husband's care such as this is of itself a communications failure).

90. The first point which has to be acknowledged is that these airborne infections give rise to what may be particularly challenging questions of diagnosis. Tests may show different things at different times. That in turn may lead both to uncertainty and indeed to differing opinions among clinicians, microbiologists and others. Thus, what may be seen as failure in communication may in reality be reflective of differing views about the infection. That said, it is difficult to avoid the conclusion that communication, in the patient-centred and transparent manner which seems acknowledged to be desirable, was inadequate.

91. There is a separate but related question over the issue, of post-mortem examinations. It appears, from the evidence led at the Inquiry, that such examinations would have revealed definitively whether the airborne infections were a cause of death That is information which, one might think, should have been well understood by the clinicians involved. On the other hand, it is unlikely to feature among the knowledge base of the average (distressed) family member. Yet it seems not to have been discussed in any transparent manner. Why that was is not clear.

92. What conclusion should be reached? Leave aside for the present what seems – on the evidence before the Inquiry – to have been a deliberate attempt to derail Mrs Slorance's efforts to meet Dr Peters by suggesting the existence of a complaint which Mrs Slorance never made. That apart, is there a conspiracy to conceal? That the NHS GGC communication performance was lacking in all of these cases is beyond doubt, but the evidential material is lacking to establish a deliberate and inappropriate motive. Perhaps the truth of the matter may lie in the insidious influence of an unstated defensive approach to communications which has seeped into the key events.

[3403] Transcript, Louise Slorance, page 11

93. The Slorance case, however, cannot be left without mentioning what had been claimed to be an 'independent review' by Lothian Health Board. That review was patently inadequate, given that LHB had neither access to patient records nor direct discussion with involved clinicians. Unfortunately, such an inadequacy will always tend to fuel the fire of suspicion.

'Social Listening'

94. A new topic also emerged in Mrs Slorance's evidence – 'social listening-' i.e. the monitoring by NHS GGC of social media activity of an individual. Mrs Slorance was upset by it. The Board ceased to carry it out and apologised for a lapse of judgement.

95. Unfortunately, it is difficult to avoid the conclusion that Ms Bustillo's late-produced Supplementary Statement again sought to 'spin' events by asserting[3404] (and it is clear that here she was simply deploying material provided by others) that what was being done was a response to an Oversight Board requirement to seek out and follow best practice from other Boards. Regrettably for that explanation, while Ms Bustillo was able to enlighten the Inquiry about the ability that other Boards had to do social listening, it turned out that none had deployed it against individuals in a similar way.[3405]

Stop Digging?

96. The First Rule of Holes, as popularised by the former Chancellor of the Exchequer, Denis Healey, would appear to be relevant. If you know that you are accused of spin and your communication approach is being criticised, it may not be helpful if the indefensible is then defended. That will fuel the fire rather than extinguish it.

97. Ms Bustillo was asked, repeatedly,[3406] if a statement [3407]that, when the hospital was first opened there was no indication that there was a problem with the water, was incorrect, given the knowledge of some NHS GGC officials

[3404] Transcript Sandra Bustillo p157
[3405] Transcript of the evidence of Sandra Bustillo at p158
[3406] Transcript of evidence of Sandera Bustillo p154
[3407] Bundle 27, Volume 11, Page 25

of the DMA Canyon Report saying precisely that. Notwithstanding the intervention of the Chair, she insisted on a position that, since the Board as a whole did not know, the statement was correct. The Inquiry may also use that exchange - as with others - to flavour its overall understanding of the NHS GGC approach to Communications.

Conclusion and Terms of Reference 4 and 8

98. Given the disparate nature of the topics encompassed in this chapter, a single overall conclusion is not appropriate. Many of the sections reach their own individual conclusions and reference is made to those. However, looking at communications in the round, the Inquiry may be able to conclude that much of the criticism in Glasgow I and II was well-founded. TOR8 covers both patient experience and communications. The evidence in 'Communications Week' has added more eloquent voices to the voices of those who were heard in earlier sessions of the Inquiry. That will allow the Chair to reflect these in dealing with the first part of TOR8. The second part, it is submitted, should be answered by determining that communications with patients and their families did not in all respects adequately support and respect their rights to information related to their treatment and events impinging on it.

99. The answer to ToR4 has to be more nuanced. If deliberate concealment is intended to infer some improper motive, there is inadequate evidence to support such a conclusion. If by 'deliberate' no more is intended than that a decision has been taken, intentionally, not to say something which could have been said, a different view can be reached. Overall, there is probably sufficient for a conclusion that there was a failure to disclose inadequacies in performance or of systems which potentially impacted on patient care and patient outcomes. A final view can await Glasgow IV.

9. LOOKING FORWARD TO GLASGOW IV

1. The Glasgow IV hearing will be held for five weeks from Tuesday 29 April 2025 to Friday 30 May 2025. All remaining evidence necessary for the Inquiry to address its remit and terms of reference will be heard. The Inquiry Team proposes that Glasgow IV addresses four topics – the first much larger than the others:

    - The governance of both the contract (both within NHS GGC and at SG level) and the reaction to the growing understanding of deficient features in the water and ventilation systems. The Chair has already heard a lot of evidence relevant to this topic, many documents have been identified in PPP13 and will be identified in PPPs 15 and 16.

    - Term of Reference 4 - which might be thought of as addressing the issue of potential obfuscation within NHS GGC and further evidence on the response to Whistleblowing – a lot, but not all, of the evidence relevant to this topic was covered in Glasgow III.

    - Evidence necessary to address TOR 9 as it relates to the reporting of HAIs and HCAIs in NHS GGC, and how infections from unusual micro-organisms that may be linked to the environment are identified, reacted and reported to HPS/ARHAI – a lot, but not all, of the evidence relevant to this topic was covered in Glasgow III.

    - Evidence necessary to address TOR 10 as it relates to the Shieldhall Wastewater Treatment Works and whether the choice of sites was appropriate or gave rise to an increased risk to patients of environmental organisms causing infection.

2. Whilst work is underway to identify Glasgow IV witnesses, it is currently anticipated that witnesses will fall into five groups:

    - The NHS GGC Project Team

    - Contractors and consultants

- Remaining NHS GGC Board executive members
- NSS including NHS Assure
- Scottish Government

9.1 Treatment of Glasgow IV evidence in Glasgow III

3. The Inquiry previously indicated that, where it appeared that Glasgow III witnesses had evidence potentially relevant to Glasgow IV issues, the opportunity would be taken to hear this in Glasgow III, to avoid, wherever possible, witnesses being recalled.

4. A number of possible questions were set out in the Opening Note for Glasgow III[3408]. These were,

- Do Glasgow III witnesses have evidence to contribute to the question of whether the Shieldhall Waste Water Treatment Works have given rise to an increased risk to patients?
- What can Glasgow III witnesses contribute to the Inquiry's understanding of the practices and processes of reporting HAIs within QEUH/RHC (including the operation of the HAIRT system and the various committees and subcommittees of the board) and whether they were effective?
- What can Glasgow III NHS GGC Estates and IPC witnesses tell the Inquiry about their involvement in the procurement of the hospital, and specifically any opportunities they had prior to contract close and authorisation to influence the specification of the water and ventilation systems?
- What can the Glasgow III IPC witnesses tell the Inquiry about whether they had any opportunity to identify any Potentially Deficient Features in the water and ventilation system prior to handover? and
- What can the Glasgow III witnesses contribute to the Inquiry's understanding of whether the recommendations in respect of the practices

[3408] Provided to Core Participants and to be published on the Inquiry Website in due course.

and processes of reporting HAIs made by the CNR and the Oversight Board have been fully implemented by NHS GGC.

5. More evidence emerged then might have been anticipated. It is dealt with in this Chapter. Inclusion of any material here, is, of course, without prejudice to submissions and rulings at Glasgow IV. In some instances, the questions have not been approached in precisely the manner envisaged by the Opening Note. The opportunity has also been taken to record here material which emerged, during Glasgow I and II, on the odour and infection risk consequences of siting the QEUH near a wastewater treatment works and waste handling site.

6. In addition, there were a significant number of what appeared to be insightful or pragmatic suggestions, recommendations and ideas offered by Glasgow III witnesses, particularly those with expertise, for steps which could, the witnesses suggested, have made a difference – or would make a difference in the future. These are recorded, at this stage without further comment or conclusion, under the headings for Governance. It will be for Glasgow IV to consider them alongside any other material which emerges.

7. In some instances, e.g. suggestions for future governance arrangements, it suffices to record here broadly what the suggestions were, and who made them. In other instances, such as narrative evidence of what happened - or witnesses assert happened - prior to handover, (or the witness evidence on odour and siting), it is more useful to record the witness evidence in greater detail (albeit that its analysis must await Glasgow IV).

8. In addition, in the course of the Chapter 6 discussion on various questions, we came to identify points which would need to be dealt with in Glasgow IV. For ease of future reference, they have been narrated here. In the review of the CNR Expert Panel in Chapter 3, there has been tabulated a number of possible points for consideration in Glasgow IV. For ease of reading that has been included at the end of this Chapter.

What happened before Handover?

9. Evidence around questions (c) and (d) from the Opening Note tended to

merge together in the evidence. Who had the opportunity to influence ventilation and water specification? Who could have spotted deficiencies before handover? That excluded many participants, who only came on the scene when the hospital was being occupied or very shortly before.

10. The available evidence is narrated below. In some cases, it is conflicting. While a brief comment is made following the narrative, final conclusions will need to await the placing of Glasgow III evidence in the context of Glasgow IV evidence, especially from the Project Team.

- **Dr Redding** gave evidence[3409] that, at some point just before 2008, she was involved at the very beginning of the project, because NHS GGC realised that it was important to have Infection Control involved. She recalled a preliminary meeting with a ventilation company, along with estates and other colleagues from NHS GGC.

- She was shown the Minute of a meeting on 18 May 2009 at the Hillington project office and, in the section on isolation rooms, mention of a paper produced by her with Dr Hood and Annette Rankin.[3410] Her recollection was that a document was produced before 2008 with input from Infection Control, clinicians and Estates. It included plans for each ward, number of positive and negative pressure rooms etc[3411]. She could not recall any absolute decision being made, but did accept that she may have advised there were downsides to natural ventilation due to overpowering smell from the sewage works. There was a lot of discussion about whether the building should be sealed, with mechanical ventilation, or whether to have fresh air and natural ventilation. At the end of the meeting various options were to be considered.

- Dr Redding gave up her Infection Control role in 2008 and had no further project involvement. Professor Williams took on her role as Lead ICD. Dr Redding had no expertise in ventilation beyond following SHTM guidance.

[3409] Dr Redding, Transcript, Pages 55-60
[3410] Bundle 14, Volume 1, Document 3, Page 75. Karen Connelly recalled the involvement of Annette Rankin and Jackie Stewart
[3411] Talk of negative pressure rooms was also recalled by Sandra Devine

No-one in Glasgow had, in Dr Redding's view, the necessary expertise apart from John Hood, but he had not been involved in a major project, so her preference was to consult external experts.[3412]On the other hand **Dr Inkster** argued that in 2009, Dr Hood and Dr Redding had expertise to advise on the specification of new water and ventilation systems. By 2014 she, Dr Peters, and Dr Hood had the necessary expertise. She added that Mr Powrie had expertise in water and to a degree in ventilation systems.[3413]

- **Dr Inkster** had some involvement with the isolation rooms procurement in 2012[3414].

- **Mr Hoffman** was not involved in the general design of the new hospital ventilation. He advised in 2010 on the ACH for a renal outpatients area[3415]. He had no objections to a reduction of ACH in that area to 2.5. In 2012 he was asked about isolation rooms with lobbies.[3416] The rooms needed to be built to the precise design. In addition, there was a worry because there would inevitably be leaks.

- **Professor Williams** said he was not responsible for the ventilation specification. If he was ever asked, he would have said, 'build to Guidance'. The original specifications were, he maintained, drawn up by Annette Rankin, Dr Redding, John Hood and Jackie Stewart. An ICN was the conduit between the project team and infection control. She had a lead role, but it was the project team who had to sign off. Infection control was merely supporting. They got a lot of questions about things like sinks and taps [3417]but the original specification required compliance with the HTMs, and SHTM and SHBN 04 01. It was the project team who were responsible for making sure the guidance was implemented. People might have thought that as lead ICD he was supervising, but he was not.

[3412] Dr Redding, Transcript, Pages 61-64
[3413] Dr Inkster, Transcript, Day 1, Page 11
[3414] Witness Statement of Dr Inkster paras 183-4
[3415] Bundle 17, p3033
[3416] Bundle 14 Vol1 p31
[3417] Also recalled by Sandra Devine

- Challenged about emails suggesting he was more involved in ventilation design than he admitted, he did not agree that any should lead to that conclusion. For instance, in an email[3418]Dr Peters had asked - “How was the design of the new build signed off from an Infection control point of view, i.e. who would be the most appropriate person to speak to get an overview of design in regard to ventilation from an infection control point of view.” The response from Tom Walsh was, ‘Craig led on most of this with some input from John Hood.” Professor Williams’ response was that he had no role whatsoever in signing off the building specifications or the infection control specifications for the new hospital. He was also unaware of the ventilation derogation until it was drawn to his attention by the Inquiry.

- Professor Williams accepted[3419] that he had met with ‘the technical guys’ in 2012 and he now knew that in 2009 it had been decided not to follow guidance. He continued to maintain that his response always was, ‘build to guidance,’ so if anyone had mentioned it that would have been the reply. **Sandra Devine** agreed there did not seem to be anybody from infection control involved in the big issues.

- **Karen Connelly** recalled that there was always someone from infection control part of the team, initially the ICN Annette Rankin and then Jackie Stewart. She understood that achieving a BREEAM award was a very high priority for the project team.

- She was referred to an e-mail from Mark Baird[3420] sent to her in December 2009, not long after she had joined. This related to the M&E log and the ventilation strategy. Asked why it was sent to her, she explained that she had no direct recollection but given the content and the time - first thing in the morning - she assumed it had been sent so that she could print it off for someone else at a meeting in the Hillington offices.

[3418] Bundle 14 Volume 1, Page 205
[3419] Transcript of Professor Wiliams p158
[3420] Bundle 17-page 2855

- **Annette Rankin** recalled[3421]being involved in the competitive dialogue discussion but just around patient flows, not water or ventilation. In the design group she had no recollection of discussion about ACH and ventilation, nor in meetings in July 2009 did she recall BREEAM, thermal modelling or discussion of maximum temperature. Nor was she asked about moving to 40l/sec.

- Contrary to the Alan Seabourne email[3422] she was adamant she had not advised on whether there should be natural ventilation, nor did she go round ventilation with Dr Redding.[3423]

- **Alan Bennett**, with the benefit of hindsight, thought there seemed to be a disconnect between the hospital design team and the cohort of experienced IC professionals with a knowledge of specialist ventilation systems located in the Glasgow area in Yorkhill and the Brownlee unit, who he assumed were not consulted during the design process.

- **Professor Steele** gave evidence focussed on water, and which looked back at the very early days. He confirmed that in due course he was a duty holder and the Designated Person for water. In 2019 the designated person for water was Mary Anne Kane and Allan Gallacher. He was made the Designated Person when he took up his post.[3424]

- Regarding 2018 and 2019, Professor Steele considered that the wards' water safety plan and group were operating and were learning in terms of the new technologies deployed on the campus around sanitary ware, point of use filters, how to test water etc. They were met but on a continuous improvement pathway.[3425]

- **Professor Steele** confirmed that in 2015, 2016 and 2017, there was not a proper structure of designated people or a written scheme for the new hospital. In 2018, (as is more fully narrated elsewhere), they were finding

[3421] Transcript of Evidence of Annette Rankin p19
[3422] Bundle 12, doc 104
[3423] Transcript of evidence of Annette Rankin p24
[3424] Transcript, Professor Steele, page 101 to 102
[3425] Transcript, Professor Steele, page 103

unusual organisms in the water. They were first looking in Ward 2A, then sampled elsewhere. The term systemic was used because the bacterium was found throughout the system.[3426]Whether the system was contaminated or not, the system had the potential to be contaminated. The control of the system was not robust enough to eradicate the bacterium.[3427]

- It was put to Professor Steele that within the litigation NHS GGC was pursuing against suppliers, there are averments that at handover there was systemic contamination. Professor Steele said that in their view the systems would support a position that, on review of the data about how the system was commissioned, it compromised the sterility of the pipework. Having water not moving in the system compromised the system. It would have the potential to create biofilm and microorganisms.[3428]

- Professor Steele maintained that a system is compromised if it is not commissioned in an appropriate manner. The system was filled, and then the water sat there. Contamination conjures many things. Microorganisms in the system had the potential to proliferate because of the commissioning of the system. He argued that contamination meant that the system had microorganisms in it at numbers that one would not have normally expected.[3429]

- The **conclusion** must be, at least for the present, that no Estates personnel were in a position to exert influence (with the possible exception of Mr Powrie, at least in theory). So far as IPC personnel are concerned, the possible candidates are Dr Redding, Dr Hood, Annette Rankin, Professor Williams and Jackie Stewart (Barmanroy). Rankin and Stewart are ICNs, Dr Redding knew little beyond SHTM 03 01. That leaves Professor Williams and Dr Hood. Professor Williams denied significant involvement (and at times much knowledge of ventilation). Dr Hood is not

[3426] Transcript, Professor Steele, page 104
[3427] Transcript, Professor Steele, page 104 to 105
[3428] Transcript, Professor Steele, page 106
[3429] Transcript, Professor Steele, page 106 to 107

available to the Inquiry.

Governance -What should have happened before handover?

11. All post holders, such as Authorised Person (Water) should have been in place in advance.[3430]

12. Given the complexities of the water system, it should always have been designed with biocide dosing.[3431]

13. Infection control should have been involved; from the planning stages all the way through the design, installation, the commissioning and the maintenance. An ICD or ICDs should have been seconded.[3432] (Though one witness questioned whether, while desirable in principle, an expectation that IPC have input at all project stages was unachievable, primarily because of the shortage of resource in the form of ICDs?)[3433]

14. Much more resource should be deployed to assist the 'bedding-in' process of a new build. [3434]

15. Influence by the people who are going to be maintaining the building was crucially important. As it was put, 'some influence should be afforded to those who will maintain the hospital [whoever that is] in relation to the quality of the assets... to enhance the longevity of efficient and effective operation..."[3435] In a PFI contract those who were going to maintain that project should have access to the contractors to influence what they are providing. Estates staff should have the same access, as should infection control, and this should be early in the process.[3436]

16. Authorising engineers should be engaged in the process to ask 'difficult

[3430] Ian Powrie, also agreed by Jim Leiper
[3431] Ian Powrie, Witness Statement p250 endorsed by Eddie McLaughlan at transcript p56
[3432] Dr Inkster witness statement para 197
[3433] Sandra Devine witness statement page 144
[3434] Transcript of Dr Mathers page 77
[3435] Jim Leiper transcript page 111
[3436] Jim Leiper transcript page 84

questions'. [3437]

17. There should have been a Ventilation Safety Group. A VSG would have been a suitable means to manage the ventilation systems, provide assurance or escalate issues within the organisation[3438].It had to be multidisciplinary.[3439]

18. Pre-handover must be improved.[3440]- 'sound, safe operational arrangements and operational systems must be in place and tested end-to-end before ... handover." [3441]

Future Governance

19. **The Role** of NSS - now in place were Key Stage Assurance Reviews (KSARs) at various stages of a project, from concept right through to eventual handover. NSS Assure conduct a review to benchmark against guidance. They feed that back to the project team. Infection control is at the heart. If a Board did not want to follow the advice, the project would be labelled 'unsupported' and would not progress. [3442]

20. If NSS told a Board what to do that might create a conflict because the resources would not be available elsewhere. A NSS compliance function e.g. to make sure that the object (for instance compliance with SHTM 03 01) was fulfilled, had been under consideration for a long time. It would be a different model which would embed a central support function in the decision making of the Board.

21. Could NHS Assure tell Boards how to build these buildings and provide a template? There would need to be a means of preventing someone not following the template.[3443]

22. **HIS** – Is there is a fundamental gap in regulation? If HIS does not have

[3437] Eddie McLaughlan. Also, at transcript p49 he referred to the 'perennial conflict between project and maintenance teams.
[3438] Andrew Poplett report para 9.13
[3439] Andrew Poplett transcript p 68
[3440] Jim Leiper transcript p110
[3441] Jim Leiper transcript p 110
[3442] Transcript of Darryl Conner page 3 on
[3443] Transcript of evidence of Sandra Devine pp170 on

regulatory powers, the inspections and reports can thus carry little weight. Boards are free, at least in theory to ignore any recommendations.[3444] Does that need to change?

23. Approach to **Finance** - Whole life cost of an asset should be the driver not just purchase cost.[3445]

24. Safety should be paramount and thereafter life cycle cost. It was suggested that,' If you marry those two, I think you're as close to Utopia as you get'[3446]. Life cycle cost was possibly 10 times more significant in cost. The life cycle costs associated with the operation of poorly designed and installed systems will dwarf the cost of getting it right at the beginning. What was more, in an operational hospital the relative cost goes through the roof, not to mention additional risk to patients.

25. One should change 'the prime motivator for projects and replace the 'on-time, under budget' ambition, with the principal target to reach a specification to deliver 'the safest, most appropriate, best value healthcare outcome,' and if possible, to achieve this prior to the Preferred Bidder stage".[3447]

26. At all times, understand and recognise the tension between operational estates and the project director - who is trying to manage the budget.[3448]

27. Avoid assuming because you have a 'shiny new hospital' money can be taken off the budget as efficiency saving. In that situation if the figures turn out to be not adequate,' it becomes a millstone round' the neck of those trying to cope.[3449]

28. **BREEAM** - Aiming for BREEAM meant a 'lesser priority' was taking precedence (effectively energy saving over safety).[3450] 'A desire to achieve a BREEAM excellent rating led to a design which 'did not adopt a patient

[3444] Louise Slorance witness statement para 25
[3445] Andrew Poplett, Transcript p94
[3446] Andrew Poplett, Transcript p42
[3447] Jim Leiper transcript p45
[3448] Jim Leiper transcript p62
[3449] Jim Leiper transcript p92
[3450] Jim Leiper transcript p55

centred approach or have infection prevention and control at its heart'.[3451] The BREEAM system was not 'specifically designed for healthcare buildings, and should never be used as a primary performance driver where clinical or infection prevention and control needs could be jeopardised or compromised'.[3452]

29. **Guidance** - avoid the use of guidance as a pseudo specification.' So, just to say you will comply with the guidance actually gifts the interpretation of the guidance to the contractor, particularly in a design-build situation'[3453]

9.2 Issues for Glasgow IV arising from the discussion in Chapter 6

30. Why was the hospital accepted with an apparently inadequate Zutec information system, no asset tagging and no or very little in the CAFM system for PPM?[3454]

31. How was it that Wards 2A and 4B were not built with a ventilation system that complies with the guidance for 'Neutropenic Wards' in SHTM 03-01?

32. Why was Ward 4B built as it was i.e. in a manner which caused clinicians to take the drastic step of returning their patients to the Beatson?[3455]

33. Why was the lack of HEPA filters in isolation rooms in Ward 2A not detected during commissioning?[3456] Why was there no validation?

34. Who should have arranged for an AE (Water), AP (Water) and Designated Person (Water) to be in place by handover in January 2015?[3457]

35. What significance should be placed on the material in an email from Dr Armstrong to the Chief Executive dated 17th September 2015[3458],which discusses room specifications on Ward 2A, and records confirmation from the

[3451] Poplett Report 7.30
[3452] Poplett Report 12.1
[3453] Jim Leiper transcript p 59
[3454] As discussed in more detail in Chapter 6
[3455] As discussed in more detail in Chapter 6
[3456] As discussed in more detail in Chapter 6
[3457] As discussed in more detail in Chapter 6
[3458] Bundle 27 Vol 8 pp114 -7,

Director of Facilities that rooms at RHC have been constructed and commissioned 'in accordance with the specifications and plans signed off by the Board to Brookfield Multiplex and this has been verified by- our NEC Supervisor'.

36. Should there have been one executive group consistently in charge of the NHS GGC response to the 'Water Incident' and subsequent infection crisis that had the potential to be linked to the water and ventilation systems?[3459]

Odour and Infection link with neighbouring uses

37. In **Glasgow I and II**, although the unpleasant odour from the sewage works undoubtedly impacted upon patients, families, and staff), some Glasgow II witnesses had a more serious initial concern: that the proximity of the sewage works might pose a risk of infection. The clinicians and nurses who spoke to this acknowledged the limitations of their expertise; they were not microbiologists or IPC experts. Nevertheless, some questioned the wisdom of building one of Europe's largest hospitals in that location[3460]. To one senior clinician, it appeared "axiomatic" that a major new hospital should not be built next to a sewage works[3461].

38. Dr Jairam Sastry recalled that concerns about infection risk were voiced prior to building work commencing. Although he and his colleagues were told that their concerns would be investigated, he did not recall receiving a response[3462]. Dr Dermot Murphy felt it was fair to assume "that when you have a team building a hospital, they know all this stuff and they do it right"[3463].

39. Other witnesses recounted an understanding that the question of whether any risk of infection arose from proximity to the hospital had been investigated and

[3459] As discussed in more detail in Chapter 6
[3460] Witness statement of Professor Brenda Gibson, para. 89; witness statement of Dr Dermot Murphy, paras. 44; 54.
[3461] Witness statement of Dr Dermot Murphy, para. 53.
[3462] see, for example, witness statement of Dr Jairam Sastry, paras. 85-86.
[3463] Witness statement of Dr Dermot Murphy, para. 54.

that there was found to be no risk[3464]. Witnesses acknowledged there had been a hospital on the same site (the SGH) for many years without any obvious adverse clinical outcomes[3465].(Note – the SGH did not have a BMT unit).

40. At least one clinician understood that it was the choice of site and associated odour that led to the adoption of a system of closed, sealed windows throughout the new hospital buildings[3466]. As has now been explained by witnesses, attempts to prevent the odour from entering the hospital were unsuccessful.

41. The evidence indicated consistent patient concerns about the risk of infection posed by the waste water treatment works, whether from airborne organisms or from underground water contamination through the drainage system[3467].

42. Quite apart from concerns about infections, there was clear evidence that the smell believed to come from the water treatment works was deeply unpleasant. It was described as "rancid" and as being like "the smell of sewage"[3468]. Witnesses recounted that the smell was present both outside and inside the hospital building[3469]. One witness had a particular concern that she was able to smell it in a specialist isolation room within Ward 2A and asked, if the room had specialist filtration and ventilation, why was the smell perceptible[3470]?

43. The impact of the smell on patients within the Schiehallion Unit was particularly acute. These patients were already experiencing sickness and nausea caused by chemotherapy treatment. The smell only worsened those symptoms[3471].

44. Whilst Glasgow II witnesses were uncertain about the risk of infection posed by

[3464] See, for example, witness statements of Dr Shahzya Chaudhury, para. 36; Kathleen Thomson, para. 147; Dr Dermot Murphy, para. 53.
[3465] See, for example, the witness statement of Angela Howat, para. 41; transcript of evidence of Dr Dermot Murphy, p.13.
[3466] Witness statement of Dr Jairam Sastry, para. 115.
[3467] See, for example, the evidence of Colette Gough and Denise Gallagher.
[3468] See, for example, the evidence of Haley Winter, Denise Gallagher, Colette and Cameron Gough, Stevie-Jo Kirkpatrick and Molly Cuddihy.
[3469] Transcript of evidence of Colette Gough, (pm) at p.2. Mrs Gough recalled the presence of the smell within the PICU.
[3470] Transcript of evidence of Denise Gallagher, at p.93.
[3471] See, for example, the transcript of evidence of Cameron Gough, at p.53; transcript of evidence of Stevie-Jo Kirkpatrick, at p.34.

proximity to the sewage works, there was consistent evidence of an unpleasant odour on site. Some witnesses recalled that the odour was present only outside the hospital buildings; others were certain that at times it was present inside[3472]. One witness described concern from nurses and medics that the odour was present in theatre suites, despite the mechanical ventilation system[3473].

45. For staff working at the QEUH campus, the odour was unpleasant. However, staff recognised that for patients and families, the impact was more severe. Nurses in particular recalled reports that patients who were already experiencing nausea as a result of chemotherapy treatment, felt worse due to the sewage smell[3474]. Senior Charge Nurse, Emma Sommerville, escalated these concerns to Estates. Although the issue was investigated, it was not resolved. Ms Sommerville reported that the smell of sewage was still present in the newly refurbished Ward 2A and is particularly noticeable over the summer months[3475].

46. Dr Murphy observed another impact of building a supra-regional cancer centre on a site next to a sewage works. For many families, it will be the first time they have been to the QEUH campus. For obvious reasons, they will be anxious and nervous. They need to be able to trust the professionals in front of them. Being met with the smell of sewage on exiting their cars was “not a great start”[3476] to the cancer journey. Dr Murphy observed that just because something has been tolerated for 100 years, it does not follow that it is a good idea to continue it[3477].It will be interesting to see the response to this penetrating criticism in Glasgow IV evidence about why carbon filters were removed from the build.

47. **In Glasgow III, Dr Peters** was asked whether she was aware[3478] of any

[3472] Witness statements of: Kathleen Thomson, para. 142; Emma Sommerville, para. 48; Dr Jairam Sastry, para. 89.
[3473] Witness statement of Kathleen Thomson, para. 148.
[3474] Witness statements of: Sarah-Jane McMillan, para.102; Emma Sommerville, para. 48.
[3475] Witness statement of Emma Sommerville, para. 48; transcript of evidence, p.28.
[3476] Transcript of evidence of Dr Dermot Murphy, p14.
[3477] Transcript of evidence of Dr Dermot Murphy, p.13.
[3478] Transcript of the evidence of Dr Peters p15

discussion about a possible link between neighbouring uses and infection at the Southern General Hospital. She had herself been a patient when the smell was bad enough to make her nauseous. However, she did not recollect any discussion about a possible infection link in the old Southern. In the new hospital, when infections were happening during the water incident, some people started to ask if the neighbouring uses were part of it. She wondered whether, given the distance and the wind, there would be enough airborne burden to get in through the ventilation. It was possible but would need careful study.

48. **Sandra Devine** maintained that the WWTW did not cause infection[3479] -'I don't believe that the Shieldhall was an infection risk as such'.[3480]

49. **Annette Rankin** had worked at the SGH but said that she 'wasn't aware …of any issues presented by the sewage works other than the smell.' She had not 'seen[3481]any evidence since that the sewage works were presenting a risk.'

50. **Dr Inkster** had been a trainee at the old SGH and was not aware of the issue of as risk of infection arising from the sewage works being discussed.[3482]

HAI Reporting and NHS GGC Committee Structures

51. The material on this topic is largely recounted elsewhere, particularly in the Narrative of Events. On HAI reporting, evidence from witnesses (such as Laura Imrie and Annette Rankin) at NSS, suggested the reporting was patchy and difficulties arose from time to time. Angela Wallace was asked about NHS GGC's reporting following different policies from other Boards. She claimed not to know that was happening but said she would look into it. She accepted that it was undesirable as it made it more difficult to make national comparisons.

52. On the effectiveness of NHS GGC's committee structure, conclusions will need to await Glasgow IV. The committees which featured in Glasgow III

[3479] Sandra Devine, Witness Statement, p467.
[3480] Sandra Devine Transcript p104
[3481] Transcript of the evidence of Annette Rankin p25
[3482] Dr Inkster, Transcript, Day 1, Page 8

included the Board Water Safety Group. The best which can be said, on the evidence to date, is that this was not a group which appeared to be at all effective. Key participants who should have been present were not and were allowed to send substitutes. Although water was at all times a high-risk item, the fact that the WSG 'owned' that risk did not - so far as is known at present - translate into positive actions.

53. The other committees to feature in evidence were the AICC and BICC. Again, on the evidence to date, their functions largely seemed to consist in receiving reports from others. Notwithstanding the various crises faced by the QEUH, none of the witnesses were able to provide examples of where either committee had taken any particular action designed to move matters forward. Indeed, one witness [3483]said that was not their function - they were for oversight.

Governance – Derogations

54. It must be clear who agreed the ventilation derogation and what prior consultation there was. Requires an audit trail. Must avoid being so poorly crafted that it could be easily misunderstood'. Should refer to possible unintended consequences and risks.[3484] Very careful steps should be taken to consider and record -and then regularly review - any derogation.[3485] they should be informed and supported by technical IPC and clinical advice irrespective of a project's internal or external approval processes. A risk assessment is required.[3486]

Implementation of recommendations of the Independent Review, CNR and Oversight Board

55. The principal evidence at Glasgow III on this topic came from Angela Wallace. She said that all the recommendations had been carried through. There was a spreadsheet which recorded each recommendation, who it was allocated to,

[3483] Sandra Devine transcript p9
[3484] Jim Leiper transcript p37
[3485] A lengthy assessment from 9.90 on
[3486] Andrew Poplett. A lengthy section on suggested derogation process is in his Report on Ventilation

what was to be done and the result. There was a 2024 version, but due to an issue with SharePoint it had not been produced to the Inquiry.[3487]

56. The Inquiry has asked for that document to be produced, but to date NGGC have yet to do so as we finalise these submissions.

9.3 Issues arising from the CNR Overview Report

Paragraph	Substance	Relevance
5.2	"… that the data systems used within NHS GGC to record facilities maintenance activity are better designed to manage workload than to provide information of potential relevance in the management of clinical situations, particularly IPC events."	TOR 9
5.3.4	"The documentation we have reviewed does not assure us there was a robust enough culture of continuous improvement for IPC within the organisation during the period of our Review or that the Enhanced Supervision process for IPC had sustained impact. We were unable to determine a strong governance and assurance process for IPC and formed a view that the focus of the organisation appeared to be directed more towards the task of audit than to the achievement of quality improvement outcomes."	TOR 9
8.2 (Whole Section)	Managing, investigating and reporting infection outbreaks	TOR 9
8.4.2	ICNet Alerts: "We found little evidence, even as late as summer 2019, that the GGC alert list had been modified in light of the evolving experience with bacteraemias caused by Gram-negative environmental infections."	TOR 9
10.4	Recommendations	TOR 9 and potential Inquiry recommendations

[3487] Transcript of the evidence of Angela Wallace p 24-25

10. CONCLUSIONS ON KEY QUESTIONS AND TERMS OF REFERENCE 1, 7 AND 8 (AND A TAILPIECE).

1. The material set out in this section is drawn from the narrative and discussion set out elsewhere in these Closing Submissions, together with the Closing Submissions by Counsel to the Inquiry following Glasgow I and Glasgow II. It is accordingly kept deliberately brief to avoid repetition. After dealing with Key Questions and TORs we add a Tailpiece.

2. This section will start by examining the 4 Key Questions which were posed in Direction 5, and suggesting the answers which, it is submitted, should be given to them. As the full reasoning behind each proposed answer will be found in Chapter 7 of these submissions, the phraseology used there should be referred to in case of divergence.

10.1 The 4 Key Questions

3. First, from the point at which there were patients within the QEUH/RHC was the water system (including drainage) in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?

    - The answer to that question is clearly ’yes’. There has been copious evidence of the state in which the water system was found, especially in the 2015 DMA Canyon L8 Risk Assessment. It would be otiose to list the problems found with the system again here.

    - Likewise, it cannot really be argued that the state of the system in, say, April 2015 did not pose a risk. Evidence about the likely creation of biofilm stands out particularly. That risk was one which had the potential to impact on patients, particularly those who were vulnerable.

    - Was the risk of infection avoidable? The answer again must be ‘yes’. Whether that was achieved by not filling the water system early, or not having a fully functioning thermal disinfection process, nor appropriate office holders such as an AE (Water) in place, or any of many other possibilities need not be debated. The answer remains a resounding ’yes’.

4. Second, from the point at which there were patients within the QEUH/RHC was the ventilation in an unsafe condition, in the sense that it presented an additional risk of avoidable infection to patients?

- The answer to this question is also ‘yes’. Unlike the water system, which, for all its size and complexity, remains essentially one system, different ventilation provision was made for different areas within the hospital. The various deficiencies in the system as currently determined are set out in Chapter 7.2.

- Some of the deficiencies need no repetition here. What was found - relatively quickly - on Ward 4B is a good example. Ward 2A, in contrast, is an example of an area where deficiencies were recognised early, but a full record of all of the deficiencies was not put together until Mr Lambert's report in 2018 (although that the Ward was not in compliance with SHTM 03-01 was recognised by NHS GGC in an internal document in March 2017 at the latest and should have been recognised in 2015).

- So far as general wards are concerned, the submission remains that both an air change rate of 2.5-3 instead of 6 and the deployment of chilled beams present additional infection risks to patients. Were they avoidable? Again, the question draws a simple answer of ‘yes’, by not derogating from SHTM 03-01.

5. Third, are the water and ventilation systems no longer in an unsafe condition in the sense that they now present no avoidable risk of infection?

- Dealing with the water system first, the answer in this instance appears to be a qualified ‘yes’. The question jumps in time to the date of these submissions, without having to pause on the unhappy history which led through the failures to follow up on the 2015 DMA Canyon L8 Risk Assessment to the Water Technical Group and the NSS Technical Review (which conveniently lists many of the problems).

- The water system remains large and complex. It may be a counsel of perfection to accept that the system as a whole contains no feature which

could be regarded as presenting a risk. Annual audits continue to flag points of detail, of varying significance. However, it is clear that the chlorine dioxide dosing system, combined with the actions now taken to respond to the DMA Canyon reports, including, in particular, the appointment of the Authorised Person for Water and others in that group, has changed the picture entirely. Accordingly, and subject to those qualifications, the answer to the question is 'yes'.

- Turning now to the ventilation systems, the answer is 'no'. The shining light in an otherwise less than satisfactory landscape is Ward 2A. It is accepted that, following the extensive work carried out in 2019 to entirely replace the ventilation system for that ward, the result meets, or exceeds, all relevant requirements. It could not properly be described as unsafe.

- The position for general wards, and others such as Wards 4B and 4C, remains that there are outstanding deficiencies and that these deficiencies give rise to risk.

6. Fourth, is there a link, and if so in what way and to what extent, between patient infections and identified unsafe features of the water and ventilation systems.

- The general answer to this question, i.e. to the question of whether there is a link between infections and the ventilation and water systems, is 'yes'. The details are to be found in earlier Chapters, but the key conclusion is that we propose rejecting the NHS GGC proposition that, with very limited exceptions, there is no link. The arguments to the contrary should be accepted.

- It is no part of the remit of the Inquiry to make findings focused on the link to infection in individual cases of infection. Making the best of the available evidence points to a conclusion in broad agreement with the conclusions of CNR, i.e. that a significant proportion of patient infections were connected to the environment. The precise percentage may not be critical.

7. So far as causative routes are concerned, the main route is by contact with a

water system (or some part of it) infected with undesirable bacteria. That these bacteria were present in the water seems undeniable. We submit that their causative effect should be accepted on a balance of probabilities.

8. So far as ventilation is concerned, the difficulties of proof have been fully discussed. Trying to locate and track an undesirable airborne microorganism is a very considerable challenge (whether that is in relation to Cryptococcus or Aspergillus). Again, the best conclusion is that a number of infections have arisen due to the absence of a fully protective environment preventing vulnerable patients coming into contact with these organisms.

9. The position of NHS GGC in respect of key question 4 was articulated in their second Positioning Paper[3488]. Their position is that the built environment of the QEUH/RHC did not expose patients to any increased risk to their health, safety or wellbeing. Subject to two cases of paediatric infection, there is no link between infections and the built environment. In very broad terms, in support of this position, NHS GGC seek to rely on the results of whole genome sequencing (WGS), the argument that infections will always occur in hospitals and that there is a recognised background rate of infection, and also the interventions carried out in response to the incidence of infections.

10. Regarding WGS, the Inquiry heard evidence from numerous witnesses who we argue, undermined the scientific basis for its use in the way proposed by NHS GGC[3489]. Particularly, the evidence of Professor Wilcox[3490], but also Professor Stevens[3491], Dr Inkster[3492], Dr Peters[3493], Dr Mumford[3494], and Mr Watson[3495] are referred to. Further, the Inquiry heard convincing evidence that, if treating clinicians had thought that a particular infection was due to gut translocation, they would have treated the patient accordingly, and the infection would not have been discussed at a PAG or IMT or reported to

[3488] Bundle 25, page 345
[3489] See Chapter 4 – paragraphs 67 to 69, Ch 5 – paragraph 804 (IMT 9 June 2019), Chapter 5 – paragraphs 931 to 946 (IMT of 8 October 2019), Chapter 5 – paragraph 964 (Re-opening of Ward 6A)
[3490] See Chapter 3 – paragraphs 560 to 571
[3491] See Chapter 3 – paragraphs 486 and 489
[3492] See Chapter 3 – paragraphs 107 and 108
[3493] See Chapter 3 – paragraph 162
[3494] See Chapter 7 – paragraphs 448 to 452, and 515
[3495] See Chapter 3 – paragraph 245

HPS/ARHAI[3496].

11. The Inquiry has also heard considerable evidence concerning the epidemiological analyses that the increase in gram-negative environmental or gram-negative environmental and enteric bacteraemia from the second quarter of 2016 was sustained until the decant of Ward 2A[3497]. The evidence of the increase did not matter if the denominator was occupied bed days or admissions, was independent of the success in respect of CLABSI rates, and consistently appeared[3498]. The evidence which the Inquiry heard suggested a strong degree of association and temporality between water positivity and infections before the decant. In addition, the Inquiry heard evidence that the level of infections only fell after decant, and are dramatically less in the new Ward 2A. HPS were able to show that the increased infection rates in Ward 2A were not experienced across the rest of the RHC, and Mr Mookerjee's exercise with comparator hospitals showed that there was a significant difference in rates between the Schiehallion unit and comparator paediatric haemato-oncology units.

12. The Inquiry also heard considerable evidence of the many interventions that were imposed by the IPC team[3499]. It was only when it became clear that the whole water system was contaminated that the approaches taken became effective. The most convincing intervention in respect of the link between infections and the water was the closure of Ward 2A in September 2018. No cogent alternative explanation has been provided by NHS GGC for the infections suffered by patients in the QEUH/RHC.

[3496] Dr Mumford and Ms Dempster, Day 2 Transcript, Pages 80 and 81
[3497] Chapter 7.4
[3498] Mr Mookerjee, Transcript, Page 99; Bundle 7, Documents 6, Figure 1 at page 223 (2019 HPS report); Bundle 27 Volume 6, Document 9, page 107 (presentation by Dr Peter and Ms Harvey Wood)
[3499] See Chapter 5

10.2 Proposed Conclusions on Terms of Reference

Terms of Reference 1

13. Term of Reference 1 requires the Inquiry to examine the issues in relation to adequacy of ventilation, water contamination and other matters adversely impacting on patient safety and care, which arose in the construction and delivery of the QEUH and RHC, and to identify whether and to what extent these issues were contributed to by key building systems which were defective in the sense of:

- Not achieving the outcomes for being capable of the function or purpose for which they were intended.
- Not conforming to relevant statutory regulation and other applicable recommendations, guidance, and good practice.

14. Dealing first with **ventilation**, the first conclusion derived from the discussion elsewhere and the answers to the four Key Questions, is that it was not adequate. It did not deliver what should have been delivered for patients. It had the deficiencies previously identified.

15. The reference to 'key building systems' requires a distinction to be made between ventilation, in the sense of the air supply received by patients and others, and ventilation in the sense of the systems, air handling units, fans etc, which were installed. The systems as installed clearly contributed to the issues which arose. They did not achieve the function for which they were intended.

16. Further, they did not conform to SHTM 03-01, which in itself, according to the evidence, is consistent with other guidance (such as from JACIE, CDC) and good practice.

17. Turning to **water**, the system was, at least arguably, capable of delivering the function for which it was intended (though some - such as Mr Powrie and Mr Watson - have suggested that failure was a real possibility due to its size and complexities and should have had dosing built in from the start).

18. However, it was the delivery, operation and maintenance failures in relation to the water system (see for instance the HFS Technical Review Report) which led to the water system not performing correctly the function for which it was intended. In addition, that meant that the water system did not conform, either to good practice, or to the regulatory frameworks in which it should have operated, such as L8.

Term of Reference 7

19. Term of Reference 7 requires the Inquiry to examine what actions have been taken to remedy defects and the extent to which they have been adequate and effective.

20. The Inquiry has had extensive evidence from many sources of the steps taken to deal with issues in both ventilation and water systems. They need not be narrated here.

21. The conclusion on whether they have been 'adequate and effective' is to be found in the answer to the third Key Question set out above

Term of Reference 8

22. Term of Reference 8 requires the Inquiry to examine the physical emotional and other effects of the issues identified on patients and their families (in particular in respect of environmental organisms linked to infections at the QEUH), and to determine whether communication with patients and their families supported and respected their rights to be informed and to participate in respect of matters bearing on treatment.

23. This Term of Reference can be divided into two parts. The first relates to the **impact** on patients and families. The second relates to the topic of **communications**.

24. Dealing with **impact** first, the most eloquent evidence is found in the words of the patients and families themselves and thus through what can be found in

their transcripts and witness statements. [3500]Any summary necessarily risks omitting something important said about the practical, emotional and psychological toll of events. Much is also set out in the Narrative of Events in Chapter 5.

25. With that caveat in mind, there is more than adequate evidence to conclude that among the impacts were: having to endure a heightened fear of infection over a prolonged period[3501];disruption to treatment[3502], including moves to other wards and centres; regular restrictions to and disruptions to experience on the ward; source isolation [3503];and poorer patient experience on Ward 6A[3504].

26. Turning to **communications**, the discussion in the earlier Chapter on that topic ranged widely. NHS GGC communications were criticised by the Oversight Board and there was extensive criticism reflected in the evidence of patients and others at Glasgow I and II. Much of that was accepted. Professor White explained the NHS GGC failure to be adequately patient-centred.

27. NHS GGC wished the Inquiry to hear the evidence of Sandra Bustillo and Jennifer Haynes. That has been done. If anything, the evidence reinforces the criticisms. See discussion of looking after the NHS GGC reputation and having an NHS GGC 'corporate position' to get over. The conclusion must be, on TOR8, that, for reasons of that kind, communications did not adequately respect patients' rights to be informed and to participate in matters relating to treatment.

Tailpiece on Drs Inkster and Peters

28. The behaviour of Drs Inkster and Peters was scrutinised in the course of the evidential hearings. Various criticisms were levelled at their actions and alleged omissions. However, when the collated evidence is carefully

[3500] As Professor Gibson put it, the evidence of patients and families speaks for itself. Transcript p187
[3501] See, for example, the transcript of evidence of: Professor Brenda Gibson, p.174; Dr Dermot Murphy, transcript of evidence, p.71
[3502] Angela Howatt, Transcript, Page 35
[3503] Sometimes described as a 'mini-lockdown' eg witness statement of Stevie-Jo Kirkpatrick at paras. 19, 25
[3504] Eg feeling like a prison, transcript of evidence of Denise Gallagher, p.56.

considered, there is little if any substance to these criticisms. The reality was that these were experienced clinicians raising patient safety concerns about the built environment of the QEUH/RHC and these concerns were ultimately vindicated. It was the lack of information from colleagues (an example, not being given information relating to pigeons[3505]) which resulted in the pro-active steps to obtain clarity on the safety of the hospital environment, albeit certain individuals within NHS GGC saw this as being disruptive. Rather than being valued, acknowledged and assisted for using their initiative, they were castigated for essentially being difficult and risk averse[3506].

29. The criticism directed at Drs Inkster and Peters is also discussed in Chapter 2[3507]. It is notable that HPS were sympathetic to Dr Inkster and agreed with her view that Ward 6A was not microbiologically safe[3508]. Indeed, Dr Mumford saw nothing to suggest Dr Inkster or Dr Peters were putting their interests above patients[3509]. Individuals such as Sandra Devine and Professor Angela Wallace, who had been critical of both Dr Inkster and Peters, when they came to give evidence were either muted[3510] or departed from most or all of the criticism[3511]. The evidence of Dr Redding showed the actions of Drs Inkster and Peter were reasonable[3512]. Curiously, as the subjects of such criticism from certain quarters, both Drs Inkster and Peter were given increased responsibilities. This oddity was not lost on Dr Cruickshank[3513]. Even Dr Armstrong acknowledged that both Drs Inkster and Peters should be listened to[3514] and that Dr Inkster was very good at her job[3515]. Notably, Dr Armstrong did not say that Dr Inkster was not focused on patients[3516]. Moreover, Professor Leanord described both Drs Inkster and Peters as two of his most

[3505] Chapter 5, paragraph 722
[3506] Chapter 5, paragraph 183
[3507] Paragraphs 5-9 and 12
[3508] Chapter 2, paragraph 52
[3509] Chapter 2, paragraphs 55; Chapter 7, paragraph 552
[3510] Chapter 3, paragraph 119
[3511] Chapter 3, paragraph 334
[3512] Chapter 3, paragraph 134
[3513] Chapter 3, paragraphs 177-178
[3514] Chapter 3, paragraph 316; Chapter 5, paragraph 436
[3515] Chapter 5, paragraph 409
[3516] Chapter 5, paragraph 875

experienced and well-versed colleagues[3517].

30. A serious accusation of misleading a patient's parents was made about Dr Inkster, yet ultimately this turned out to be baseless[3518]. The dispute between Professor Steele and Dr Inkster about a minute, which impliedly questioned her integrity, was resolved to a great extent in Dr Inkster's favour[3519]. Sandra Devine conceded in her oral evidence that she had overstated the position concerning Dr Inkster's removal as IMT Chair[3520]. There was sufficient evidence to vindicate Dr Inkster's position relating to the duty of candour incident[3521]

31. There can be little doubt that in raising these concerns both Drs Inkster and Peters were putting the patients' safety first and evidently jeopardised their own careers in doing so. The criticisms directed at them were unwarranted. They should be commended.

Fred Mackintosh KC
Craig Connal KC
Graham Maciver, Advocate
Graham Horn, Advocate
Neil Morrison, Advocate

20 December 2024

[3517] Chapter 5, paragraph 117
[3518] Chapter 5, paragraph 594
[3519] Chapter 5, paragraph 767
[3520] Chapter 5, paragraph 892
[3521] Chapter 5, paragraph 825-826

ANNEX

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