Scottish Hospitals Inquiry
Witness Statement of
Professor Alistair Leanord

1. My name is Alistair Leanord. I am currently Chief of Medicine, Diagnostics at NHS Greater Glasgow and Clyde (GGC). I have been in this role since April 2021. I am based at the Glasgow Royal Infirmary and have been since January 2018

QUALIFICATIONS

2. Between 1980 and 1987 I studied at Glasgow University where I graduated with a BSc in Immunology and achieved my MBChB. In 1992 I was awarded Doctor of Medicine.

3. Between 1993 and 2004 I achieved a DTM&H (Diploma in Tropical Medicine and Hygiene), MRCPath (Membership of the Royal College of Pathologists) and FRCPath (Fellow of the Royal College of Pathologists).

4. In 2015 I was awarded a FRCP Edin (Fellow of the Royal College of Physicians of Edinburgh).

PREVIOUS EMPLOYMENT HISTORY

5. Between 1987 and 1988 I held Junior House Officer posts, both Medical and Surgical in Glasgow Southern General and Vale of Leven Hospitals respectively.

6. Between 1988 and 1990 I was a Medical Officer for the British Antarctic Survey, and between 1990 and 1991 I was a Research Fellow (Microbiology) in the Department of Medical Microbiology at Aberdeen University.

7. Between 1991 and 1993 I held Senior House Officer posts at Ruchill and the Southern General Hospitals in Glasgow, and between 1993 and 1996 I held Career Registrar and Senior Registrar posts at the Western Infirmary, Glasgow.

8. Between 1996 and 1998 I held the post of Consultant Microbiologist/Infection Control Doctor at Law Hospital, Carluke, where I was responsible for a Microbiology department of fifteen people processing 75,000 specimens per annum.

9. Between 1998 and 2008 I was a Consultant Microbiologist at Monklands Hospital, Airdrie. During this time, I was responsible for a Microbiology Department of twenty-eight people processing 290,000 specimens per annum. As Head of Department, I was responsible for policy, staff training, quality assurance, and Health & Safety within the Department and for communicating and liaising with other Microbiologists within the County.

10. In addition to this role, between 1998 and 2001 I was the Infection Control Doctor at Monklands Hospital, Airdrie, where I was responsible for giving microbiological and Infection Control advice to colleagues in Monklands District Hospital, which had 550 beds.

11. Between 2001 and 2006 I was the Lead Infection Control Doctor within Lanarkshire Acute Division, working with a team of 21 people. The Lead role involved chairing the Divisional Infection Control Committee, reporting to the Health Board Area Communicable Disease Committee, and leading the Division in attaining Quality Improvement Scotland compliance.

12. Between 2005 and 2008 I was the Lead Clinician in the NHS Lanarkshire Microbiology Service. In this role I led the Microbiology Specialist Subgroup reporting to the Core Directorate Team. The main role was developing the strategic direction of the Microbiology Service in consultation with key stakeholders, providing clinical leadership in the operational delivery of the implementation plans and ensuring the service delivery was consistent with the Clinical Governance framework.

13. In May 2008 I was employed as a Consultant Microbiologist in NHSGGC based at the Southern General Microbiology Department.

14. Between 2009 and 2013 I took a seconded post as a Consultant Microbiologist at Health Protection Scotland (HPS) for 2 sessions per week where, amongst many other functions, I was Clinical Lead for the Antimicrobial Resistance (AMR) and Hospital Acquired Infection (HAI) Teams and was Microbiology and Infection Control Doctor support to other teams within HPS: the HAI ICPT team, Environment and Health, Immunisation and Vaccine Preventable diseases, Respiratory Infections and Travel Health.

15. Between 2013 and October 2017 I was the Medical Adviser to the AMR and HAI Policy Unit at the Scottish Government, advising the Cabinet Secretary for Health on policy delivery and delivery on HAI and antimicrobial resistance within Scotland, liaising with other parts of the UK. Communication, expert advice, professional and clinical leadership were the key elements of this role.

ACTING LEAD INFECTION CONTROL DOCTOR FOR NHSGGC NOVEMBER 2019 - JUNE 2021

16. From November 2019 to June 2021, I was the Acting Lead Infection Control Doctor in NHSGGC. I took on this role when Professor Jones, retired. This role was a pan GGC role which included the QEUH and RHC. There is a very clear separation between the Microbiology role and the Infection Control role. The Lead Infection Control doctor role is a lead role amongst the Infection

Control Doctor (ICD) team. The ICD team had four to six Infection Control Doctors, depending on the personnel attached to the IPCT at the time.

17. I have been asked by the Inquiry what other hospitals this role covered. The Acting Lead ICD role covered all Acute Hospital sites in GGC. This includes Glasgow Royal Infirmary, Queen Elizabeth University Hospital, Royal Hospital for Children, Gartnavel General Hospital, Royal Alexandra Hospital, Inverclyde Royal Hospital and Vale of Leven Hospitals.

18. I have been asked by the Inquiry what I mean by 'clear separation' between the microbiology role and infection control role. Microbiology and Infection Control worked as two separate Teams with different reporting structures. Microbiology reported via the Laboratory Management ultimately to the Director of Diagnostics, whilst Infection Control reported into the Infection Control and Prevention Team (IPCT) and ultimately to the HIA Executive Director.

19. As Lead ICD I was the point of contact for the Board and Senior Management for IC Doctor related issues and I worked as part of the Infection Protection and Control Team (IPCT) working closely with the Executive Director for HAI and the Acting Infection Control Manager. In this role, I reported professionally to Mairi McLeod after Professor Jones retired as Head of Service for Microbiology and as Acting Lead ICD I reported to Sandra Devine, Acting Infection Control Manager.

20. The Infection Control Doctors, who were part of the Infection Prevention and Control Team (IPCT), reported to me in this role.

21. This role does not involve face to face contact with patients. It involves answering infection control (IC) queries from Clinicians and the IPCT Nurses. It involves close working with the Executive Director for IC and the HAI Executive Lead at Board level. It also involves initiating and participating in Incident Management Teams (IMT), reviewing surveillance data, reporting

correctly to HPS, which is now reconfigured as Antimicrobial Resistance and Healthcare Associated Infection (ARHAI), and answering queries from the Board, HPS and the Scottish Government.

22. As the Lead Infection Control Doctor, I was responsible as the named person to present appropriate laboratory data to the Oversight Board. The data I produced for the Oversight Board related to water testing results from QEUH/RHC which were tested in the Environmental Microbiology Department at GRI.

23. The Laboratory IT Manger extracted water testing data from the LIMS (Laboratory Information Management System), collated it and I presented that data to the Oversight Board Infection Control subgroup.

24. Data was presented through Powerpoint and documents with verbal presentation. The data was collected from the LIMS.

25. I have been asked by the Inquiry what I was told about the infection control team before I became responsible for it. Before I became responsible for the infection control team in 2019, I had not been told anything about it. I was given no instructions in relation to the infection control team before I became responsible for it in 2019.

26. I have been asked by the Inquiry what immediate or ongoing infection concerns there were when I became responsible for the infection control team. When I became responsible for the infection control team, the pressing piece of work was to develop a Standard Operating Procedure (SOP) that described patient placement, as per Infection Control requirements and the specialised ventilated pressure rooms within QEUH and RHC. This work was completed in the autumn of 2019. All ongoing IMTs had been stood down by the time I took over as Acting LICD.

CLINICAL DIRECTOR OF LABORATORIES NHSGGC 2018 - 2021

27. From 2018 to 2021 I was Clinical Director of Laboratories at GGC.

28. I had responsibility for the six laboratory disciplines that were part of the Diagnostics Directorate, working with the General Manager for Laboratories.

29. I have been asked by the Inquiry how I divided my time between being Clinical Director of laboratories and Acting Lead Infection Control Doctor. Clinical Director (CD) for Laboratories had a time commitment of a day a week which equated to two sessions from my ten session 40hr/per week contract. A session is a contracted block of time equating to 4 hours. The 2 sessions (ie one day a week) of CD work were worked flexibly. The 8 sessions for my other roles as Director of the Reference Laboratory were worked flexibly except for fixed Microbiology sessions.

DIRECTOR OF SCOTTISH MICROBIOLOGY REFERENCE LABORATORIES 2017- PRESENT

30. From 2017 to the present, I have been the Director of Scottish Microbiology Reference Labs, which is my Clinical role to which my Direct Clinical Care sessions are attached.

31. During this time, I also had Medical Management roles as Clinical Director and Chief of Medicine. The time attributed to the role of CD was as described in paragraph 21. The time attributed to my role as Chief of Medicine is described in paragraph 28.

ANTIMICROBIAL RESISTANCE AND HEALTHCARE ASSOCIATED INFECTION MEDICAL ADVISOR 2013 - Oct 2017

32. Between 2013 and October 2017, I was seconded to the Scottish Government as an Antimicrobial Resistance and Healthcare Associated Infection Medical Advisor. I worked within the CNO Directorate reporting to a Senior Civil Servant.

33. I have been asked by the Inquiry what other roles I had during the time I was a HAI medical advisor. While I was a HAI medical advisor, I was also a Consultant Medical Microbiologist at QEUH and Clinical Lead for the Microbiology Department at QEUH.

34. I have been asked by the Inquiry why I was seconded to the Scottish Government and how this came about. I was seconded to the Scottish Government after being successful at interview as part of an open recruitment process. The time split between my roles was decided as part of the secondment. I was seconded for 3 days a week to the Scottish Government.

35. I was working two days a week as a Medical Microbiologist while seconded to the Scottish Government. I would travel to Edinburgh for 3 days a week and travel to the QEUH for 2 days a week. The role with the Scottish Government ended in October 2017.

36. Due a potential conflict of interest where I could be advising the Scottish Government about my own Health Board, it was decided by my Senior Civil Servant not to include me in email traffic or to attend meetings concerning issues at the QEUH and RHC. I was in an unusual situation where everyone assumed I knew what was going on, either from the Glasgow side or from the Government side, but the reality was I was not party to any details at this time. I was not part of the GGC Infection Control Team until November 2019.

37. I have been asked by the Inquiry what the ‘conflict of interest’ was. The ‘conflict of interest’ was never explained, but I assumed that it was thought that I could either be biased in my advice to the Scottish Government or/and be put in a position as a result of advice given to the Scottish Government being at odds with a view taken by my main employer, namely NHS GGC. I was cut out of emails and meetings.

38. Prior to this within GGC, I was a Consultant Medical Microbiologist. I was the Sector Clinical Lead for Microbiology from approximately 2015, although I have trouble remembering the exact date.

39. I have been asked by the Inquiry what I did while I was working for HPS. As per paragraph 14: “I was Clinical Lead for the Antimicrobial Resistance (AMR) and Hospital Acquired Infection (HAI) Teams and was Microbiology and Infection Control Doctor support to other teams within HPS: the HAI ICPT team, Environment and Health, Immunisation and Vaccine Preventable diseases, Respiratory Infections and Travel Health.”

40. I have been asked by the Inquiry how I knew people assumed I knew what was going on at the QEUH and RHC. I knew people assumed I knew what was going on at the QEUH and RHC from questions posed to me by others as part of informal conversation.

41. I have been asked by the Inquiry why I became part of the infection control team in September 2019 when I was not in the team officially until November 2019.I was not part of the infection control team in September 2019. I became Acting Lead IPCT when Professor Jones, who had been Acting Lead ICD, retired at the end of October.

CURRENT ROLE

42. My current role is Chief of Medicine for Diagnostics, Glasgow. This is a medical management role. Diagnostics covers all diagnostics, including all Imaging, Nuclear Medicine, Medical Illustration, Clinical Physics, and all of the six laboratory disciplines, which are Biochemistry, Immunology, Virology, Microbiology, Pathology, Clinical Genetics, and Laboratory Genetics.

43. As Chief of Medicine, I work closely with and report to the Director for Diagnostics. There are two Clinical Directors that report to me. One in Imaging and one in Laboratories. I am one of six Chiefs of Medicine in GGC, and I am one of the senior Doctors in the organisation in terms of management. I report professionally to the Deputy Medical Director Acute Services. I have been in my role as Chief of Medicine for Diagnostics from April 2021 to present. The Acute Medical Director is Dr Scott Davidson.

44. The Diagnostics Directorate includes all clinical specialisms that are used to make a diagnosis. This includes all Imaging, Medical Physics, Radiotherapy, Nuclear Medicine, Bioengineering, Medical Illustration, Haematology, Biochemistry, Immunology, Pathology, Microbiology, Virology, Laboratory Genetics, and Clinical Genetics.

45. My clinical role is Director of Scottish Reference Laboratories, Glasgow. I do sessions of Infection Control when required. I also participated in Microbiology duty room sessions and participated in the out-of-hours Microbiology service. I stopped these latter roles in March 2023 and June 2023 respectively.

46. The Scottish Reference Laboratories is a Scottish National Network of reference laboratories based in Glasgow, Edinburgh and Inverness. Each lab has specialist expertise in a range of organisms. In Glasgow we have expertise in *Salmonella*, *Shigella*, *C. difficile*, Parasitology, *S. aureus, S. pyogenes*, *Legionella*, *H. influenza, S. pneumoniae* and *N. meningitidis*.

47. The role of Director of Scottish reference labs is an NHS role. In my role as director, I report to The Head of Service for Microbiology and the Reference Laboratory Clinical Scientists report to me. I have been in this Director role since January 2018.

48. This role is in addition to being Chief of Medicine for Diagnostics. I have been asked by the Inquiry how I split my time between roles. Chief of Medicine is a 5 session role. Director of the Reference Laboratories is a 5 session role. Both worked flexibly from my base in the Glasgow Reference laboratories.

49. We use a range of specialised diagnostic tools and tests, requiring a high level of scientific expertise. Some tests use sophisticated costly methods. It would not be reasonable or affordable for every diagnostic laboratory in Scotland to perform these tests on-site. As a result the tests are sent to the Reference Laboratories for confirmation of their initial diagnostic result or for further work. We send a small percentage of work to UKHSA Reference Laboratories Colindale, London in England, which is the UK Reference Laboratory.

50. For this role, as Director of Scottish Reference Laboratories, Glasgow, I am based in the Glasgow Royal Infirmary. The reference laboratory is based on the fifth floor of the New Lister Building. This role covers all Scotland for the pathogens for which we perform reference testing.

51. My Microbiology department role is hospital specific to the Glasgow Royal Infirmary. This role covers the North of Glasgow for microbiology which includes the Golden Jubilee, Glasgow Royal Infirmary and Royal Alexandria Hospital. I demitted from a role in Clinical Microbiology at GRI in May 2023. I have not had Clinical Microbiology input into the QEUH or the Royal Hospital for Children (RHC) since January 2018.

52. My microbiology role in the Glasgow Royal Infirmary is in addition to my other roles as Chief of Medicine for Diagnostics and Director of reference labs. I

worked 1 session a week as Duty room Consultant in the Medical Microbiology Department. This time would come out of my Reference Laboratory Director role as it was a clinical session. I also did out of hours work on a 1 in 8 basis at weekends as part of an 11.5 session (46 hour/week) contract. I have since demitted from both these clinical activities.

53. My microbiology input for the QEUH and RHC ended in January 2018 because I moved to GRI to take up the role of Director of the Reference Laboratory.

THE NEW HOSPITAL

54. I had no involvement in the planning and design of the QEUH. The only planning I was involved with occurred in 2009/10 to look at the floor plans for the Microbiology department in the new laboratory block which was built a couple of years before the main Hospital. This block was a separate building to the QEUH and was built independently from the QEUH.

55. I have been asked by the Inquiry who invited me to provide input into the planning for the microbiology department in the new laboratory block. The Laboratory Management team invited me to provide input into the planning for the microbiology department in the new laboratory block.

56. The meeting took place in The Old Microbiology Department in the Southern General Hospital. Architects, Consultants, and technical staff were present at the meeting. The meeting was in 2012. The architects were seeking advice. I cannot remember specifics of any advice I gave at the meeting.

57. I do not know which clinicians were involved in the planning and design of the QEUH and RHC. I was not involved with planning the QEUH and RHC.

58. My input was related to the ergonomics within the Microbiology Department which consisted of asking for benches, shelves, and light switches to be placed as appropriate. I had no input into any clinical area.

59. I do not know what a Clinical Output Specification is. I did not have any involvement with Clinical Output Specifications.

60. The most important part of planning the Microbiology Department was to ensure the space was appropriate to the current and future needs of the service. The footprint of the building had already been set. We ensured the Microbiology Department had the right internal configuration. I was happy with our input and how the Department worked on completion.

61. The future needs of the service relates to the Category 3 room where infectious samples can be safely handled. The specification for these rooms are strict, making expansion of them problematic if, as a result of increased workload, there is a future requirement to expand them.

62. The aspect of room sizing that was crucial was that the size of the area within the Microbiology Department was sufficient to enable the amount of work, ie the number of Category 3 cabinets and isolation facilities that would be required to deal with current and projected work within the Category 3 facility.

ROLE WHEN QEUH/RHC WAS OPENED

63. When the QEUH and RHC opened in 2015 I was the Clinical Lead in the Microbiology department. I was the Medical Lead and the Departmental Lead for the microbiology testing and reporting.

64. All Microbiologists would visit the wards and clinical areas in the QEUH/RHC dependent on rota and clinical specialisation. For instance, when on the rota, I would have daily meetings with the Intensive Care Consultants, both General

Intensive Care, Neuro Intensive Care in the Institute of Neurological Science and the Spinal Unit (which is not located in the new hospital block).

65. Where there were concerns about patients with infections, we would go to the ward and discuss the care if required. However, a large proportion of that work was done over the telephone. It is more efficient to phone a clinician than walk around the hospital trying to catch them.

66. The new hospital was a perfectly fine building as far as I was concerned. I thought the atrium was quite spectacular; it was almost like walking into a cathedral. My overall general impression of the wards was they were all single rooms and were well made.

67. I thought the single rooms were an improvement on the original nightingale wards in the SGH. The rooms looked well made, new and fresh.

68. The biggest concern I heard from colleagues was that they had lost their offices, so administration and office space was tight. People just learned to work a different way and it all settled down. I did not hear any complaints about patient care or patient safety. I thought the hospital was very nice compared to other hospitals I have worked in.

69. I have been asked by the Inquiry what concerns I heard from other colleagues. I heard concerns from other colleagues that office space was limited. I was informed of these concerns during general discussions with individuals.

70. I have been asked by the Inquiry why I thought everyone liked it. I assume everyone liked it, like me, because it was new.

71. I have been asked by the Inquiry what my initial observations were in relation to ventilation when I began accessing the QEUH in 2015. I had no opinion on the ventilation or on HEPA filters. I am not expert in ventilation.

72. I have been asked by the Inquiry what I know of the Scottish guidance SHTM 03-01. I know it exists but I am not familiar with it.

73. I have been asked by the Inquiry what way people worked differently. They worked differently in their way of accessing office space and doing administrative functions.

74. I cannot remember the first date I became aware of water issues. My first IMT was on 13 September 2019 **(A36591627 – Incident Management Meeting Minutes (IMT Minutes) – Bundle 1 - Document 80)**.

75. I have been asked by the Inquiry when I became aware of ventilation issues. I became aware of ventilation issues when I became Acting Lead ICD in November and worked on developing the patient placement SOP.

HOSPITAL ACQUIRED INFECTION VERSUS HEALTHCARE ASSOCIATED INFECTION

76. Hospital acquired infection is a term that is no longer routinely used. The most accurate and now most commonly used term is Healthcare Associated Infection (HCAI). The National Point Prevalence Study still uses this term but it is considered to be for surveillance purposes. This study has not taken place since 2016.

77. I have been asked by the Inquiry if HPS still provide guidance. HPS now renamed ARHAI still give guidance through the NICPM (National Infection and Control Manual).

78. If you are in a hospital longer than 48 hours and an organism is identified it is classed as a hospital acquired infection (HAI) for surveillance purposes; in reality most of the organisms now referred to the IPCT have extended, or unknown incubation periods and this definition is outdated. This definition

would be set within the ICNET systems and makes a referral to local IPCTs. In addition, the ICNET system triggers if there were two alert organisms or in some cases one of these alert organisms over a defined period of time. Investigations are undertaken for every referral. Healthcare Associated Infection is when after review the person has been in contact with some part of the healthcare system in the past 30 days; that could be anything from visiting the dentist to being a resident in a care or residential home.

79. I have been asked by the Inquiry why it is longer than 48 hours in hospital that an infection is usually HAI. It is because that is the definition as described in the NIPCM.

80. I have been asked by the Inquiry what the trigger systems are. These are organism thresholds set within ICNET. ICNET data managers may be better able to answer the specifics. I have no working knowledge of ICNET.

INFECTION CONTROL RESPONSIBILITIES

81. Prior to November 2019, I had no Infection Control responsibilities for the QEUH and RHC. At the tail end of summer 2019 I became aware of discussions around issues with infection. This was partly from talking to Professor Jones who was my Head of Service (Microbiology) at the time. He would ask my opinion concerning a topic. I cannot recall specifics, but I knew there were several IMTs that had been undertaken. At that time, I was working purely as a Consultant Microbiologist dealing with a clinical microbiology workload and I was not aware of the details as they related to Infection Control.

82. I have been asked by the Inquiry what issues with infection I was discussing with Professor Jones at the end of summer 2019. I was discussing his involvement with the ongoing IMT's at that time and data he was looking at around infections. Professor Jones was speaking to me about issues with

infection as this would have been as part of general discussions we would frequently have. I did not offer Professor Jones any specific advice as a result of these discussions.

83. I have been asked by the Inquiry what my knowledge of what was going on was. I was becoming more aware about some the issues being dealt with by the IMT's. There were no other discussions with me directly about those topics.

84. Prior to my involvement with the IMT as of 13 September 2019, apart from knowing Dr Inkster was the Chair of previous IMTs, I had no detailed knowledge of who was on the IMT group.

85. It was more general conversations than specifics. I was not directly involved until I went to my first IMT on the 13 September 2019. As Clinical Director for Laboratories I was responsible, with the General Manager, for ensuring all the Laboratory disciplines were working well. Infection Control did not report to me, although the Microbiologists, who worked as Infection Control Doctors were within my remit as concerned the clinical Microbiology aspects of their role. No specific patient information was discussed at these discussions.

86. At that time, the Infection Control Team would follow the National Infection Prevention & Control Manual. I do not know what these procedures were at the time as I am only aware of current ones. Like all Microbiologists I did advise on Infection Control issues whilst on call. This would be advice given to the Clinician or Ward staff about the Infection Control procedures to follow after isolating an alert organism and would relate to the immediate Infection Control precautions required to ensure any risk of transmission was reduced.

87. I have been asked by the Inquiry what the current national infection control manual procedures are that I refer to. The procedures that are in the NIPCM issued by Health Protection Scotland (now ARHAI). There is a wealth of guidance and information in the online resource that is constantly being

updated through evidence based updates. This guidance has now been adopted by all four Nations in the UK.

88. I have been asked by the Inquiry what new information I had to learn for this role. I had to refresh my knowledge of the information in the current NIPCM to ensure I was up to date on Infection Control.

89. My seven years as an infection control doctor in Lanarkshire assisted me with this role as it gave me a background in Infection Control that I could draw upon although I was not familiar with the new NIPCM at that time.

90. I have been asked by the Inquiry what support was provided to me to help me get up to speed in my new infection control role. Support from within the IPCT, from colleagues who had more experience and knowledge of issues in QEUH/RHC at that point than I did.

COMMUNICATION BETWEEN INFECTION CONTROL TEAM AND MICROBIOLOGY DEPARTMENT

91. Infection Control Doctors are Microbiologists who have taken on that specialist role. As ICDs they have full access to the Microbiology Departments and the laboratory system. There is appropriate communication between the Infection Control and Prevention Team and other microbiologists who were not ICDs. This takes the form of directly highlighting alert organisms via email, ICNET alerts, as a standing item on Microbiology Management Teams meetings, informal Consultant meetings and weekly updates from the IPCT on IC issues within GGC. Microbiologists and ICDs would communicate daily.

92. I have been asked by the Inquiry to explain what ICNET is. It is a software program used by the IPCT for data capture and analysis. The Data Team in the IPCT could give you more information. I have no working knowledge of ICNET.

93. As the duty Microbiologist if I saw two cases of an organism of interest I would tell the ICD. If this was an alert organism this would be picked up via ICNET and a report generated.

94. I have been asked by the Inquiry what I mean by an “organism of interest”. If the organism was an alert organism, that is already flagged in the ICNET system as an organism of interest such as MRSA, C difficile etc, or if we as Microbiologists were aware that an antibiotic resistant strain of an organism was prevalent in a particular unit and if we saw another pathogen with the same resistance pattern we would highlight it to Infection Control colleagues.

95. I have been asked by the Inquiry who I would tell if I saw two cases of something. I would tell colleagues who may be covering the particular unit that those organisms were seen as well so that the right treatment could be started as part of the daily liaison that occurs between the Microbiology Department and the clinical areas.

96. Microbiologists co-located with Infection Control Doctors because they worked in the same Department. They were a discrete service, although they were not distinct from the Microbiologists themselves. There would be Microbiology Management Team (MMT) meetings where IC was a standing agenda item and the Lead ICD would report on any IC issues to the MMT. Other formal meetings were the Acute Infection Control Committee and the Board Infection Control Committee. Within each sector there is a Lead Infection Control Nurse and an ICD who would work closely together.

97. I have been asked by the Inquiry to what extent infection control matters were discussed at Microbiology SMTs or other Microbiology team meetings. It was a standing agenda item and the ICDs would discuss issues.

98. I have been asked by the Inquiry to explain how an infection control service can be discrete yet not distinct. ICDs are all trained Medical Microbiologists who have chosen to specialise in Infection control and are therefore part of

the IPCT. All ICDs therefore have a Microbiological background and so they are not distinct from Microbiologists but they perform a different role as ICDs. The service that provides Infection Control within GGC is a discrete service that has different reporting structures (as described above para 16) and therefore Line management than the role of a Medical Microbiologist.

99. I have been asked by the Inquiry how many infection control doctors there were. I am only aware of the team make up after I became Lead ICD. This might be better directed to the Sandra Devine who was Acting Infection Control Manger or Dr Inkster as a previous Lead ICD at the time. During my time as Lead ICD there were between 4 and 6 ICDs working together across GGC. I worked with Dr Bagrade, Dr Mareks, Dr Valyraki, and Dr Balfour. One colleague from the Microbiology Department would also rotate as an ICD over a 6 month period. Therefore there 6 ICDs whilst I was in post as Lead ICD. The microbiology management would meet monthly. There were minutes of these meetings.

100. As Clinical Director I Chaired a Laboratory Clinical Governance committee that reported to the Diagnostic Directorate Clinical Governance and Safety Committee (CG&SC).

101. I have been asked by the Inquiry to explain what the governance programme is. The Diagnostics Directorate Clinical Governance Work Plan was developed by the Directorate CG&SC. This would be reviewed annually.

102. BICC does not input into the Governance of the Microbiology team. The governance of the Microbiology team is set within the Laboratories team led by the General Manager for Laboratories, supported by Clinical Service managers, who report to the Diagnostics Director who has overall responsibility for the Diagnostics Directorate as described in para 28. The Directorate Clinical Governance and Safety Committee is chaired by the Chief of Medicine for Diagnostics (currently myself) and this reports to the Acute

Clinical Governance Forum chaired by Dr Scott Davidson. Directorate Governance meetings occur monthly.

103. The microbiology management team reported to the General Manager for Laboratories.

104. I have been asked by the Inquiry how issues would be escalated in the microbiology team. Issues would be escalated from one of the laboratory sites (initially microbiology laboratories were sited at GRI, QEUH and Clyde at RAH) and latterly (GRI and QEUH after the microbiology work from RAH was integrated into either GRI or QEUH microbiology departments) to either the Head of Service for Microbiology or the Clinical Service Manager who looked after that laboratory site and ultimately to the General Manager for Laboratories. The route taken would depend on the issue being escalated. Clinical issues would more likely go through to the Head of Service for Microbiology and operational issues would go via the Clinical Services Manager to General Manager for Laboratories. Issues would be discussed at the Microbiology Management Team monthly meetings where the Head of Service and the General Manager would be present.

105. I have been asked by the Inquiry what the structure of the microbiology team was. Laboratory staff made up of administrative staff, health care support workers, biomedical scientists, clinical scientists, Associate Specialists, Trainee Medical and Consultant staff.

106. I have been asked by the Inquiry to what extent the microbiology team would be involved if an outbreak occurred. The microbiology team would receive samples, process and report any growth from those samples, inform the clinical staff, suggest treatment and any immediate infection control mitigations i.e. to isolate the patient or not, and inform IC colleagues of any relevant results either directly or via the ICNET system electronically which was set up and produced automated reports of organisms of interest.

107. My lead infection control nurse when I was in infection control was Pamela Joannidis.

108. The Microbiologists who were not involved in Infection Control would be passing on information, either through emails, or through conversations, about any potential issues. By potential issues I mean the isolation of Alert organisms, and multi-drug resistant organisms of interest. I believe this communication mechanism was effective. There is no professional reason why one colleague would not communicate with another colleague.

109. I have been asked by the Inquiry what “information” microbiologists would be passing on. This would include the organism(s) of interest, the patient names and CHI numbers.

110. I have been asked by the Inquiry why I thought this communication method was effective. In my experience it was simple, had very short lines of communication and worked on a day to day basis.

111. ICNET is the surveillance software used by the IPCT that was programmed with alert organisms. The IPCT set triggers for alert organisms (or any organism of interest). If a trigger is reached then a report is generated which goes to the infection control team.

112. I assume using surveillance software would simplify, standardise, and automate the process of laboratory surveillance for the IC team. It also allows for electronic data storage and transfer to other systems. This would be better answered by one of the IPCT Surveillance team who work with the software if more detail is required.

113. The microbiology team provide organism and patient data that can then be used by the IPCT.

114. I have been asked by the Inquiry what difficulties, if any, me or my colleagues encountered with the ICNET system. None. I however did not have access to

ICNET nor have I got a working knowledge of the ICNET system. I used its outputs. This would be better answered by one of the IPCT surveillance team who work with the software if more information is required.

115. I never had concerns about the communication process. Since I joined the IPCT in November 2019, I thought it was a very professional, structured team. The IPCT was under pressure during the period of level four escalation and Oversight Board, and also with the COVID pandemic. A dysfunctional team would not have coped so well. If anything, the IPCT have pulled together and become stronger as a team. I could not speak more highly of the Infection Prevention and Control Team members.

116. I have been asked by the Inquiry how a pressure to deliver ensures good communication. A team cannot deliver effective and safe patient care if it does not communicate. If that process survives during high stress periods, my view is it a robust and effective system.

117. When I was a part of an IMT I thought that senior management were proactive, informed and engaged. I got no sense that they were distant or not engaged. Since I took over the role as Lead ICD I was having frequent direct conversations at a senior level, such as Medical Director, Deputy Medical Director Acute Services, Executive Director for HAI, and Acting Infection Control Manager. I felt the senior management were very supportive of the Infection Prevention and Control team. As Lead Infection Control Doctor it felt like this level of support had been a long-term way of working and there was a level of support that had gone back years. There was nothing that caused me any concerns. Senior Management had an open door policy and I could access then to update, question or ask advice at any time.

118. I have been asked by the Inquiry how senior management kept themselves very informed. They did this by having regular meetings either throughout the week or weekly dependent on the issues. During Covid, meetings would take many times over a week.

119. Both Dr Armstrong and Dr Davidson had open door access to myself as Lead ICD. Angela Wallace as HAI Executive Lead and Chief Nurse for GGC also had an open door policy and was very supportive and helpful.

120. I viewed the board as being very supportive of the infection control team due to the way they interacted with IPCT and myself. They were approachable, listened and questioned, and gave support when required.

121. I have been asked by the Inquiry why I felt that the level of infection control support had gone back years before I took on the role. The impression I came to was that Senior Management's knowledge of IPCT had developed over a number of years as a result of previous interactions with the IPCT.

USE OF PROPHYLACTIC MEDICATION

122. If a patient is going to become immunosuppressed as part of their treatment or if they are immunosuppressed because of the illness that they have, antimicrobial prophylaxis protects them from infection.

123. Prophylaxis protects a person from infection. Prophylaxis is given for two reasons. Firstly, you want to protect the patient from their own body flora if they are immunosuppressed. We have got more bacteria in our bodies than cells in our body. We have approximately 37 trillion human cells and there are approximately 40 trillion bacteria within the average human. Secondly, you want to protect the patient from exogenous environmental organisms which can infect immunosuppressed patients. An exogenous environmental organism is an organism from out with the body.

124. I have been asked by the Inquiry if aspergillus would be an example of an exogenous environmental organism. Yes it would.

125. I have been asked by the Inquiry if aspergillus would be the only bug I would expect to find if there was a ventilation problem. This would be the main

pathogen that could infect immunocompromised patients, but other moulds or fungi which form spores such as Mucor, or Cryptococcus can commonly be found in outside air and could have the potential to be transported into the inside air.

126. The Microbiologist's input is to offer advice to the Clinicians about the most appropriate agent to use taking into consideration the potential organisms, their local antibiotic sensitivities, the possible side effects of the antibiotics and what national guidance there is. A Microbiologist would work together with the Clinicians to make the best choice for that group of patients.

127. There is national and international guidance about prophylaxis for certain conditions. Guidance can be developed by SIGN, NICE, and Professional societies about what antimicrobials to use. This does not imply reference to any specific guidance, only that if guidance was being sought the above are sources of evidence based, or expert opinion guidance that is produced by these bodies and that would be weighed by strength of recommendation. A SIGN guidance is a Guideline producing body in Scotland. Scottish Intercollegiate Guidelines Network. A NICE guidance is a Guideline producing body in England. The National Institute for Health and Care Excellence. Professional society guidance is guidelines produced by Professional bodies such as the British Society for Antimicrobial Chemotherapy, British Infection Association and the Infection Prevention Society.

128. Examples of guidance produced by, for instance the IDSA (Infectious Disease Society of America, or ECDC (European Centre for Disease Prevention and Control) who produce Guidance documents on a range of topics, for example measles guidance, can be found at the website addresses referred to in the Appendix to this statement.

129. Microbiologists have advisory input into patient care. We have no direct patient care. The Clinician makes the decision about the treatment plan for the

patient. Microbiology advice would be recorded in the Laboratory system (Telepath) Patient Notes.

130. You would not have a conversation about every patient that came in about what antibiotic we should give as a prophylactic agent. Antimicrobial agents are part of the treatment protocol. Treatment protocol is the treatment plan that is tailored to the individual patient.

131. I have been asked by the Inquiry to what extent, if any, the treatment plan would change if there were concerns about the built environment increasing the risk of infection. It could change quite dramatically ranging from not being able to treat a patient on the site to changing antibiotic prophylaxis and best guess treatment antimicrobials.

132. In GGC we have got the Antimicrobial Utilisation Committee. This writes the guidance and the guidelines for the use of antimicrobials, and they would be involved in developing guidance for the use of antimicrobial prophylaxis. This Committee would be involved in setting the prophylactic policies for GGC.

133. I have been asked by the Inquiry to what extent, if any, the AUC was involved in the 2019 IMT. I am not aware of any involvement with the IMT. Andrew Seaton Consultant Infectious Disease Physician as Chair of the AUC may be best placed to answer this.

134. The clinician would be responsible for communicating with patients and families regarding prophylactics. This is not something a Microbiologist would do.

135. I did not have any concerns about the use of prophylactics in the RHC. There were discussions around the prophylaxis regime in the paediatric transplant unit. I was not involved in that discussion. I don't know the details of who was having those discussions. I heard about the discussions as part of the discussion at the IMTs attended in the autumn of 2019.

NOVEMBER 2017 – HAI SCRIBES

136. I have been asked by the Inquiry to explain what HAI SCRIBES are. These are building control documents that highlight the control processes required to maintain infection control integrity used prior to any building work being carried out within NHS facilities. The document is filled out by Estates and signed off by IPCT, usually an ICD. I did not sign any HAI SCRIBES in November 2017, as I was not part of the IPCT in 2017.

MARCH 2018

137. I resigned from my role as sectoral clinical lead in the summer of 2017.

138. I have been asked by the Inquiry why I resigned from the role. I had been Clinical Lead for a number of years, I had just finished my role at the Scottish Government and as Deputy Director of the Reference Laboratory. I was going to replace Professor Coia as Director of the Reference laboratory when he left the post for a new role. All that added up to an opportune time to let someone else in the Team take over the role of Clinical Lead.

SEPTEMBER 2018

139. I have been asked by the Inquiry what concerns, if any, were raised with me by Dr Kathleen Harvey-Wood about wards 2A and 2B in the RHC. I am not aware of any concerns being raised. I was in GRI in September 2018 having left QEUH. I was not a member of the IPCT in 2018.

INCIDENT MANAGEMENT MEETINGS (IMTs); SEPTEMBER – NOVEMBER 2019- GENERAL OBSERVATIONS

140. IMTs are a standard method to address IPCT issues. An IMT follows a structured agenda that describes the incident, the clinical condition of the patients, the hypothesis generated, the results of any investigations, the control measures to put into place, the communications required, the HIIAT report and score that is reported to HPS Scotland, and ultimately any learning from the incident once it is over.

141. An IMT is called after an incident is identified and been through a PAG (Problem Assessment Group) and this group has decided that an IMT is required, or the incident is such that it requires an IMT with full membership from ward staff, clinicians, ICNs, and ICD (usually the Chair) and other relevant people as befits the nature of the incident e.g. Estates staff or Theatre staff for instance. The criteria to initiate an IMT is defined in the National Infection Prevention & Control Manual. Any HIIAT with a 'red' score requires an IMT to be held. The witness has provided the following document to the Scottish Hospital Inquiry for reference when they completed their questionnaire statement.

142. I was not involved in any IMTs in QEUH prior to 2019. I had no issues with any IMTs I attended in GGC during 2019. I was attending as a medical Microbiologist giving advice relating to infections.

143. I was not involved in any IMTs prior to 2019 out with QEUH/RHC. The IMTs in QEUH/RHC I attended were on 13 September 2019 **(A36591627 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 80)**, 08 October 2019 **(A36591643 - – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)**, 25 October 2019 **(A37992819 -– IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 85)**, 5 November 2019 **(A36591709 - – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 86),** 11 November 2019 **(A37993248 -– IMT Gram Negative Blood Ward 6A – Bundle 1 -**

Document 87) and 14 November 2019 **(A37993497** - **– IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 88).**

144. At the IMTs I was asked about water sampling results and I was asked to make a comment on them I gave my opinion on the water sampling results during the IMTs. I have been asked by the Inquiry if the discussion at the IMTs was around the opening of Ward 2A. This was discussed at the IMT on the 14 November 2019. The discussion was recorded in Section 7 of the IMT minutes. **(A37993497 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 88).**

145. The IMTs in 2019 operated well. Everyone was able to input. Dr Emilia Crighton was an excellent Chair. Dr Crighton is a Public Health Doctor. She was selected to replace Dr Inkster who was the previous Chair. The IMTs were looking into Gram-negative infections in patients from ward 6A and was using as the outbreak definition all Gram-negative infections from patients in ward 6A.

146. I have been asked by the Inquiry to what extent did opinions differ in the IMTs on the topic of gram negative infections within ward 6A. A difference of opinion centred around the inclusion of the enteric bacteria *Enterobacter* and *Klebsiella*. WGS showed there was no genetic linkage between *Enterobacter* isolates, and in my opinion they were more likely to be from an endogenous source. Most probably from the patients bowel flora. I also did not think that other predominantly enteric bacteria such as *Klebsiella* should be included as an environmental organism. Both *Enterobacter* and *Klebsiella* are members of the normal colonic flora in humans.

147. Attendees from HPS (now ARHAI) felt these enteric bacteria should be included as they fulfilled the inclusion criteria for entry into the outbreak. The definition of a case was infection from a Gram negative organism (excluding *E.coli*).

148. I did not know at the time, but I now know, that from water testing between 2015-2020 *Enterobacter* species were isolated from 6 water samples out of 10, 311 samples tested. *Klebsiella* species were isolated from 4 water samples from 10,311 samples tested. Therefore in my opinion on balance of probability these two genera were not environmental organisms.

149. The witness referred to the following document when they completed their statement. For details, please see (**A42895836 - Chaput DL 'Microbiological Testing (2015-2020) of Water and Environmental Samples from the QEUH (Adults) and RHC, Overview of Sample Numbers and Test Results' [2023] – March 2024 – Bundle 18 - Volume 1 of 2 – Document 2).**

150. The IMTs had a secretariat. The minutes were accurate or if they were not then people could make amendments. This was usually done during the first part of the next meeting and would usually be to amend the accuracy of the minutes rather than update actions. The minutes were produced and were amended as wished. There was no disagreement about that. We would then move on to the main section of the meeting.

151. I have been asked by the Inquiry what the process was for making amendments to the minutes. Amendments were proposed by members of the IMT, discussed and accepted and the draft IMT minutes were changed to reflect those changes and a final IMT minute was produced. The amendment process was used at every meeting by meeting participants. The amendment process could take several minutes.

152. The IMT process sits within the Infection Control Governance framework. The Chair of the IMT is the ultimate arbiter of the decisions of that committee. By ultimate arbiter I mean the Chair has to balance the views of the IMT group and consider their input, using that to make recommendations for the group about what next steps to take in controlling an outbreak. The Chair would work through the agenda, explore differences in view, allow open discussion, input into the decisions of the Committee, and agree HIIAT scoring and any communications. I am not aware if these processes are set out in the NIPCM.

Different views would be reflected in the IMT minutes if discussed at the meeting.

153. At all the IMTs I attended in the time period being examined by the Inquiry, only Dr Emilia Crighton was Chair. The Chair of an IMT is usually an Infection Control Doctor or a Public Health Consultant. It depends on several factors, for example where the outbreak has occurred and the scale of the incident. Public Health physicians have expertise in chairing these meetings. I do not have any concerns about how these meetings operated. In the meetings I attended no one was shut down or ignored.

154. The chair of an IMT would be an infection control doctor or lead infection control doctor because they have the expertise and knowledge to run a group investigating issues of infection. This was the case with Dr Emilia Crighton.

155. We also had representation from external bodies such as HPS (now ARHAI), who have expertise in this area and supported the IMT. I felt the IMTs did what they were meant to do. They allowed a discourse, and they did all the things that a structured agenda should do. I did not feel that anyone was sitting in the meeting feeling like they could not speak. Some of the meetings were very long as a result of the issues and trying to understand whether we could open up the ward to new patients. The ward was still operative but it was closed to new patients.

156. At that time, the Transplant patients were being redirected in Scotland with the effect that this was delaying treatment. The clinicians were saying they were starting to see harm because of this. There was discussion around that, and the meetings were long, but appropriately so. The longevity of the IMTs was to allow discussion to take place and for Dr Crighton as Chair to develop a recommendation.

157. In my opinion we had the right people around the table. Attending were Senior Medical staff, Public Health doctors, Estates personnel, Microbiologists, we

had Infection Control Doctors and Nurses, the Clinical Doctors and Nurses, HPS, and Communication Team. The right people were turning up every single week and got involved in the discussion because they recognised the importance of supporting the IMT.

SBAR - 26 AUGUST 2019

158. An SBAR is a Situation, Background Assessment, Recommendation report. A structured reporting tool often used to describe clinical situations.

159. I have been asked by the Inquiry what my view of the SBAR authored by Dr Inkster and Dr Peters is. I have not seen an SBAR authored by Dr Peters and Inkster in August 2019.

160. I have seen, as it was tabled at the IMT on 08.10.19, an SBAR 6A incident, data and epidemiology, 07/10/19, Dr Teresa Inkster, Consultant Microbiologist, QEUH, Dr Christine Peters, Consultant Microbiologist, QEUH. **(A38694850 – SBAR dated 7 October 2019 – Ward 6A – incident data and epidemiology – Bundle 4 – Document 44)**

161. I have been asked by the Inquiry what discussions, if any, did I have with Dr Inkster about concerns that the environment in Ward 6A was an infection risk. Dr Inkster had no discussions with me on that topic in August 2019.

162. I had one discussion about the environment in 2A prior to closure at which Annette Rankin was also present. I was the Acting Lead ICD. Dr Inkster shared a report about high organism levels and biofilm within taps, their components and flow straighteners. Also that work showed there was a splash zone around sinks and that there were some sinks that had imperfect drainage as a result of sealant being proud of the ceramic forming a mini dam. This meeting took place in October or November 2019.

163. I have been asked by the Inquiry what discussions, if any, did I have with Dr Inkster about concerns relation to the management culture within infection control. Robert Gardiner, General Manager for Laboratories and I (as Clinical Director) met with the Microbiology Consultants from the QEUH on 25 September 2019 **(A41745856 – Notes from IC meeting 25 Sept – Bundle 27 – Document 32)**, 02 October 2019 **(A41745864 – Notes from IC meeting 2nd Oct – Bundle 14 – Document 159)**, 09 October 2019 **(A41745839 – Notes from IC Meeting – 9 October 2019 – Bundle 27 – Volume 7 - Document 17)** and 23 October 2019 to look at Infection Control Doctor provision in the QEUH/RHC as a result of Dr Inkster's resignation as Lead ICD. At the initial meeting on 25 September 2019 a series of concerns were mentioned. I took my own notes at the meetings.

a) Burden and scope of the ICD role due to issues with the ventilation and water.
b) The complexity of the IC issues arising. That ICD colleagues on the North couldn't cross cover as the role in QEUH/RHC was too complex.
c) The lack of expertise within the ICDs around their competency in dealing with ventilation and water issues. The requirement for ICDs to sign off the ventilation.
d) Undermining of the ICD role in respect to HAI Scribes and their implementation of protective mitigations described in the Scribes by Estates.
e) A reduction in ICD resource in QEUH/RHC.
f) The IC environment was not supportive.
g) The information given to the ICDs was inaccurate, changing, with poor documentation and this made decision making difficult for the ICDs.
h) Overall there was a loss of trust by the ICDs and the Consultants in the Infection Control service.

164. In the meeting on 02 October 2019 further issues arose on:
a) Patient placement
b) Cryptococcus
c) Advice from the BMA

d) Ventilation in 2A/B not compliant

e) Breakdown between ICDs and ICNs at high level

165. During these early meetings Robert Gardiner and I were asking if the Consultants would provide IC cover for QEUH/RHC which they refused.

166. In the meeting of 09 October 2019 the discussion centred around IMT handovers by email, tightening up documentation and sharing that documentation with Team members, looking at a patient placement SOP, a new rotating ICD position to help with the burden of work, starting an IC Forum to allow for discussion amongst GGC ICDs. At this meeting Dr Peters agreed to give Infection Control advice for the QEUH/RHC.

167. On the meeting on the 23 October 2019 we reported that there had been agreement that ICD sessions should increase from 18 sessions (1.8 whole time equivalents to 26-30 sessions (2.6- 3 wte) depending on finance. This would allow for better continuity of care. There would be exploration of Team Service Planning (a Job Planning system where everyone in a Team, however defined, agrees to do the same roles over the same time period) to even out workload, the recruitment of Clinical Scientists into the IPCT to support the ICDs, dissemination of meetings and courses on topics relevant to ICD practice, support for registration fees and travel to take up any Infection Control or Building standards courses they felt relevant.

168. The synopsis of these meetings were reported to Dr Green (Chief of Medicine, Diagnostics).

IMT Minute 13 September 2019

(A36591627 – IMT Gram Negative Blood Ward 6A - Bundle 1 – Document 80)

169. I have been asked whether I can recall the particular circumstances which led to this IMT being called. It was part of an ongoing process, and the Committee would have agreed to meet at whatever frequency was appropriate. IMTs would be run when there is an outbreak, but during an outbreak they would run regularly.

170. I have been asked by the Inquiry what view Professor Jones and I reached on the safety of ward 6A from a microbiological perspective. After reviewing the water testing results, which were negative, and with point of use (POU) filters on the taps and the effective level of chlorine dioxide in the water system, my view was that the water was microbiologically safe. Professor Jones will be best able to answer what his view was.

171. I reached this view through review of the latest water testing results which were negative, the use of POU filters on the taps and the effective chlorine dioxide water levels.

172. I have been asked by the Inquiry what the outcome of the detailed review of 12 cases (12 confirmed, 1 under investigation) was and what was the root cause. I have no knowledge of this. The author of the RCA Pamela Joannidis may be better able to answer this.

173. The mitigation actions that were taken at this IMT were as per the minutes of the meeting, as below:

Further Investigations Required

"A detailed review of the 13 cases (12 confirmed, 1 under investigation) is to be undertaken, including a full microbiological analysis and development of root cause analysis tools for each new case of positive blood cultures going forward.

A summary of all mitigating actions taken to date and a summary of all the epidemiology is to be collated and presented at the next IMT.

Discussion regarding if a Hydrogen Peroxide Vapour Clean (HPV) to be included for every discharge clean/terminal clean for all Ward 6A rooms. There is no requirement for a HPV clean to be undertaken as no evidence showing it would be effective for this incident.

Estate colleagues are going down to Great Ormond Street (GOSH) to have a walk round of their haematology/oncology unit. They will see what cleaning and testing regime they undertake within the unit and compare it with what we have currently in place.

Development of Standard Operating Procedures for obtaining regular samples of Water, Environmental and chilled beams are to be drawn up with the help of HPS.

Dr Lisa Ritchie has received GOSH ventilation policy which she will share with estates so that a comparison can be undertaken. "

AD HOC PROPHYLAXIS GROUP

174. Within the IMT minute dated Friday 13 September 2019 **(A36591627 – IMT Gram Negative Blood Work Ward 6A – Bundle 1 - Document 80)** reference is made to a microbiology report which states an ad hoc group was set up to look at antifungal prophylaxis. I was not involved in any of the prophylaxis work.

EPIDEMIOLOGY

175. There is mention in the minute of 13 September 2019 of my commentary that was given on epidemiology data introduced by Dr Kennedy. From what I can recall, Professor Jones presented to the IMT, and as I can recall the conclusion was that there was no real change in the types of infection being

seen. I would not want to comment on this any further before refreshing my mind on the data.

176. I have been asked by the Inquiry to explain what the epidemiology data was. This was an EPI curve of Gram-negative bacteraemia from blood cultures in paediatric haematology/oncology patients from July 2013 till July 2019 with comparison of infections of those infections from Yorkhill compared with RHC. Since moving to the Ward 6A the patterns of environmental Gram-negative organisms were the same compared to the counts when the ward was at Yorkhill hospital. In Yorkhill similar organisms had been seen in blood cultures as was being seen in RHC and 6A.

177. This work was trying to establish what was the normal pattern of infectious organisms that had been seen in patients when the Transplant Unit was in Yorkhill and compare the historical infections with the infections that were being seen at that time. My recollection is that same environmental organisms were seen in infected patients in Yorkhill. In Yorkhill similar organisms had been seen in blood cultures as was being seen in RHC. I was not involved producing the comparison report with Yorkhill.

178. Mains water is not sterile and, unless air is in a specialist engineered unit, it has a significant but acceptable number of particles in each cubic metre which you expect to be either spores or dust or bacteria.

179. I think the idea that the water and air was contaminated is a misconception. Air unless specialist filters are used, is not sterile. Mains water is not sterile and has aquatic organisms within it at levels which are deemed acceptable in wholesome water.

180. I have been asked by the Inquiry what Cupriavidus is. *Cupriavidus* is genus of bacteria that is widely distributed in nature and can be isolated from water, ultrafiltration systems, and bottled mineral water that can cause, in rare

cases, serious infections both in immunocompromised and immunocompetent patients. An immunosuppressed patient would be susceptible to infection.

181. They are very common. We know through gene sequencing that there is a stable population within the water system of RHC. See Sequencing report, which I have provided to the Inquiry **(A42401483 - Report by Professor Alistair Leanord and Doctor Derek Brown titled - Application of whole genome sequencing to identify relationships among isolates of Cupriavidus spp., Enterobacter spp., and Stenotrophomonas spp. isolated from clinical samples and from water and drainage associated sources within the healthcare environment. - Bundle 6 - Document 40)** and supplementary statement **(A47848718 – Supplementary Statement).**

182. I have been asked by the Inquiry what a “potential Cupriavidus” is. This depends on the context. If this relates to organism identification, it is possible that the Clinical Microbiology laboratory will misidentify an organism. This is due to the database which makes the identifications on the equipment (the MALDI-TOF which is a spectrophotometer) that is used for clinical pathogen identification not having an extensive dataset of non-clinical environmental pathogens. This can lead to misidentification. This misidentification comes to light when other techniques for identification i.e. WGS are used and the genome of the organism is checked against International datasets.

183. *Cupriavidus* are normal resident aquatic organisms that are found within the water system of RHC and QEUH. There is no agreed level above which they would be described as a contaminant.

184. I have been asked by the Inquiry to what extent, if any, is a particular microbe exceeding safe levels in water sampling considered contamination. There are no National or International agreed levels which can be used to differentiate between normal aquatic organisms in wholesome water and contamination by those aquatic organisms.

185. You cannot decontaminate drains. Drains by their very function of removing waste will always have organisms within them. All drains have high microbial numbers within them with hundreds of bacterial taxa. Putting disinfectants down drains will not remove those bacteria in any meaningful sense and has the potential to create resistance to the disinfectant and in some cases promote the spread of antimicrobial resistance, which we know in some cases is linked to disinfectant resistance within organisms.

186. From the final sentence in that part of the IMT minute which states there was no real difference compared to the counts at Yorkhill, I would deduce that if there had been no changes in the patient population and the practices had been the same, I would be saying that what we were seeing was like for like.

187. I have been asked by the Inquiry if there was a problem in the old Yorkhill or if infection is inevitable with immunosuppressed patients. Every care is taken to prevent infections. Infections are not inevitable. However, because of the highly immunocompromised nature of these patients between 20-45% of patients will get an infection as a result of their disease and treatment. This was noted in the Case Note Review. as quoted below with reference.

188. Dr Kennedy did the analysis on the data which was an EPI curve. I am not sure if it was collected on an ongoing basis from 2013-2019. Certainly, we have got that data as part of our routine. I am not sure how comprehensive the clinical data was in 2013. However, I had no reason to believe it wasn't. Using data in historical comparisons can be fraught with data differences as a result of changes in measuring things over time. It was probably robust since it would have to be at a certain level to be able to make the comparison. If it was not at the same level as the July 2019 data, then it would be a false comparison. So, I am certain in this instance it would have been comparable, but as author of the report Dr Kennedy would be better able to answer this.

189. I was making the assumption that the recording of infections needed to be standardised over the 2 time periods. However Dr Kennedy who did the data analysis may be better able to answer.

190. I have been asked my Inquiry why I think the EPI curve peaked during the water incident in March 2018. I cite data from “Report by Iain Kennedy "Descriptive analysis of trends in bacteraemia rates for selected gram negative organisms" dated July 2019” **(A38662683 –Report by Iain Kennedy “Descriptive analysis of trends in bacteraemia rates for selected gram negative organisms” dated July 2019 – Bundle 6 - Document 28)**. It is impossible to be definitive about the reasons why the EPI curve peaked.

191. This was most likely multifactorial. In my opinion I thought the likely source of infections with the enteric bacteria, *Klebsiella* (20 infections) and *Enterobacter* (14 infections), was most likely to be due to translocation of the organisms from the bowel which these organisms inhabit. There could also be issues of how central venous catheters were cared for.

192. The *Stenotrophomonas* (13 infections) could have been due to the use of the broad spectrum antibiotic meropenem to which *Stenotrophomonas* are inherently resistant. Therefore use of meropenem will advantageously select out *Stenotrophomonas* from the bodies flora. In 2016 there was a worldwide shortage of piperacillin/tazobactam due to a manufacturing problem. Piperacillin/tazobactam was the antibiotic of choice for the treatment of neutropenic sepsis and as a result of the global shortage many units/clinicians substituted meropenem as the agent of choice for treating neutropenic sepsis. A GGC review of cases showed that two thirds of all cases of *Stenotrophomonas* had been given meropenem up to 119 days prior to the positive blood culture. It is known that an antibiotic, even a short course, can increase the risk of carriage of a resistant isolate for up to a year.

193. There was an increase in patient numbers from 2017 when measured in total activity over the time period which could have been a factor. There is the

possibility that there was a change in patient clinical acuity but I think this would be better answered by the Clinical team who see these patients as I have no knowledge if that was the case.

194. I have been asked by the Inquiry how useful the report was when the analysis could not demonstrate causality. No report thus far has shown causality. All report association. I know of only 2 cases of possible causality, one case of Cupriviadus and one case of M chelonea.

HYPOTHESIS

195. One of the two hypotheses in this case was exposure to unfiltered water outwith ward 6A where there is no point of use filters. These patients were coming into ward 6A but their clinical care necessitates they are moved for scans, interventions, and investigations. They may require intensive support in Intensive Care Unit. So there are a number of areas where they could have been exposed to unfiltered water.

196. Some of them who attended day care at ward 2B would also possibly have been seen in clinics or become unwell and presented at the Emergency Department. So, there were many possible reasons why they would leave the confines of 6A. Filters were not put on in every single outlet in the RHC, so it was possible that in, for example, a clinic room they were seen in, they could be exposed to water that was unfiltered.

197. I am just surmising, but I think that was probably it, because it makes biological sense. I know that they were trying to put filters on the water outlets where the patient pathway was most likely for these children to either enter or go for investigations and scans, but not every single outlet had a filter.

198. I have been asked by the Inquiry why all water outlets on the immunosuppressed patient's pathway were installed with filters. This was a

decision made by earlier IMTs. The Chair of the IMT, Dr Inkster, at that time would be better placed to answer the reasoning.

199. It does not strike me as unusual or a concern that every outlet did not have a filter. You would only remove the risk where you believed there was a risk. These patients were a very susceptible population. The patient pathway would be very different from someone who came in for a sore ear for instance and had to see an ENT surgeon. There would be no reason to put a filter on the ENT ward for instance.

200. Filters are not without their issues. They are costly. They lower the ergonomics of the wash hand basin, and they lower the height where you can wash. This means people have to stoop down and put their hands into the bowl. Where we saw contamination of filters, it was almost certainly retrograde contamination as a result of handwashing. People were putting their hands into the wash hand basin and touching the filters on the way down which means those organisms then can grow in the spigot and contaminate the water.

201. Retrograde contamination is contamination of the filter as a result of use of the sink i.e. by hand washing causing splashes, inadvertent touching of the filter or from pouring liquids down the sink. The spigot is the end of the point of use filter from which water flowed. The nozzle.

202. There were cleaning issues potentially with them in terms of training people how to do it. I found out later that one of our expert engineers, Dennis Kelly, said that they breach some regulation about how high the water outlet should be above the basins. He did not specify which regulation had been breached.

IMT MINUTE 8 OCTOBER 2019

203. In the IMT minute dated 8 October 2019, **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** I am noted as “acting as the

Infection Control Doctor during this meeting". I assume it was due to Professor Jones who was Acting Lead ICD being absent.

204. I have been asked by the Inquiry what Coliforms are. "Coliforms" is a collective term that describes Gram-negative organisms.

205. I have been asked by the Inquiry why I think some outlets in QEUH and RHC had higher coliform counts. I think this was due to natural biological variation if a biofilm was present or due to heavier contamination as described above (para 83) on the filters and its outlet.

206. Tom Steele enquired in the lab could carry out routine swabbing of the chilled beams to see if the Microbiology laboratory could accept this sample type.

207. I have been asked by the Inquiry why there are great difficulties in separating infection sources in biofilm. Biofilm can be made up of a number of different organisms. There is sometimes a predominant organism within a biofilm. However, shedding of these organisms into the water can occur at different times such that one biofilm can shed a number of different organisms from the same outlet.

208. I have been asked by the Inquiry to what extent could any leaking taps behind IPS panels be a potential infection risk to patients in RHC. The dampness could allow for the growth of coliform bacteria and fungi which can grow in damp conditions.

209. I have been asked by the Inquiry why I think the 3 potential new cases should be classified as "MINOR" when the route of transmission was still unknown. In my view the fact that the three organisms were different meant that there was no point source (from a single source) outbreak. Although the source was unknown the fact that the organisms were all different pointed to what the source was not. That it is was not from a single contaminated source. If that was the case and the source was from a single point I would expect to see

organisms that were of the same species, and if typed, to be genetically related. The IMT scored the risk as Moderate.

MICROBIOLOGISTS SBAR

210. The thing that I remember most from this IMT is a graph that was in the SBAR (Situation, Background, Assessment, Recommendation Report) that showed an increase in *Enterobacter*. **(A38694850 – SBAR dated 7 October 2019 – ward 6A – incident data and epidemiology – Bundle 4 - Document 44).** For typing reference organisms of Public Health interest we use whole genome sequencing (WGS) in the reference lab. It struck me at that there was the ability and the Clinical Scientists with the requisite expertise to use WGS to see if there was the possibility of transmission with this organism. We collected and sequenced these organisms.

211. I have been asked by the Inquiry to explain what whole genome sequencing ("WGS"). Genomes can be assembled using standard methods. **(A42401483 - Report by Professor Alistair Leanord and Doctor Derek Brown titled "Application of whole genome sequencing to identify relationships among isolates of Cupriavidus spp.,Enterobacter spp., and Stenotrophomonas spp. Isolated from clinical samples and from water and drainage associated sources within the healthcare environment." Dated 18 January 2023 - Bundle 6 - Document 40)**.

212. Sampling was done to strict SOPs developed by DMA Canyon to prevent contamination of the sample. Only cultured organisms were sequenced. No WGS was done on primary water samples.

213. I have been asked by the Inquiry if it is the case that many organisms co-exist and their genomes may be fragmented and mixed together so the WGS may not accurately capture the genomes. This is not correct. Only single cultures organisms were sequenced by WGS. See report at para 181.

214. The hypothesis in the SBAR was that the drainage system was contaminated. The word ‘contaminated’ was used. The reality is that drains are designed and used to take waste away. Organisms will naturally reside in drains. If you were the last person that took a shower in a ward or washed one hands in a wash hand basin then there would be organisms that were resident on one’s skin that would now be transferred into the drain.

215. Dr Inkster never attended an IMT I attended.

216. I have been asked by the Inquiry what my views are on the definitions in the CDC environmental guidelines in relation to Enterobacter found in the drains of the hospital. I am not aware of these guidelines.

217. I have been asked by the Inquiry to what extent, if any, was I surprised that the levels of Enterobacter were higher than E.Coli or Klebsiella. I was not surprised. Organisms in drains are a function of what has been put down them and what selective advantage each organism has over any other.

218. I have been asked by the Inquiry why a drain with an unsafe level of a certain organism or organisms would not be considered “contaminated”. I know of no agreed threshold level for bacterial numbers in drains that identifies it as unsafe. All drains will have organisms present within them.

219. The SBAR highlighted that the drains could be an issue and it should be investigated. This was where I thought WGS might be helpful. I think Enterobacter were numerically the second highest species affecting patients after Stenotrophomonas. In 2019, the only gram negative bacteria I was looking at was Enterobacter species.

220. The recommendations of the SBAR are as below **(A47603210 – C Peters and K Harvey-Wood, Bacteraemia rates and Resistance patterns in**

Paediatric Haematology / oncology patients 2014-2018. Draft Report 10 October 2018 – Bundle 19 - Document 19)

a) "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.
b) Overall this data supports the hypothesis that environmental factors have been driving rates of bacteraemias in this cohort
c) As the organisms and resistance rates are volatile the most crucial component of managing sepsis is rapid diagnosis and identification or organisms with daily microbiology and clinician discussions regarding therapy.
d) Empirical guidelines will not cover environmental organisms well, but when these are removed meropenem offers 100 % cover as an escalation antibiotic. Further discussions regarding empirical policy are warranted and are ongoing.
e) Antibiotic use is driven by increases in infections and serious bacteraemias.
f) Further work is required to look at amikacin resistance, different combinations of antibiotics for different groups of pathogens.
g) Resources need to be identified in order to maintain a close and timely monitoring of this level of epidemiological data."

221. There was a WGS protocol (pipeline) that we used in the reference lab that I felt we could use to look at the genetic relatedness of the *Enterobacter*. Pipelines are a way of extracting and sequencing organisms' DNA simply.

222. One of the Clinical Scientists did the sequencing and initial analysis. This took maybe four weeks to six weeks to do. I presented it at the IMT on 5 November 2019. That was one of the actions I took away from this IMT.

223. The clinical scientist that undertook the WSG had twenty nine years as a Clinical Scientist.

224. I have been asked by the Inquiry why the analysis takes some time. Time is needed to find and collect the organisms from freezers, then grow the organisms, then extract the DNA, then check for purity, then sequence the DNA, then quality check the sequencing output, then to reassemble the genome, then to do the data analysis.

225. I presented the analysis to the members of the IMT on 5 November 2019. The actions I took away from this IMT were to discuss and agree a statement regards reporting and monitoring of Enterobacter cases.

RESULTS OF WHOLE GENOME SEQUENCING

226. I gave a presentation to the IMT on 5 November 2019 **(A36591709 – IMT Gram Negative Blood Ward 6A - Bundle 1 - Document 86)** bn the sequencing results of the *Enterobacter* blood stream infections from the RHC. We wanted to see if the *Enterobacter* organisms causing these infections were genetically linked and put them into context about whether there was potential transmission or not.

227. The WGS showed no genetic similarities between any of these *Enterobacter* organisms. Using diagnostic testing it was clear that although all these isolates were identified in the diagnostic Microbiology Department as the single species *Enterobacter cloacae* this encompasses five different species when looked at with WGS. WGS showed that there was no genetic similarity between isolates when looked at from a ward, hospital or date perspective. That is, they were all genetically distinct.

228. They were all genetically distinct and separate from each other. So that showed that there was no point source outbreak, or no single source for these organisms. I would say it is more likely that these organisms, which are normal inhabitants of the mammalian gut, derive from the patient's normal gut flora and rather than from the environment. *Enterobacter* species were very

rarely isolated from potable water sources. We did not have many other environmental isolates with which to compare but the issue of directionality must be kept in mind. If an *Enterobacter* species was found in a drain and a patient, it would be difficult to prove that the isolate originally in the drain was acquired by the patient or if the drain acquired the isolate from the normal flora of the patient as a result of washing.

229. What the distinct genetic heterogeneity does tell you is that it is not likely that there is a point source from which all these *Enterobacter* species came from.

230. The *Enterobacter* organisms were collected from departmental freezers. A Clinical Scientist did the sequencing and the analysis because that is their expertise. There was no peer review because this is not a part of the laboratories normal sequencing procedure and this work was not designed for publication but to inform the IMT.

231. When I presented this information at the IMT on 5 November 2019 the discussions were starting to be about how to open up the ward to new patients and how to reassure the clinicians that nothing has been going on. I stated that we now had a tool we could use for any future infections that could put any infections in context and therefore rule in or rule out possible transmission events.

232. I felt clinicians needed reassurance because they had concerns about further patient infections. I am not in a position to say who it did reassure or not.

233. Page 8 of the 8 October IMT minute **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** refers to specific patients with three different organisms. A traditional classical outbreak would have one organism, and infections are caused by that organism. For example, a classic example might be that you have somebody with tuberculosis (TB) who then coughs over everyone, usually in an enclosed environment (barracks, prisons etc) and then everyone around them gets that organism. Epidemiologists would call that a point source outbreak. This outbreak was different in that the

definition of the outbreak was any Gram-negative bacteria. This to my mind was a very broad and unusual definition to use to define the outbreak.

234. When defining what to include and exclude from consideration by the IMT i.e. how do you define the outbreak, a definition must be specific enough to ensure no infections are missed out but not so broad that there will be a large number of "false positives" that are counted as being related to the outbreak. At this point in the IMT I couldn't understand why any Gram-negative bacteria was part of the outbreak but when analysis was done *E. coli* (a common gut bacteria) was not included.

235. It then starts becoming a bit more difficult to understand what is going on because each of these organisms *Achromobacter*, *Stenotrophomonas* and *Delftia acidovorans* are found in mains water. It does not necessarily mean contamination; they are aquatic organisms residing in the water. So, we need to ask: were these organisms seen in Yorkhill? The answer from Dr Kennedy's work was, yes, they were. So, what had changed? I think that was what was puzzling people. No conclusion was reached.

236. I have been asked by the Inquiry to what extent would a large number of these organisms in the water be considered a "contamination". None. It is recognised that water is not sterile. They are organisms that can be found in non-sterile potable water that is wholesome.

CASES DEFINED AS BEING A HAI

237. The IMT minute states that one of the previous cases, patient [redacted], should be taken off the timeline, as they had not been in hospital in the 30 days prior. **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** This would not therefore fit the definition of a healthcare associated infection. The hospital will always be the point at which a diagnosis is made, since it is the hospital which is doing the testing. But that does not mean that

the infection was picked up in the hospital - it could have been picked up outside.

RESULTS OF ROOT CAUSE ANALYSIS

238. At this IMT the results of the Root Cause Analysis were discussed, and a common factor was that the patient has a line in situ. **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** A patient has a line inserted when the Clinician knows that the patient is going to need vascular access for some time for their treatment. The patients will live with those lines until either they can be removed because they may get infected, they block, or the treatment is complete. They will have those lines tucked in under their clothes.

MICROBIOLOGY REPORT

239. During the IMT Dr Kennedy mentions *Delftia acidovorans* which is an unusual organism. **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** It is an organism that resides in the aquatic environment, so you would expect to see it in mains water. It would be common practice to have a look back to see if you have seen an infection before.

240. I have been asked by the Inquiry why Delftia acidovorans is an unusual organism. It is unusual to see this organism cause a clinical infection. It is not a common organism in clinical infections.

241. The action I recall around transmission data was in relation to the *Enterobacte*r data that was presented in the SBAR that showed there was an increase in infections over the four year period 2016-2019 and I wanted to sequence these organisms to see if we could understand why. One of the

things that we can use WGS for is to see whether the same genetically similar organism(s) are spreading in patients.

242. When I say ‘same’ I mean genetically the same. The species is called *Enterobacter cloacae* by the Clinical Microbiology laboratory in QEUH, and in fact not all of them were. There were five species in that group. All isolates identified by WGS as *Enterobacter cloacae* were as genetically different as two strangers are genetically different. I would have expected if there was contamination of the water system that where *Enterobacter cloacae* was being isolated that these organisms would be genetically similar or tightly genetically related. This was not the case. In my opinion the sequencing did not support transmission of this species of bacteria from the water system to the patient.

243. I have been asked by the Inquiry why I would expect the Enterobacter to all be the same genetically where they were coming out. In a point source outbreak the organisms would be indistinguishable by typing methods. In this case the typing method was whole genome sequencing.

244. From April 2015 to December 2020 from 10,311 water tests there were 5 *Enterobacter cloacae* and 1 *Enterobacter* spp. isolates were identified from water samples. Enterobacter therefore are rarely found in the water system in QEUH/RHC.

WATER SAMPLING

245. Dr Kennedy was looking at the water samples and the IMT mentions that since August all outlets had been resampled and had multiple negative samples. **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** There were two further outlets testing positive in September and the resampling results were not yet on the tracker. If you had an outlet that had tested positive for an organism, the first thing you would do is clean it because they had filters on them. You would flush the outlet and that might

be enough, then you would retest it. If it was still positive, you might take off the tap, dismantle it and decontaminate it.

246. The tracker was a spreadsheet of the water results. DMA Canyon and Estates personnel were responsible for maintaining the “tracker”.

247. If the outlet still tests positive you would replace the tap or remove the tap if the outlet were not being used. Resampling would occur to see if that was a consistent finding or if it was local contamination of the outlet, such as surface or retrograde contamination of the filters.

248. I have been asked by the Inquiry if the removal of a rap would create a dead leg. Tap removal would be replaced by a new tap. If a tap was removed permanently I believe the associated pipework is also removed. Estates personnel are better placed to answer this question. A dead leg cannot be flushed.

CHILLED BEAMS

249. Tom Steele had asked for routine swabbing of the chilled beams to see if anything had grown on them. If it had, this would change the hypothesis to that of airborne transmission. However, that was not what we were seeing; we were seeing aquatic organisms. Some of these organisms would not survive in a dry environment. I am unsure whether airborne transmission was a part of the hypothesis at the time. It did not make sense to swab these. The only way that hypothesis would have worked is if there was leakage from the chilled beams. I know this had happened, but I think that had all been fixed by this point. If there was leakage and there was water dripping through and contacting the surface of the chilled beams, picking up whatever organisms that were there, that water was then somehow accessing or getting into the environment such that patients were getting infected. The chain of possible transmission starts becoming convoluted.

250. I have been asked by the Inquiry why I think they had been fixed at this point. This was discussed at the IMT on 13 September 2019 **(A36591627 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 80)** where it is recorded that “Interventions have been taken to minimise/eradicate condensation occurring and leaks from the chilled beams”.

251. I have been asked by the Inquiry why I think the chilled beams had been fixed. This was discussed at the IMT on 13 September 2019 where it is recorded that “Interventions have been taken to minimise/eradicate condensation occurring and leaks from the chilled beams”.

252. I have been asked by the Inquiry why I was confident that there had been no further leakage since they had been fixed. I assume that if a leak cannot be fixed or wasn’t fixed this would be escalated through the Estates Department.

253. I did not know at the time what specific actions were taken to minimise/eradicate the condensation occurring and the waters leaks from the chilled beams. I now know that dew point controls have been fitted.

254. I would expect to see Organisms associated with skin squames and dust such as Staphylococci, Bacillus species, Corynebacteria, and possibly Streptococci.

255. Also, if this was what was happening, I would not expect to see only water organisms. There would be fungal spores, Gram-positive organisms that can survive in dry environments and dust, and skin organisms from skin squames. That is not what we were seeing. A lot of Gram-negatives do not survive for 20 minutes on a dry surface. Some of them do, but a large number of them do not. Had we seen a mix of Gram-positives and Gram-negatives then the hypothesis might have been reasonable.

256. If the leak was from source water i.e. the water circulating within the CBUs then Gram-negatives would support that hypothesis. My understanding at this time was that condensation on the outside of the units was the problem rather than leakage of internal water from within the CBUs.

257. I was not part of the IPCT when the chilled beam hypothesis was raised. It was noted as a hypothesis in the first IMT of the 13th September 2019 that I attended. I have no experience of chilled beams.

258. I have been asked by the Inquiry to what extent, if any, do I think condensation forms on chilled beams. I cannot give an opinion about this as I have no experience of CBUs.

259. I have been asked by the Inquiry why this was not an active concern when I was involved in the latter IMTs. It was noted as a hypothesis in the IMT of the 13 September 2019 and closed at the next IMT as a hypothesis on Tuesday 8 October 2019.

260. Following the chilled beam hypothesis, the mitigations were:

a) Leaks had been fixed
b) Environmental swabbing occurred
c) Water testing of the water system serving the CBU occurred
d) Biocide was introduced into the water system serving the CBU with repeat water testing
e) Ongoing air sampling and swabs of the CBU
f) And I am aware from documents that dew point control(s) were fitted.

AIR SAMPLING

261. During this IMT we discussed the recent results of air sampling within Ward 6A. **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** It had previously been mentioned that a high count had been

taken by the nurses' station. However, you need to take into account what is happening when sampling.

262. In areas of high human activity, such as the nurse's station, the particle counts can be high. Air samples are taken in the patient's room to get a sense of how many particles there are. The technician who takes the samples records if a patient (and visitor) is resident in the room at the time. Samples can sometimes be taken in the corridor, and we always find the corridor particle counts are higher. At the time, a sample was taken at the nurses' station. Particle counts are higher in areas that people frequent. There is no order of sampling. Outside air can be sampled first if convenient.

263. I have been asked by the Inquiry how likely it is that a nurses' station will have a number of nurses standing around it. Very likely. That is where they will do their admin functions and also acts as the central nursing hub of the wards.

264. I have been asked by the Inquiry why the nurses station was tested for particle counts when the high count results were not acted on. I cannot answer that question. I did not organise the sampling sites. But my view is there is no value testing particle counts in an area where there are a number of people present. Or if sampling needs to be done in such an area then persons present should be noted.

265. I have been asked by the Inquiry why the nurses' station was to be re-tested when portable HEPA filters were placed in the corridors. This was to see if the stand alone HEPA units reduced particle counts.

266. I have been asked by the Inquiry how I knew it was the nurses at the nurses' station and not a deficient ventilation system. The counts were very high and there were a number of staff present during the sampling period. We know that human activity can increase counts.

267. In the context of sampling for particle counts, activity would be numbers and movement of people within the sampling site.

268. There are no national standards for particle counts to confirm if air quality is acceptable or not. In GGC we have historically used particle counts of lower than a thousand to infer acceptable air quality.

269. I do not know why there are not national standard for particle counts. There is no guidance on particle count levels. One thousand particle count number comes from GGC experience. I would consider a “high count” to be over 10,000 thousand.

HEPA FILTERS

270. I have a very simple view on the effectiveness of portable HEPA filters, which is that they cannot do any harm and they might do some good. There are concerns about how they might disrupt airflow. A further consideration is are they big enough for the area you are going to use them in? Apart from the noise and inconvenience, I did not see any reason why they should not be used.

271. I have no experience of ventilation systems in hospitals and no experience of HEPA filters in hospitals.

HYPOTHESIS UPDATE

272. In this IMT, Annette Rankin referred to these being unique organisms in the QEUH. **(A36591643 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 83)** However, I do not agree with this description. There had been a look back at Yorkhill data and there was no change, so they were not unique. We had seen these organisms previously.

273. I have been asked by the Inquiry to what extent, if any, are these organisms considered unusual or very rare if I do not think they were unique. These organisms are unusual. In a ten year period between 2010 to 2019 in under 16 year old patients in GGC isolated from blood cultures there were 4 cases of *Achromobacter,* 3 cases of *Delftia acidovorans* and 43 cases of *Stenotrophomonas maltophilia*.

274. You may not see many of these organisms but when you look back you do see them being isolated in the Microbiology laboratories. In fact, you see them being isolated from other units. There were not many of these environmental organisms but we as microbiologists were aware of them.

275. We would expect a certain percentage of these immunosuppressed patients to have an infection during their treatment. That is one of the major clinical risks.

276. I have been asked by the Inquiry what percentage would I expect to see. As noted in the Case Note Review blood stream infections can occur in between 20 to 45% of patients in some series. See para 77.

277. There are only two places you can get an infection from: your own body, or the environment. I have already talked about the fact these patients had Hickman lines, which is a type of Central venous catheter. The patients would go home, and they could be exposed to an aquatic source at home. This was not a typical outbreak. It would not be usual practice to take a number of disparate organisms, which inhabit different ecological niches, display different transmission dynamics and group them all together and call this an outbreak. We would normally see one specific organism and we would investigate possible sources from which that organism could be coming from.

278. I used the term pseudo-outbreak in this IMT outwith its normal usage to try and highlight the broad outbreak definition being used and that all Gram-

negative organisms were defined as being potentially from an environmental source even though they were disparate organisms, which inhabit different ecological niches, and displayed different transmission dynamics. I could also not see any objective reason why some enteric organisms i.e. *Klebsiella* and *Enterobacter* were included into an environmental definition of the outbreak, whilst enteric organisms such as *E. coli* were not included. Thus, my initial view when joining as a member of the IMT was that the definition was too broad, not specific enough to be useful and therefore normal infections in this patient group would always fall within the outbreak definition and therefore perpetuate the outbreak.

279. A pseudo-outbreak in, the classic sense, is where a single organism is identified from microbiology samples, which do not match the clinical scenario, or are uncommonly isolated environmental organisms. This looks like an outbreak but the reality is that there is a contaminant that is being identified. There are many sources of contamination published in the literature which include clinical wipes, manufacturing contamination of sample collection bottles or swabs, fluids, and contamination within the laboratory.

280. I have been asked by the Inquiry how many infections would need to be present in this patient group before it could properly be called an outbreak. Outbreaks are usually defined as being caused by two infections from a single species of organism and if the outbreak occurs over a period of time genetically closely related progeny of that original single species organism. It is not usual to treat a range of different infections as an outbreak.

281. I used the term “pseudo outbreak” in an attempt to draw attention to the unusual and very broad outbreak definition used in this outbreak.

282. I have been asked by the Inquiry why I believed that it might possibly be the first described pseudo outbreak in the world. There is no literature that I am aware of that describes a similar situation. Most outbreaks in the literature are reported as single organism point source outbreaks. This may be as a result

of reporting bias where Journals will only publish outbreak reports that have clearly identified mitigations that curtailed the outbreak. The literature pertaining to this outbreak contains two reports by Inkster et al that are both single organism reports and which does not describe the entirety of the outbreak as defined by the IMTs, nor reflect the totality of the situation as recorded in IMTs. Both papers are single organism specific reports.

283. At that time, my view was that this was not a typical point source outbreak. It had all manner of Gram-negatives collectively considered, and that was because that was how this outbreak was being defined. If you look at this patient population and you look at national or unit specific surveillance data, you will get infections that involve a wide range of Gram-negative organisms. Overall, on a national basis there is a higher prevalence of Gram-negatives infections in this patient population than there were historically.

284. As regards these Gram-negative infections I am unclear how much of this was normal background infection that we would see in this patient group, if it was the result of a change of use of antibiotics, how much of it was the change in the global epidemiology of Gram-negatives that they had become more prevalent in causing infections, how much of it was the way the outbreak was defined and how much was a true result of environmental transmission.

285. I have also made comment in this IMT within the hypothesis update section about the new hypothesis related to biofilms. Biofilms are ubiquitous in water systems to a greater or lesser extent. My view on this would be that, with the range of organisms that were being isolated from patients, every single biofilm, and mix of organisms within that biofilm that could possibly exist, would have to exist in every single outlet within the hospital. It did not sound to me like it was biologically plausible that that was the case. However, I am not an expert on biofilms.

286. A biofilm is a thick layer of prokaryotic organisms that have aggregated to form a colony. The colony attaches to a surface with a slime layer which aids in protecting the microorganisms.

287. I have been asked by the Inquiry why it is not biologically plausible to have every single biofilm in every single outlet. My understanding is that biofilms usually inhabit the last 2 metres of pipework in a water system or areas where water can stagnate. The organisms that make up that biofilm are relatively stable. As a result there should be some consistency in the organisms being collected from samples from that outlet. You can see this in the *Stenotrophomonas* organisms collected from the outlets in the basement water tanks where genetically similar organisms are present over a period of months. Over time this population is replaced by another stable but genetically different population of *Stenotrophomonas.* On this basis you would expect a limited number of organisms coming through from an outlet.

288. We had a large number of organisms isolated from patients, and I felt that if that was the case then we were dealing with a range of different biofilms which were all different because we did not have any pattern. Biofilms are important. But I did not know how or to what extent they were important and if they explained all the findings. The hypothesis was not discounted at that point. We wanted to see if a root cause analysis would highlight any commonality that would be helpful in identifying a potential source(s).

289. Serious “contamination” of a water system would result in a range of biofilms.

290. I have been asked by the Inquiry how difficult it would be to prove the biofilm hypothesis. This would be difficult and destructive to prove requiring the removal of pipework, taps, and elements of the water system and subject them to specialist testing.

291. I have been asked by the Inquiry why it was not discounted as a theory. I believe because it would be difficult to disprove.

IMT MINUTE 25 OCTOBER 2019

INCIDENT UPDATE

292. At this IMT there were discussions about the complexity of considering patient pathways when carrying out the Root Cause Analysis, since patients are not in ward 6A for their entire stay. **(A37992819 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 85)** They have day passes out of the ward. It had to be recognised that we only had strict control of the environment when children were resident in GGC.

293. When patients were outwith that environment, we had no control over any potential exposure. The children would be exposed to the same organisms in domestic water systems or in public water systems as they would in 6A. They were still at risk, and they were still undergoing treatment. I do not know why it is called a new hypothesis in this IMT minute because it is clear to me that any aquatic environmental source at your home or in the hospital is a potential source of infection.

IMT MINUTE 5 NOVEMBER 2019

INCIDENT UPDATE

294. I have been asked by the Inquiry to Describe the IMT of 5 November 2019 **(A36591709 –IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 86)**. Emilia Crighton was the Chair. I was there as a Consultant Microbiologist. I presented the results of the WGS on *Enterobacters* as discussed previously. See para 181.

295. I have been asked by the Inquiry about a presentation I gave on sequencing results of Enterobacter blood stream infections from RHC. See report and para 181. **(A42401483 - Report by Professor Alistair Leanord and Doctor Derek Brown titled - Application of whole genome sequencing to identify**

relationships among isolates of Cupriavidus spp., Enterobacter spp., and Stenotrophomonas spp. isolated from clinical samples and from water and drainage associated sources within the healthcare environment. - Bundle 6 - Document 40) and supplementary statement **(A47848718).**

296. I discussed the sequencing results with Mr Derek Brown who did the sequencing and the analysis before my IMT presentation on 5 November 2019

297. I have been asked by the Inquiry why Enterobacter was chosen as the blood stream infection for the presentation, and why Stenotrophomonas was not chosen. See Reports in para 181

298. I have been asked by the Inquiry to what extent I would agree, if at all, that gram negatives are exogenous infections. I do not believe all Gram-negatives are exogenous. Many are endogenous such as the enteric bacteria *Enterobacter* and *Klebsiella*. Both *Enterobacter* and *Klebsiella* are members of the normal colonic flora in humans. As result of the treatment of these haematology/oncology patients there can be translocation of organisms through the intact, but compromised gut wall into the blood stream thus causing a blood stream infection. There are estimated to be 300-500 different bacterial species in the human gut at high concentrations of 10^{9-12} colony forming units/ml. WGS showed there was no genetic linkage between *Enterobacter* isolates and in my opinion they were more likely to be from an endogenous source. Most probably from the patients bowel flora. I also did not think that other predominantly enteric bacteria such as *Klebsiella* should be included as an environmental organism.

299. For example other Gram-negative organisms such as *Stenotrophomonas* and *Cupriavidus* are ubiquitous in nature and have a wide range of aquatic reservoirs. These are examples of exogenous organisms.

300. I have been asked by the Inquiry if I considered the blood stream infections from the RHC to be endogenous or exogenous. It is impossible to know precisely.

301. I have been asked by the Inquiry what my rationale for that view is. Some enteric organisms are capable of being transmitted in an aqueous environment. When this occurs the organisms are all either indistinguishable genetically or very closely linked if the outbreak occurs over a period of time.

302. The reports referenced at paragraph 181 show when the sequencing of several different organisms was carried out and the process for sequence analysis. These also show who worked with me, on the sequencing analysis. If anyone does this as a role and what roles they hold and what tools are used when carrying out sequencing analysis.

PATIENT REPORT

303. At this IMT we discussed that there had been no Gram-negative bloodstream infections since 1 October 2019. **(A36591709 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 86)**. Ward 6A has had a reduced clinical caseload and was not receiving any new diagnosed patients. We put in place a number of interventions to mitigate, and we do not know exactly which one works. For a five-week period we had not seen any new Gram-negative infections. I think there was a feeling that although it was early the mitigations we had put in place might be working.

304. I have been asked by the Inquiry what mitigations had been put in place. Chlorine dioxide dosing, Point of use filters on taps, a protocol for dealing with out of specification results from water samples.

HAND HYGENE AUDIT

305. During this IMT **(A36591709 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 86)**. Gillian Bowskill gave an update on hand hygiene and told the IMT there was going to be a better education programme for the parents, as their compliance with hand hygiene was poor. The staff were also having training. They had hand hygiene coordinators and lots of training and audits were done. I am aware there was something new introduced; however, Gillian Bowskill or Sandra Devine could speak in more detail about this.

306. I am certain that the hand hygiene coordinators were doing a lot of work with the parents. I know one of the senior charge nurses was doing an awful lot of ground-breaking work on line care. This included the protocols on how to look after lines which I think was the best in the world. This was over and above the normal procedures.

FURTHER INVESTIGATION REQUIRED

307. It was noted that discussion was to take place between myself and HPS regarding the genetic sequencing methodology. It was to look at what methodology we were using, because you can use different methodologies, but that never happened. It was written down, but it did not happen.

308. The methodology used for WGS is in the reports I reference at paragraph 181 as are the other methodologies that can be used.

309. I have been asked by the Inquiry why the discussion between myself and HPS never happened. This was never pursued by HPS.

310. This was partly because we are not funded to look for environmental organisms and in the Reference Laboratory we were transitioning a number of our phenotypic organism testing methodologies to whole genome sequencing

methods. It was also due to this outbreak finishing and we were not getting a range of environmental organisms coming through.

311. I have been asked by the Inquiry what I mean by “not funded to look for environmental organisms”. That the budget from NSD does not include costing to do sequencing work from environmental organisms. The Scottish Microbiology Reference Laboratory, Glasgow is funded by NSD to do microbiological work that supports Public Health outcomes.

312. I have been asked by the Inquiry which part of GGC microbiology service and labs would sample water, in particular looking for environmental organisms. The Environmental laboratory based in the Clinical Microbiology Department at Glasgow Royal Infirmary.

313. It all got caught up in another piece of work from genome sequencing that was being commissioned from NSD through HPS at that time. I think it was probably going to be wrapped up as part of that work, but we are still doing that work and it is taking us a lot longer than we thought. Work has continued but it is not stated in the IMT. NHS Assure has given us funding to do sequencing after the fact. So, it hasn’t disappeared, it is just taking a bit of time and has happened through a different mechanism.

314. National Services Division is a Department within National Services Scotland.

IMT MINUTE 11 NOVEMBER 2019

HYPOTHESIS UPDATE

315. There is a request at this IMT that a water leak in ward 6A should be included as a hypothesis. **(A37993248 – IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 87)** Water sampling was continuing at this point and there was discussion about how significant the leak was; whether it was a lot

of water, whether there was saturation in some of the framework behind the kitchen, the sink unit and what was being tested. There was a lot of water testing, and in fact, on 5 November 2019, there were embedded documents that were on the previous minutes, which were all test results of that sampling.

316. The water sampling was getting routinely reported back to the IMT and all the water testing was negative. I do not know what testing was done. It would be a big job to find out what samples were taken from that period from our datasets. Suffice to say, if it was added to the hypothesis, it did not stand the test of time. It was not biologically plausible that a water leak in a kitchen could cause what we were dealing with at the time. It's not unusual to get water leaks in buildings. They are reported by staff. Estates deal with them quickly, and you take water samples if required.

317. I have been asked by the Inquiry why it is not biologically plausible that a water leak in a kitchen could cause what I was dealing with at the time. I understood the extent of the water leak was minor and according to Estates there was no sign of mould and the leak was dealt with as soon as it was reported.

318. I have been asked by the Inquiry why Laura Imrie would have requested it be included in possible hypothesis if it was not a plausible cause. I think Laura Imrie may be better placed to answer this question.

319. I have been asked by the Inquiry how concerned I was on hearing there was a further positive blood culture for gram negative bacteria in a Ward 6A patient? I was concerned that there was the potential for ongoing infection within the ward.

CASE DEFINITION REVIEW

320. At this IMT, **(A37993248 – 11.11.2019 IMT Gram Negative Blood Ward 6A – Bundle 1, Document 87)** Annette Rankin raised concerns that the case definition had been updated to exclude the *Enterobacter cloacae* cases as endogenous, based on the outcome of the WGS investigation.

321. I have been asked by the Inquiry why Annette Rankin was concerned about the new case definition excluding Enterobacter cases as endogenous. I think Annette Rankin would be best placed to answer this question.

322. I have been asked by the Inquiry what my reaction was to Annette Rankins concerns. I did not agree with her. I felt the WGS evidence was sufficient to remove *Enterobacter* from the case definition. See para 146.

323. I have been asked by the Inquiry what other blood steam infections were tested using WGS. During the period of the IMTs only *Enterobacter* were sequenced. However we sequenced *Stenotrophomonas* and *Curpriavidus* species later. See report **(A42401483 - Report by Professor Alistair Leanord and Doctor Derek Brown titled - Application of whole genome sequencing to identify relationships among isolates of Cupriavidus spp., Enterobacter spp., and Stenotrophomonas spp. isolated from clinical samples and from water and drainage associated sources within the healthcare environment. - Bundle 6 - Document 40)** and supplementary statement **(A47848718).**

324. A definition is what you make it. If you put a mixture of every Gram-negative organism into a basket, as your definition, that then defines the outbreak. I believed there was good scientific evidence that there was no linkage between the *Enterobacters* that we sequenced from clinical cases. All these clinical *Enterobacter* organisms were genetically very distinct. There were very few environmental isolates we could sequence, thus making direct comparisons difficult. However, the WGS did show, in my opinion, that there

was no point source outbreak for *Enterobacter* infections, and that the very wide genetic diversity in the WGS results meant that on the balance of probability they were more likely to have arisen from the patient's own bowel flora than from an environmental source.

325. Annette Rankin is absolutely right; her definition of the outbreak was all Gram-negative organisms. That would include organisms that would be normal organisms from your gut such as *E. coli*, *Enterobacter* species and *Klebsiella* species. I felt that we could exclude *Enterobacter* because there was no common source, or they were genetically distinct, and we could differentiate between them. I did not understand why some enteric organisms such as *E. coli* were excluded from the definition but other normally enteric organisms such as *Klebsiella* and *Enterobacter* species were classed as environmental for the purpose of the outbreak definition.

326. I have been asked by the Inquiry to what extent, if any, would a wider approach advocated for by Annette, encompassing all gram negative bacteria have been better for patient safety. I don't believe it would. The wider the definition would mean there are more false positive infections that would be attributed as part of the outbreak that were not related to the outbreak.

327. Annette Rankin felt that because it was defined as all Gram-negatives and they were Gram-negatives, they should still be included within the outbreak as defined by the IMT, which does not make scientific sense to me. I come from a scientific driven perspective, Annette Rankin came from a definition perspective. I felt that the WGS data did not support that definition and new evidence was not being used to refine the outbreak definition.

328. I have been asked by the Inquiry why Annette's position on gram negatives did not make scientific sense to me. This was because there was WGS data showing that the *Enterobacter* were all distinguishable. See **(A42401483 - Report by Professor Alistair Leanord and Doctor Derek Brown titled - Application of whole genome sequencing to identify relationships**

among isolates of Cupriavidus spp., Enterobacter spp., and Stenotrophomonas spp. isolated from clinical samples and from water and drainage associated sources within the healthcare environment. - Bundle 6 - Document 40) and supplementary statement **(A47848718).**

329. I have been asked by the Inquiry what I mean by I "come from a scientific driven perspective" and Annette comes from a "definition" perspective. Annette has an epidemiological background and I have a scientific background. My understanding is that epidemiologists like to keep definitions as constant as possible to be able to identify trends over time.

330. I have been asked by the Inquiry to what extent, if any, could these sides be applied to the clinicians. There was no obvious delineation in opinion as a result of speciality that I was aware of.

331. I have been asked by the Inquiry how many clinicians at the IMTs were on the data driven side. I do not know.

332. I have been asked by the Inquiry what I meant when I said that I "felt that WGS data did not support that definition and new evidence was not being used to refine outbreak definition". My view was that the WGS data showed that there was no genetic linkage with *Enterobacters* and that they should be removed as part of the outbreak definition and there was no evidence that they were linked.

RISK MANAGEMENT/CONTROL MEASURES

333. There was some discussion at this IMT **(A37993248 – 11.11.2019 IMT Gram Negative Blood Ward 6A – Bundle 1 - Document 87)** about the use of hydrogen peroxide vapour (HPV) cleans being carried out on top of the clean already being carried out after each patient was discharged from 6A. HPV had been used before in several outbreaks. It was a discussion about whether it

was going to help. It is very disruptive, and it is toxic. You must move the patients out of their rooms. Therefore, there always has to be free rooms or half the ward has to be decanted.

334. I do not know exactly how toxic HPV is but it cannot be used where patients are situated or by operators without protection as it is an irritant of mucous membranes i.e. eyes, respiratory tract.

335. There are several issues with it. It is helpful in some scenarios but my thinking at the time was that I did not think it would be helpful in this situation. I think the IMT committee decided not to do it at the time and to await events. HPV would have no effect on any of those hypotheses. This must have been accepted because we agreed not to do it. It was one of those things that was not discounted but it was felt it was not needed at that time. I do not recollect it happening at any time.

336. I have been asked by the Inquiry why HPV would have had no effect on any of the hypotheses, or why HPV was not needed at that time. HPV would not be capable of entering the water system where the hypothesis stated that the infections were coming from. It would have also been disruptive to the functioning of the ward and the number of patients the ward could hold at any one time due to the necessity of decanting patients whilst HPV fogging was undertaken.

IMT MINUTES 14 NOVEMBER 2019

INCIDENT UPDATE

337. The IMT notes that the final report from HPS has been received, which states there is no evidence from the data to continue restrictions to admissions. **(A37993497 – IMT Gram Negative Blood Ward 6A – Bundle 1 -Document**

88) My view was this was positive. HPS were there to support the Board and the IMT, so to get that opinion was very important and helpful.

338. HPS supports the board as it has a range of skills and experience that complements the experience and skill of the personnel within the Board.

339. We also discussed the SBAR that had been drafted to allow us to plan for the re-opening of Ward 6A. **(A38694861 – SBAR dated 14 November 2019 – ward 6A – Gram Negative Bacteria – Bundle 4 - Document 48)** Dr Murphy expressed concern that the source of infections had still not been found. Dr Crighton advised that the new Nurse Director during the meeting with the Chief Nurse (CNO) shared HPS' view that sometimes a source cannot be identified.

340. New lines of enquiry were not proposed to identify the source of infections at this stage.

341. Several things can happen in an outbreak, and sometimes you do not find the source. You implement a multitude of interventions all at the same time because you do not have the luxury of time to implement them separately in a step wise fashion to see which one has an effect. Controlling an outbreak is not an experiment. You cannot change one thing and then see if there was an effect and then if there is no effect, change another individual thing to see if that has an effect. So you do everything all at once. All the appropriate interventions happen as closely, and as quickly as you possibly can make them happen, such as prophylaxis, changing practices, changing areas, testing, cleaning audits.

342. There could be several reasons why you might not find the source. Either the hypothesis could be wrong, it could not be linked with the area, or the hypothesis could be right, for example, as previously mentioned, the patients had intravenous catheters and were going home, where they could have been exposed to an aquatic environment from domestic sources or from other

aquatic sources. It still means that the environment is a source of infection, but just not the hospital environment.

343. In its widest term, the environment always must be suspect. This is why we did the sequencing. We have this tool, so if we see future infections, we will be able to sequence those organisms and drop them in to an epidemiological context so that we can try and understand if transmission has been occurring.

344. And you keep any mitigations you have put in in place. If you withdraw them, it should be done slowly, one by one in a measured way while you are still monitoring, so you can see if there has been any difference. That is a professional and scientific way of doing things. At this stage no mitigations were withdrawn.

345. The future process for investigating Gram-negative infections was also discussed at this IMT and it was agreed that there would be a Root Cause Analysis (RCA) for each new case. There had been a previous RCA, which showed that there were two risk factors. One was the Hickman lines, and I cannot recall the other one. With root cause analysis, you are really trying to see if there are any common risk factors. If you for instance have had new cases, have they, for example, all gone through a particular theatre, had a particular line put in? It then gives you an immediate and specific focus to look at for any initial mitigations.

346. Some of the risks found with root cause analysis are central parts of patient treatment in this patient group – they are all immunosuppressed and they have all got lines. A Clinician is also required to be part of the team that performs the RCA. That is important, because then the Clinician can describe how at risk the patient was and also how significant the infection was, or if it is thought to be a contaminant for instance. A RCA is a tool that allows you to make immediate assessments of whether there are concerns or not.

347. We also discussed the Systems Process Control (SPC) charts that were included in the HPS report, and it was confirmed those would be continued by the GGC IPCT surveillance team. They are a standard tool produced by the infection control team. We have SPC charts for C. difficile, MRSA, Gram-negatives, environmental Gram-negatives, and we have also collected Gram-negative and environmental Gram-negatives into the same plot. Epidemiologically, within the UK and globally, Gram-negatives are now the predominant organism in this patient group and overtook Gram-positives several years ago. SPC is a quality tool that is used in industry, and it is used to show if quality is poor. It allows you to monitor trends in a variable system.

IMT MEETING - 10 DECEMBER 2019

(A38172486 – 10.12.19 IMT Meeting Minutes – Ward 1D PICU – Gram Negative – Bundle 27 – Volume 9 - Document 9)

348. The three incidents all occurred in the Paediatric Intensive Care Unit (PICU) RHC. Theatre 8 was implicated in the transmission of cases 1 and 2 because the patients had been in there, and there was a concern that transmission of organisms could have occurred in the theatre as a result.

349. The hypothesis for the serratia case was possible water transmission, because the water as a source could not be ruled out. Serratia was also in the NIPCM as an alert environmental organism.

350. New actions taken forward from this IMT are, as per the IMT minutes:

"New actions from IMT:

a) Weekly Safe Patient Environment audits.

b) Routine weekly swabbing of POUF's, drains and CHWB's over a 4 week period commenced this week.

c) Routine weekly water sampling will be carried out over a 4 week period checking for all Gram negatives. Monthly water sampling will check for any Mycobacterium.

d) All drains will continue to have weekly Hysan dosing.

e) P Joannidis will share the PPVL room document to the IMT.

f) The IC Data team have produced a SPC chart for all Gram negatives in PICU, details of occupied bed days to be supplied.

g) Trigger will be 2 Gram negative isolates in a 30 day period or 2 HAI in a 2 week period.

h) RCA will be completed for any new blood cultures.

i) As requested by the Scottish Government there will be a retrospective look back for a period of 6 months and RCA completed for the 2 cases in the time period."

351. I have been asked by the Inquiry what "Hysan dosing" is. Hysan is a chlorine based disinfectant. Dosing refers to pouring Hysan into the drains and leaving it for 10-15 minutes in an attempt to eradicate resident organisms.

352. Routine weekly water sampling was started for all gram negatives to test the hypothesis that these infections were attributable to organisms in the water.

NICU MEETING MINUTES 27 DECEMBER 2019

(A41890001 – NICU Meeting Minutes dated 27 December 2019 – Bundle 27 – Volume 10 – Document 26)

353. My role during the NICU meeting on 27 December 2019 was Lead ICD.

354. I decided not to undertake any environmental sampling because the yield from environmental sampling is usually very low, if anything at all. The rooms were to be terminally cleaned and sampling results would not inform doing anything differently. Three cases would not be sufficient for environmental sampling to be undertaken.

AICC MINUTES – 14 JANUARY 2020

(A32180724 – Minutes – AICC Meeting – 14 January 2020 – Bundle 13 - Document 24)

355. The Inquiry asked why I requested some central guidance on sampling drains and when it is the be carried out from HPS and the Scottish Government. This was a topic that was repeatedly coming up at IMTs. There is no guidance in the NIPCM about how to sample and what thresholds for levels of bacteria would be “out of specification”. This made interpreting the results of drain sampling meaningless. Organisms will always be found within drains. I did not receive a response from HMS or the Scottish Government.

AICC MINUTES – 4 AUGUST 2020

(A32700337 – Minutes – AICC Meeting – 04 August 2020 – Bundle 13 - Document 25)

356. The Inquiry asks why I was waiting for guidance about sampling of drains. This was a topic that was repeatedly coming up at IMTs. There is not guidance in NIPCM about how to sample and what thresholds for levels of bacteria would be “out of specification”. This made interpreting the results of drain sampling impossible.

357. I did not know who in HPS would provide the response about sampling of drains.

358. I was not involved in the upgrade works in Ward 2A of the RHC in or around August 2020 that I can remember. I was involved in discussion with the Capital Estates team about drain traps for shower trays in 2A and about the ventilation requirements (separate ventilation system from the ward ventilation in 2A) for the Scottish Paediatric Molecular Radiotherapy Service ("SMaRT Kids") [atiend room in 2A. This room has a separate ventilation system from the rest of the 2A ward. I cannot recall the dates however.

359. My understanding about why these upgrade works were being undertaken at this time was this was part of a capital program to rectify defects within the water and ventilation systems in 2A.

360. The Inquiry asked me what "out of specs" means in the context of water sampling. It means that the test results fall out with the parameters set by GGC such that the water would be deemed a "fail". In the absence of any recognised guidance for threshold levels that would be considered out of specification, GGC developed and measured against its own internal thresholds.

361. The Inquiry asks me what "retrograde contamination" is. My response can be seen in paragraph 83.

362. The agreed protocol, simply put involved flushing the outlet, retesting the outlet, removing the outlet from use until 3 negative samples had been returned. This is an Estates protocol dealing with what to do if an outlet returned growth from water samples taken from it. Mr Kerr Clarkson Estates can give the exact protocol. I had no input into the agreed protocol about Ward 6A.

363. Re-flushing is running an outlet for a prescribed time.

364. The filters on the water outlets were changed at regular intervals stipulated by the manufacturer.

365. The Inquiry asked me what extent would a total viable count of 37 in a room cause any concerns. As a single test it would require the outlet to be flushed and retested. Which is what occurred.

BICC MINUTES – 11 AUGUST 2020

367. I have no recollection of discussions Sandra Devine and I had with Tom Steele about infection control in or around August 2020. **(A32700321 – Minutes – BICC Meeting – 11 August 2020 – Bundle 13 – Document 62)**

CRYPTOCOCCUS

GENERAL:

368. Cryptococcus belongs to Basidiomycetous yeast (group of higher fungi that have septate hyphae and spores borne on a basidium) with 2 species complexes, Cryptococcus neoformans and C. gattii.

a) *C. neoformans:* has a worldwide distribution, is ubiquitous in the environment, having a number of environmental reservoirs; pigeon droppings, decaying matter of soil. Positive soil samples for *C. neoformans* can be found in areas frequented by pigeons, chickens, turkeys, or occasionally other avian species. The organism has been recovered from the guano bird species including canaries, parrots, munia birds, and budgerigars. It can also be isolated from trees.

b) Environmental reservoirs of *C. gatti*: are trees. It has not been isolated from bird guano.

369. Further information regarding Cryptococcus is in the report from the Expert Advisory Sub-Group. **(A39235063 – Report prepared by Cryptococcus IMT Expert Advisory Sub-Group dated 5 April 2022 - Bundle 6 – Document 39**).

370. The most common manifestations of Cryptococcal infections in humans are Pulmonary cryptococcosis, Cutaneouscryptococcosis and Cryptococcal meningitis. However, any system of the body can be affected.

371. Further information regarding Cryptococcus is in the report from the Cryptococcus IMT Expert Advisory Sub-Group. Cryptococcus is not a common infection.

372. Infections mainly occur in immunosuppressed individuals: HIV infection with CD4 <200uL, immunosuppressive therapy or solid organ transplantation, innate immune deficits, patients with advanced renal or liver disease, diabetes, rheumatological diseases and sarcoidosis. There have been cases reported in apparently immunocompetent individuals.

373. Further information regarding Cryptococcus is in the report from the Cryptococcus IMT Expert Advisory Sub-Group.

374. I was asked how common it is to see cases of Cryptococcus in children. This question is best answered by reference to the Cryptococcus IMT Expert Advisory Sub-Group.

375. I was asked by the Inquiry what my experience of Cryptococcus was in a healthcare setting prior to the QEUH/RHC. I had seen a handful of cases whilst working at the Southern General Hospital/QEUH as part of interaction

with the Neurosciences Institute. Between 2015 to date, I know of two cryptococcus infections at QEUH/RHC.

CRYPTOCOCCUS 2018:

376. The Inquiry states they are aware that there were Cryptococcus infections in QEUH/RHC in 2018. I did not have any understanding of Cryptococcus infections at QEUH/RHC in 2018/2019. I was not involved.

CRYPTOCOCCUS IMT 2 JULY 2020:

(A41890578 – 02.07.2020 IMT MINUTES WARD 6A - BUNDLE 1 - DOCUMENT 94)

377. I Chaired the IMT on 2 July 2020. The issue was that a routine Cryptococcus antigen screen was carried out on the patient as a result of a temperature on the [redacted] June and reported as positive. My clinical area of responsibility as an ICD was in RHC. An ICD would be expected to Chair an IMT.

378. I first became aware of the issue when I attended the video meeting on Tuesday 30th June 2020 Convened by Chief of Medicine Women & Children Directorate following an IC Alert on 29th June 2020. This meeting agreed that an IMT would be convened, and an IMT was called to properly discuss and investigate the case.

379. From 04 April 2020 to 08 October 2020, 18 Cryptococcus tests were performed. The results below have been collected from the Microbiology LIMS system (Telepath).

Date	Lab No	Sample	Tpath list number	CrAg GGC result	Ref Lab result
[redacted]20	[redacted]	Blood	75	Negative	
[redacted]20	[redacted]	Blood	61		Positive (NEAT)
[redacted]20	[redacted]	Blood	60	Negative	Positive (NEAT)
[redacted]20	[redacted]	Blood	57		Positive (NEAT specimen) Positive by lateral flow device only
[redacted]20	[redacted]	Blood	58	Positive (Titration Negative <1:5 x2) Lab comment positive sample on direct testing	
[redacted]20	[redacted]	CSF	50	WCC<5 RBC<5 No organisms seen	
[redacted]20	[redacted]	CSF	52	Negative	Negative
[redacted]20	[redacted]	Blood	45	Positive Titration <1/5	Positive (NEAT)
[redacted]20	[redacted]	Blood	46		Positive (NEAT specimen) Positive by lateral flow device only
[redacted]20	[redacted]	Blood	35	Positive <1:5 (Titration Negative <1:5)	Positive (NEAT specimen) Positive by lateral flow device only
[redacted]20	[redacted]	Blood	31	Positive <1:5 Original report on 03.08.20	

				Negative Amended to Positive on 04.08.20	
[redacted]20	[redacted]	Blood	28		Performed by MicroPathology Warwick Cryptococcus neoformans DNA- not detected
[redacted].20	[redacted]	Blood	27	Positive <1:5 (Titration Negative <1:5)	
[redacted]20	[redacted]	Blood	24	Negative <1:5 Weak positive discussed with CP and amended to negative	Negative
[redacted]20	[redacted]	Blood	21	Negative	Negative
[redacted].20	[redacted]	Blood	20	Negative	
[redacted].20	[redacted]	Blood	19	Negative	
[redacted].20	[redacted]	Blood	18	Negative	

380. Please see email from Professor Elizabeth Johnston, Director, PHE Mycology Reference Laboratory, to Kathleen Harvey-Wood and others dated 7 July 2020 in which Professor Johnston says, “I do not think based on this evidence that a full scale look for environmental sources is warranted at this stage. I cannot be definitive that these represent false positives, although it is likely

and they are less than proof of infection." **(A49751664 – Email re lab results – 13 July 2020 - Bundle 20 – Document 98, page 2095)**

381. The patient's test results for cryptococcus can be seen in the table above.

382. Further investigations into this matter were that John Hood would inspect the plant rooms. These showed they were "clean with no evidence of pigeon ingress or pigeon fouling"; email from John Hood **(A48305542 – Email from J Hood to S Devine – Inspection of Level 12 plant rooms 3 July 2020 – Bundle 27 – Volume 8 - Document 59)**

383. Other actions were to await results from Mycology Reference Lab, the Clinical team will provide an update for ward staff. There was to be no change to current antifungal prophylaxis regime. IMT will reconvene when results from Bristol are available.

384. I had no concerns with how matters were dealt with, and I am not aware of any issues with communication between colleagues that arose as a result of this incident.

385. In the IMT of 2 July 2020 **(A41890578 – 02.07.2020 IMT minutes Ward 6A – Bundle 1 - Document 94)** Dr Murphy stated that 'there is no clinical evidence of Cryptococcus but the patient is being treated as if they have this'. This was Dr Murphy's clinical judgement. I had no reason to question it. It is in line with my opinion that there was no microbiological evidence of invasive Cryptococcal infection. It would be a sensible precaution to start antifungal treatment while awaiting the results of further diagnostic tests.

386. In the IMT of 2 July 2020 I stated that 'there were 3 serum samples from lateral flow test using neat serum. All three were negative by latex agglutination'. The relevance of all three being negative was that samples had been tested using neat serum i.e. directly. The antigen released by Cryptococcus as the result of an infection can be at a very high level. To find

the level of antigenaemia the neat serum is diluted in a stepwise fashion to find the highest dilution at which it is still reactive. After dilution to 1:5 these samples were negative. This means that the antigen levels were low. In the context of the clinical picture as described by Dr Murphy these results could reflect an early infection or were possible false positives.

387. The Inquiry asked me why samples were sent to Professor Elizabeth Johnston, Director, Mycology Reference Laboratory, Public Health England at Bristol for further testing to decide if there is any increase in positivity over time. This is because levels of antigen can rise and fall over time. Samples were sent to Bristol to check and confirm the initial results. This would be normal practice for a cryptococcal infection.

388. Sending samples to Reference laboratories is done by the on-site Microbiologists as a routine. I had no involvement in sending these samples. Results from the laboratory in Bristol are received by post, with the results scanned into the Laboratory results system as a scanned copy of the report which is attached to the original sample record in Telepath. Results of the sample testing can be seen in the table above.

389. The Mycology Reference laboratory reported the result as Positive (NEAT specimen) Positive by lateral flow device only. As per the email from Liz Johnson the lab were unable to titre the antigen and they found faint and very faint banding at 1:2 and 1:4 dilutions respectively. Both above the 1:5 dilution where the test in GGC was negative.

390. In the IMT of 2nd July 2020 the hypothesis is noted as follows:

a) Environmental – community or hospital
b) Testing – false positive
c) Activation of previous latent infection

i) All Cryptococcus ultimately comes from the environment as it has wide environmental reservoirs. The spores are normally inhaled and it is almost certain that this event is universal. In an immunocompetent individual spores will reside in latent form within macrophages within the lung. In an immunosuppressed individual an antigenaemia likely occurs as a result of reactivation rather than new infection through exposure to the fungus in the environment (Wake 2023) **(A49404293 – Wake RM et al "Cryptococcal Antigenemia in Advanced Human Immunodeficiency Virus Disease: Pathophysiology, Epidemiology, and Clinical Implications", Clin Infect Dis. [2023 Feb] 18;76(4):764-770 – Bundle 27 – Volume 8 - Document 60**). The hypothesis this was from the environment was reasonable.

ii) The information given to the IMT was that there was no signs of clinical infection, the antigen titre was low and positivity was seen on neat serum only, there was advice from Dr Johnson from the Mycology Laboratory was "I cannot be definitive that these represent false positives, although it is likely and they are less than proof of infection" and that literature shows there can be a high level of false positives using the CrAg. In my opinion I believe the hypothesis this was a false positive reaction was reasonable.

iii) All Cryptococcal infection is a reactivation of latent infection. This hypothesis is a reasonable hypothesis. However, this describes the aetiology of a natural infection with Cryptococcus.

391. At the time of the case there was no positive finding to implicate the hospital as a source. Plant room inspections had shown them to be clean with no pigeon fouling or ingress or with recent filter changes.

392. In my opinion I believe the Cryptococcal antigen test results were a false positive reaction

393. I checked the antigen test rates over the last two years, out of 376 the majority being negative. The tests were all looked at from GGC. 6 tests from 3 patients

were positive. I did not give an exact number to the IMT as I did not think it was necessary to inform our thinking on this particular case. I had already stated the majority were negative which I felt described the situation with initial CrAg lateral flow testing.

394. In the IMT of 2 July 2020 I advised that fungal air counts were analysed: The Inquiry asked what the significance was, if any, of my comments on fungal air counts: “As expected the Beatson had zero counts in 79% of samples, which is pretty good. In Ward 4B the counts were not as good with zero counts of 62% of samples. Ward 4C drops to 40% of samples and Ward 6A dropping to 20% of samples with zero counts.” This is a reflection of the air quality as a result of the filtering system within those ward areas.

395. QEUH had higher rates than the Beatson because there is no HEPA (H12) filtration in some of the areas in QEUH/RHC. Personnel in Estates will be best able to confirm this.

396. I took no further actions to investigate these findings following the IMT. Air sampling that had been done previously were being looked at by Dr Hood as part of the Cryptococcal sub group work.

397. The Inquiry asked me to what extent were higher rates of fungal air counts at QEUH/RHC linked to non-compliant rooms and wards with SHTM ventilation guidance. I think the ventilation Engineers in Estates are better placed to answer this question.

398. I do not know how the use of chilled beams impacted the ward and room air fungal particle counts at QEUH/RHC.

399. The Inquiry asked me how the lack of HEPA filtration impacted ward and room air fungal particle counts at QEUH/RHC. At its simplest HEPA removes particles (including fungal spores) as a result of filtration and the expectation

would be that lack of HEPA filtration would mean that particles (including spores) would be raised.

400. I do not know to what extent air permeability impacted the fungal air particle counts. I did not have any concerns about the rooms in QEUH/RHC.

401. I am not aware of any negative air pressure rooms in the Ward housing the patient.

402. Higher counts of fungal air particles at the QEUH/RHC would mean that there was higher exposure to particles (which can include fungal spores) and this would be a possible risk to immunosuppressed patients.

403. I have been asked by the Inquiry how the higher rates of fungal air counts at QEUH/RHC contribute, if at all, to the patient Cryptococcus infection in 2020. I do not believe it did. Cryptococcal infection is thought to be reactivation of previously inhaled spores that are latent within the body. As previously stated there was no clinical or microbiological evidence of infection as confirmed by the Mycology Reference Laboratory in Bristol. See email above.

404. I stated further in the IMT that ‘if a patient has not got prior Cryptococcus infection that there is a 30% false positivity rate using lateral flow antigen testing’.

405. I have been asked by the Inquiry how lack of prior Cryptococcal infection impacts the antigen testing. Prior Cryptococcal infection was defined in the Dubbels paper as people who were being tested with Cryptococcal antigen test as a requirement for monitoring treatment progression. That is they had already been diagnosed as having an invasive cryptococcal infection. This was not the case in this case. This was a first time diagnosis and therefore prior does not apply. All tests have sensitivity (false negative) and specificity (false positive) limitations. As Dubbels paper shows the false positivity rate was 34% for first time low level (1:2 to 1:5) Cryptococcal antigen levels.

406. Prior Cryptococcal infection was defined in the Dubbels paper as people who were being tested with Cryptococcal antigen test as a requirement for monitoring treatment progression. This was not the case with this patient. This was a first time result.

407. Other testing carried out on the patient was microbiological testing for Aspergillus, blood cultures, faeces, skin swabs, throat swabs, urine samples totalling 65 samples for the period from admission at 21.06.20 to 26.03.21. Numerous blood results would have been taken. A listing of all tests from haematology and biochemistry with the results attached could be a substantial body of data and may not provide insight without reference to the clinical condition of the patient at those points in time.

408. The paper by Dubbels **(A49404310 – Low Cryptococcus Antigen Titers as Determined by Lateral Flow Assay Should Be Interpreted Cautiously in Patients without Prior Diagnosis of Cryptococcal Infection Dubbels M. et al 2017Dubbels 2017 – Bundle 27 – Volume 9 – Document 3)** is the evidential basis for the 30% false positivity rate using lateral flow antigen testing that I stated at the IMT on 02 July 2020 **(A41890578 – IMT minutes Ward 6A –– Bundle 1 - Document 94)**.

409. I had no further involvement after the IMT closed.

410. I have been asked by the Inquiry why the conclusion was reached that the further case of cryptococcus was a false positive result.
Two hypothesis were considered as per my email of 8 July 2020 **(A47946639 – Email chain – Bundle 19 – Document 60)**

1. An early clinical infection that has been ameliorated by antifungals
As can be seen in the table below the CRP was decreasing for several days before the antifungal fluconazole was started. When the antifungal fluconazole was started the CRP was 15. This level of CRP does not indicate a serious invasive infection. On this basis I do not think the antifungal played any role in

the clinical recovery as the recovery from a peak CRP level on the 25.06.20 had been underway for 4 days prior to receiving antifungal treatment on the 29.06.20. The CRP is normalised by the 01.07.20.

2. A false positive result in a case with no clinical indicators of Cryptococcus infection.

At the time of the IMT the patient was showing no signs of cryptococcal infection and had a very low cryptococcal antigenaemia that was felt by the Dr Johnson at the Mycology Reference laboratory to be "less than proof of infection". There is evidence that false positives in this situation can be as high as 34% (Dubbels 2017). In an invasive infection, antigenaemia would be much greater that seen in this case. The patient was started on antibiotics and had been on meropenem and teicoplanin. The C-reactive protein (CRP) which is a non-specific marker for infection was being monitored from the 21.06.20 - 05.07.20. See table below. The results below have been collected from the Biochemistry LIMS system (Telepath).

A normal CRP is < 5mg/l.

Date	CRP	Comment
21.06.20	35	Admission + antibiotics
22.06.20	58	
23.06.20	111	
24.06.20	89	
25.06.20	118	
26.06.20	75	1st CrAg test
26.06.20	70	
27.06.20	76	
28.06.20	34	
29.06.20	15	Fluconazole started
30.06.20	7	
01.07.20	5	
02.07.20	4	Date of IMT

03.07.20	3	
04.07.20	2	
05.07.20	2	

411. As can be seen the CRP was decreasing for several days before the antifungal fluconazole was started. On this basis I do not think the antifungal played any role in the clinical recovery as the recovery from a peak on the 25.06.20 had been underway for 4 days prior to receiving antifungal treatment on the 29.06.20. In my opinion the patient did have an infection that was effectively treated with antibiotics given on admission.

412. Taken together it is my opinion that the Cryptococcal antigen test results were false positive reactions.

413. There were 18 tests for Cryptococcus at that time from this patient. The CrAg test becomes negative on 24.08.20 and this is confirmed by Bristol on a sample taken on 01.09.20.

414. This is not in the IMT minutes which is a summation of discussions that took place during the IMT meeting on the day. This information would not be known at that stage.

415. HIIORTs were sent to HPS on the 02.07.20 and 09.07.20.

416. I had no concerns at the time that the minutes of the IMT of 2 July 2020 **(A41890578 – IMT minutes Ward 6A - Bundle 1 – Document 94)** were an accurate summation of the meeting discussion. As Chair I would have seen and approved the draft minutes.

417. My name was not listed as being in attendance at the Cryptococcus Sub-Group Meetings following the IMT of 2nd July 2020 as I was not a member of the Group and had no communication with them. I attach no significance to me not being on the group. We were coming out the first wave of Covid at the

time and as Lead ICD for GGC there were other competing priorities on my time.

418. I have been asked by the Inquiry if I read Dr John Hood's report for the Cryptococcus Incident Management Team Expert Advisory Sub-Group final draft dated 5 April 2022 **(A39235063 –Report prepared by Cryptococcus IMT Expert Advisory Sub-Group dated 5 April 2022 - Bundle 6 - Document 39)**. I read a draft report dated September 2020. It is Microsoft dated in my files as 10th September 2020. I assume I read it at or close to this date. I noted the theory that Cryptococcal infections resulting from deficiencies in the building as a result of pigeons was unlikely.

419. I was satisfied with the management of the Cryptococcus incident in 2020 by NHSGCC.

420. I am aware of 2 cases that have been published in the literature regarding Cryptococcus infections in QEUH/RHC between 2015 to date. Please see **(A47709447 – Farrer, Inkster et al, 'Genomic epidemiology of a Cryptococcus neoformans case cluster in Glasgow, Scotland, 2018' (2021) 7(3) Microbial Genomics 1 - 01 March 2021 - Bundle 19 – Document 47)**

AICC MINUTES – 30 SEPTEMBER 2020

(A32700549 – Minutes – AICC Meeting – 30 September 2020 - Bundle 13 - Document 26)

421. Filtration units were being changed in relation to flushing water as estates were increasing the backwash chlorine dioxide level of the 3 filtration units in the Basement Tank Room.

422. I cannot recall what Sandra Devine said about the specialist ventilation group.

423. To my knowledge Dr John Hood prepared the draft cryptococcus report. I noted the theory that Cryptococcal infections resulting from deficiencies in the building as a result of pigeons or their guano was unlikely.

424. I cannot specifically remember what was discussed at the meeting in relation to the draft cryptococcus report.

RISK ASSESSMENTS WARD 4C

425. I was not involved with the risk assessments in 2020 that were carried out in respect of Ward 4C and so cannot comment on them.

426. In 2021 Risk Assessments were carried out in respect of Ward 4C in order to actively assess the 'risk associated with the exposure to airborne pathogens from ventilation systems, for immune compromised patients'. I looked at the Particle count data and the Fan validation data, and was a signatory to the Risk Assessment. I took no further specific action following the Risk Assessment. This Risk Assessment was dealt with via Estates.

427. I agree with this assessment. Air quality is one of the mitigations that keep patients safe. Other mitigations are use of respiratory protective equipment, prophylaxis, cleaning, precautions such as single rooms and closed doors, visitor access, and restricting staff and visitor access whilst they are ill.

428. I have been asked by the Inquiry if any further action should have been taken. I am not an engineer but I believe only a complete retro fitting of the ventilation system, its air handling units and subsequent air locks, door sealing, monitoring systems would have been required. This would have removed the clinical function of the Unit for potentially several years even if it was possible. Therefore a cohort of patients with treatable disease would not

have been able to be treated. A complete retrofitting of the ventilation system would have reduced any adverse risk.

429. I am unaware of any risk assessments occurring for Wards 6A or 4B. and so I cannot comment on them.

430. I have been asked by the Inquiry why upgrade works being carried out in Ward 2A at RHC were not carried out in the adult hospital Ward 4C. I am not an engineer but I believe only a complete retro fitting of the ventilation system, its air handling units and subsequent air locks, door sealing, and monitoring systems would have been required. This would have removed the clinical function of the Unit for potentially several years even if it was possible.

431. I have been asked by the Inquiry to what extent the upgrade works carried out to Ward 2A resulted in a higher level of protection to patients from risk to infection, than that offered in Ward 4C, both at the time and now. Ward 2A currently meets ventilation standards whilst 4C does not as laid out in SHTM03-01 but has the mitigating factors as laid out in the 4C Risk Assessment of:

1. NICE guidelines (2016) recommending the use of single rooms for accommodating high-risk patients, **(A36871036 – National Institute for Health and Care Excellence – Haematological cancers: improving outcomes – NICE guideline – 25 May 2016 - Bundle 27 – Volume 9 – Document 4) .** All accommodation in Ward 4C is in single rooms.

2. Antimicrobial prophylaxis medicines : The use of antimicrobial prophylaxis medicines are strongly recommended in patients being treated for acute leukaemia. Several classes of drugs are used for prophylaxis but the azoles, particularly posaconazole, are the most commonly used. Posaconazole has been shown in multi-centre, randomised controlled trials to be highly effective, in one trial published in the NEJM showing a reduction in overall mortality in addition to fungal related mortality. Furthermore, there is prospective,

observational, single centre, real-life data showing significant clinical benefit. In addition there is a good understanding of how posaconazole works at the cellular level that explains its efficacy as a prophylactic agent. All international guidelines including IDSA and ESCMID recommend anti-fungal prophylaxis in high-risk patients.

3. Regular routine surveillance for possible fungal infection as noted above.

4. Management of patients in single rooms with movement outside this environment only for essential imaging or diagnostic/therapeutic procedures. Limited access by visitors.

5. Adults Ward 4C is located on the 4th floor of the Queen Elizabeth University Hospital and is supplied by 3 Air Handling Units located on level 12 plant room 124, these AH-units also serve adjacent ward levels 5, 6 &7 for the C core and have thermal wheel recovery incorporated within them at source. The original filtration and pressure set up from building hand over for ward 4C was as follows :

General ward - G4 rated primary filtration and F7 Secondary filtration at source with an ambient (0pa) pressure cascade from room to corridor.

As an additional risk reducing measure within ward 4C, installation of recirculation air scrubber fans (Camfil Camcleaner 400 concealed fan units) located within the ceiling of each toilet bedroom on ward 4C was carried out and then each space validated to quantify the improvements achieved. The Cam cleaner consists of a pre-filter (bag) and a secondary HEPA filter. See report details of fan settings, air volumes, room pressures and noise levels achieved while maintaining SHTM03-01 compliance.

Subsequent improvement modifications include :

1. Oct/Nov 2018 plant re calibration and ventilation system re balance to change ward 4C Room Differential pressures to corridor to be nominally positive (+ve)

2. Jan 2019 Installation of F9 secondary filtration to improve the source air quality delivered to these departments.

3. Jan 2019 Deployment of mobile city M HEPPA air scrubbers to assist in reducing the existing particulate within the Air.

4. January 2020 CVG (Ceiling Ventilation Grilles x10) removed and replaced with a standard ceiling tile to reduce the risk of particulate moving from the corridor ceiling void into the corridor transfer area and rooms.

5. 4C, installation of recirculation air scrubber fans and particulate counts carried out in October 2020.

432. I do not believe that there is any evidence that CBUs in 4C have been shown to have any direct infection risk to these patients. I understand that this was one of the hypothesis put forward at an IMT but was not proven.

433. I have been asked by the Inquiry to what extent, if any, did the lack of HEPA filtration impact patient protection from infection in Ward 4C. The increased risk this posed to the patients cannot be quantified as my understanding is that there is no evidence that HEPA has a protective effect from the trials published in the literature. However, I am not a ventilation expert and others with more expertise may be batter placed to answer this.

434. I have been asked by the Inquiry to what extent, if any, did lack of HEPA filtration in Ward 4C contribute to higher levels of infection in patients. The increased risk this posed to the patients cannot be quantified as my understanding is that there is no evidence that HEPA has a protective effect from the trials published in the literature. However, I am not a ventilation expert and others with more expertise may be batter placed to answer this.

435. I am unaware of any direct evidence that lack of air permeability impacted patient protection or caused higher levels of infection in ward 4C.

436. Negative air pressure impacted patient protection from infection in Ward 4C as it would allow air to enter rooms when the opposite is what is required. What is required is that air is being blown out of the room as a protective effect against the entrainment of organisms. I am unaware of any direct evidence that negative air pressure contributed to higher levels of infection in patients.

437. I have been asked by the Inquiry to what extent, if any, did the non-compliance with SHTM in relation to air changes per hour in Ward 4C impact patient protection from infection in Ward 4C. I am not aware of any direct evidence that this increased levels of infections in patients or impacted patient protection from infection. Taken in isolation the non-compliance in ACH would not have impacted patient protection in this patient group as there is no reason to dilute the air as only organisms from staff, visitors and the patient would be present and they would not have high numbers of spores. I am not a ventilation expert but I believe increased ACH is used for temperature and odour control.

438. I have been asked by the Inquiry what action has been taken to improve on risks associated with airborne pathogens to patients in Ward 4C following the risk assessments from 2020 and 2021. In answer to this I would advise to see mitigations as per the 4C risk assessment.

439. My understanding from reading current reports is that Ward 4C was never built to a compliant SHTM standard.

OTHER RELEVANT RECORDS

440. It is noted in the minutes that a hand hygiene audit has been carried out with 100% compliance. This audit was most likely done by a hand hygiene audit nurse who goes onto the ward. Everyone will know the audit nurse. As a result, there is a Hawthorn effect where practice changes as a result of the observation being in place. Once that observation is removed then practice tends to lapse into a more normal pattern of behaviour. You would normally expect a 90-95% audit score as normal.

441. There was a very good study that if showed if you were able to take every single opportunity for hand hygiene in an eight-hour shift, it would take up to two and a half hours of hand washing if hand washing was performed after every opportunity required to wash ones hands. That is the reality. We know that nobody does that. Alcohol gels made life a lot easier, but we do not live in a perfect world. Boards still do hand hygiene audits because it is a great audit tool and it is great for picking up poor practice. The output of the audit is reported within the Department/Ward and the Internal Infection Control Committees.

COMMUNICATION

442. I was not involved with communication with patients and families. That would be for staff in the relevant department and the clinical team. My understanding was that staff members in a department would communicate between themselves through huddles. I have never attended a huddle. The nurses who work within a department would be able to explain this in more detail. The clinical team or the clinician would communicate with patients and families, since they can put any questions into context of how the care is going or what to expect from that care. Communication with patients and families was not a routine thing that microbiologists were doing at that time.

443. In terms of other communication there would always be someone from the "Comms Team" at an IMT. They were very helpful. Communication was a

standing item on the IMT agenda. They would write the statement that would go out, if required, and this would be shared with the Chair of the IMT to ensure accuracy and appropriateness.

444. When I was Lead ICD that we would receive a draft communications document and you would either okay it or make edits as appropriate. Infections can be quite technical and maybe the “Comms Team” had not picked up the detail. So sometimes I would have to make a correction it and send it back before it could be signed off, I have never known the “Comms Team” just to put something out without involving the Chair of the IMT. That never happened as far as I am aware.

445. I received the draft communications document from the member of the Communications team that would be attached to the IMT or incident.

446. The draft communications document would be about whatever incident was being dealt with. The member of the Communication team attached to the IMT would, after a meeting, prepare a draft statement, either as a holding statement or for media release, which would be checked with the Chair of the IMT for factual accuracy.

447. It would be Dr Crighton who as the Chair of the IMTs I was involved in, who would sign off on any communication. I was happy with how this process of communications worked. I was there to do my specific job and my specific role, and I communicated to the people with which I was involved. I cannot comment on the broader communication system, but as far as I was aware there was not anything that caused me concern.

IMPACT ON PROFESSOR LEANORD AND OTHER STAFF

448. The major impact has been on the staff. We now have many microbiologists who are reluctant to take on an Infection Control role due to the current

investigatory and political spotlight that it has and still is under. We struggle to get a Microbiologists to take on these roles and we are the poorer for that.

449. The Scottish Government is keen that Infection Control Doctors with experience or expertise in the built environment are part of the planning process. There are not many ICDs with that experience and there is the potential that this lack of expertise could hold up future planning and builds. Some ICDs will be involved with a hospital build once in their career. Many will not. Therefore, the learning is almost generational. That is going to be a big issue about how knowledge transfers and how ICDs keep current and don't deskill on a niche expertise that may never be used.

450. The number of senior man hours these events has taken up is phenomenal. As part of my research output, I would normally produce a number of scientific papers in every year. That stopped, as all of the focus has been on trying to support the Board, then the Oversight Group, and now the Public Inquiry.

451. I could also raise stress, upset, personal responsibility, team dysfunction and lots of things that sit there in the background. Ultimately, I think ICDs are entering into a very different world going forward. There will be a range of questions that will come out of this Inquiry that we will not be able to answer. There is decades of knowledge on antibiotic use and antibiotic resistance for instance, but there is not the same depth of knowledge on the environmental aspects of buildings or what it means to healthcare.

452. The role of infection control doctor can raise levels of stress and upset because the current climate whereby Infection Control and the decisions made by Infection Control Teams is under scrutiny and concern from ICD and ICNs that they will be put under intense future scrutiny. There was no dysfunction in the IPCT whilst I was Lead ICD.

453. We do not have the scientific knowledge to answer all the unknowns currently within the topic area of how a building, its microbiome, and patients (of all vulnerabilities) interact with the building environment.

454. There will need to be many years of concerted research, what does normal look like, what does good look like, what does bad look like. There is no legislation that says we should do any kind of water testing apart from Legionella. Yet we are being asked to affirm what water quality we have against standards which we have had to develop ourselves within GGC because it reflects our understanding of the water system and there are no external standards which apply. There are no legal requirements apart for statuary Legionella testing.

455. I am aware of the guidance applicable to water systems in the hospital in SHTM 04-01, but I am not conversant with it.

456. I am aware of the guidance applicable to water systems in the hospital in SHTM 04-01, but I am not conversant with it. However, someone else in a different Health Board might have a completely different set of hospital specific parameters that may be more rigorous or less rigorous than the one used by GGC that they use to assess the performance of their water system. There is no standardisation. So, I think there are a lot of questions to be asked. We can develop the answers but some of that is going to take time. I would like to think the public, the press and the politicians will allow us to research the build environment and give us time to get these answers.

Declaration

457. I believe that the facts stated in this witness statement are true. I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.

CURRICULUM VITAE

OF

PROFESSOR ALISTAIR THOMAS LEANORD

BSc, MBChB, MD, DTM&H, FRCPath, FRCP Edin

PERSONAL DETAILS

Name Alistair Thomas Leanord

D.O.B. [redacted]

Address [redacted]

GMC No [redacted]

Phone [redacted]

Email [redacted]

QUALIFICATIONS

2015	FRCP Edin (Edinburgh)
2004	FRCPath (London)
1996	MRCPath (London)
1993	DTM&H (London)
1992	MD (Glasgow University)
1987	Glasgow University Degree of MBChB
1984	Glasgow University BSc in Immunology (2:1)

EMPLOYMENT HISTORY

2021 – Present	**Chief of Medicine, Diagnostics NHS GGC**
2019 - 2021	**Acting Lead Infection Control Doctor**
2018 - 2021	**Clinical Director of Laboratories, Greater Glasgow and Clyde**
2017 – Present	**Director, Scottish Microbiology Reference Laboratories, Glasgow**
2008 - Present	**Consultant Microbiologist, Greater Glasgow and Clyde**
2009 - Present.	**Honorary Professor of Microbiology, University of Glasgow**

Consultant Microbiologist based at Glasgow Royal Infirmary, Glasgow. I am Clinical Director for Laboratory Medicine in Glasgow. I am Director of the Scottish

Microbiology Reference Laboratories, Glasgow. I have academic and teaching responsibilities at Glasgow University.

Clinical Director of Laboratories,
Director, Scottish Microbiology Reference Laboratories
Consultant Microbiologist, Greater Glasgow and Clyde, NHS

Key outputs of my role within Glasgow:

- Chief of Medicine for Diagnostics involves responsibility for the delivery of all imaging, nuclear medicine, medical illustration and laboratory services across NHS GGC. I am responsible for approximately 200 Consultants and a number of junior medical staff and indirectly responsible for 3,000 staff at various grades and skills.
- Acting Lead Infection Control Doctor. I took over this role on resignation of the previous incumbent in autumn 2019. The role involves giving clinical direction to the 5 other ICDs and working closely with the ICM and the 46 members of the IPCT.
- My major focus as ICD has been 2 fold: involvement in the response to the Board being put into Level 4 measures as a result of environmental infection issues in QEUH and the Boards response to Covid-19.
- Clinical Director of Laboratories with responsibility for 120 Consultant and approximately 1,000 technical staff across all laboratory disciplines.
- The main responsibilities are to provide Clinical Leadership, manage and improve Quality and to ensure safe systems (Governance) are embedded within the Diagnostic Directorate.
- I have been a Consultant appraiser for approximately 10 years, annually appraising a significant number of Consultant colleagues.
- Director of the Scottish Microbiology Reference Laboratories, Glasgow Royal Infirmary. I am responsible for the National staphylococcal, meningococcal, pneumococcal, haemophilus, Salmonella, *Clostridium difficile,* parasitology and the antimicrobial resistance laboratories based in GRI, Glasgow. A large work plan is currently in progress transitioning all organisms onto a sequencing platform.
- As past Sector Lead in QEUH Microbiology, managing a Department, processing over half a million specimens, covering two laboratory sites, the key challenge was developing and maintaining a diagnostic service operating within tight financial constraints, whilst managing the change culture prevalent within the NHS.
- The integration of major diagnostic laboratories. Firstly, the VI and SGH Microbiology departments (2009), secondly, the integration of Yorkhill and parts of the Gartnavel service (2012). This involved planning and engagement with key laboratory stakeholders, clinicians, management, Staff side and GPs, to enable the smooth transfer and integration of service delivery.
- The introduction of new diagnostic testing systems; e.g. Vitek, Chlamydia PCR, automated urine testing and liquid TB culture.
- Implemented new reporting structures and working practices within the microbiology lab.

- I am the Clinical member of the Programme Board for renegotiating the Managed Service Contract for the Glasgow diagnostic services for the next 10 years. This is a [redacted] contract.
- Led the Microbiology planning team for the building of a new [redacted] pound laboratory block on the Southern Campus. This involved co-ordinating planning with architects, management, engineers, building control, other diagnostic specialities and service users.
- Lead daily ward rounds, attend to patient referrals and lead antimicrobial ward rounds delivering a clinical service to patients, advising on clinical management, Infection Control and antimicrobial stewardship issues.
- Deliver OOH Infection Prevention and Control advice.

Honorary Professor of Microbiology, University of Glasgow.

Key academic outputs

- Director of Scottish Infection Research Network. SIRN has a remit to increase networking and capacity for Healthcare Associated Infection research within Scotland. The Group reports to the Scottish Government. As Director I am responsible for liaising between Government agencies, University bodies and Industry to set strategic direction, influence change and develop links that strengthens the HAI R&D framework within Scotland and beyond. Chair the SIRN Steering group made up of Government representatives, University academics, NHS clinicians, Nurses and National Educationalists that enable us to deliver on our National remit.
- Am the PI for the SHAIPI (Scottish HAI Prevention Institute) consortium which has membership drawn from 6 HEI's, 19 Co-Is, NHS Health boards and Pharma stakeholders. This is a 5 year programme of work, with key strategic aims, costing [redacted] awarded December 2014. The main role as Lead PI is maintaining cohesion, focus, and ensuring the programme delivers on its strategic aims.
- Successfully gained funding of [redacted] that has successfully supported a number of research projects and Research Fellowships aligned to the HAI priority areas.
- Individual grant funding of [redacted] awarded to support work in a range of current HAI topics and AMR related areas.
- Development and delivery of teaching modules on HAI and Infection to medical students, science students and nurses. Training of postgraduate trainees as part of their training RCPath curriculum program.
- Member of the CSO Experimental & Translational Medicine Research awards committee since 2014.

2013 – 18 AMR and HAI Medical Adviser to the Scottish Government

I was the Medical Adviser to the AMR and HAI Policy Unit at the Scottish Government, advising the Cabinet Secretary for Health on policy development and delivery on HAI and antimicrobial resistance within Scotland, liaising with other parts of the UK.

Communication, expert advice, professional and clinical leadership were the key elements of this role.

Key outputs:

- Delivery of professional leadership and advice to the Scottish Government AMR and HAI Policy Unit and appropriate Ministers, liaising internally with CMO, CNO, CVO, CPO and CDO offices. Externally with the Scottish agencies; Health Protection Scotland, Health Improvement Scotland, Health Facilities Scotland, SMC, HEI, NHS Education for Scotland, Scottish Antimicrobial Prescribing Group, the Scottish Health Boards, the Infection Control Network, the Scottish Microbiology and Virology Network, and the Consultants in Public Health Medicine group.
- To provide clinical leadership as appropriate on matters arising within and outwith the NHS and across Scotland around HAI, AMR and decontamination.
- Developed close working relationships with Infection Control Managers, Doctors, Nurses and NHS Board HAI Executive leads to secure policy implementation at tactical and operational level.
- National Lead for the Scottish implementation of the UK Five year Resistance strategy (2013-18). Proposed, developed and populated the structures required in Scotland to deliver on the UK AMR strategy (Controlling antimicrobial resistance in Scotland [CARS] Chaired by the CMO). This is funded ([redacted] for a 5 year period comprising 4 key workstreams, (surveillance, prescribing, research and engagement) bringing together key partners, to implement cross cutting developments, in a One Health model.
- Represented Scotland at UK level at the UK AMR High Level Steering Group (HLSG) which acts as the advisory Group to DH and the DAs, Advisory Committee on Antimicrobial Prescribing, Resistance and Healthcare Associated Infection (APRHAI), HLSG Diagnostics subgroup, and a number of National Expert Advisory groups as appropriate ie CPE, PVL, CDI.
- Led the review of national mandatory surveillance and AMR and HAI targets as part of Sir Harry Burns Review of Targets in Scotland.
- Inputted into a number of Scottish National groups including: Chair of ScotMARAP 2 policy development, member of the Scottish Antimicrobial Prescribing Group, Scottish Antimicrobial Resistance HAI (SARHAI [Chaired by CNO]) Committee, Scottish Antimicrobial Prescribing Project Board (HIS), Health Protection Scotland AMR and HAI Programme Board, Scottish Microbiology and Virology Network Steering Group, National CPHM Group, Scottish HAI Commodities Steering Group, Infection Intelligence Platform Project Board member and member of the SARHAI Commissioning Group which co-ordinates and financially supports work within the Scottish NHS around AMR and Infection Prevention and Control.
- Member of the Vale of Leven Response Committee tasked with delivering on the Inquiries 75 recommendations.
- Contributing to the Chief Medical Officers Annual report.
- Member of the working group that developed new National HAI standards “Healthcare Associated Infection (HAI) standards 2015”.
- Scottish member of the UK Joint Working Party on the prevention and control of multi-drug-resistant Gram-negative bacteria which published in 2015.

- Conveyed key strategic and policy messages on HAI to a wide audience and linked with and advised SGHD communications colleagues on issues and messages for the media.
- Provided support and advice from a medical and Board perspective to the HAI Policy unit for Parliamentary Questions, ministerial correspondence, and briefing papers.

2009 - 2013. Consultant Microbiologist, Health Protection Scotland

Key Health Protection Scotland outputs

- Clinical Lead for the AMR and HAI Teams. This involved working within the AMR and HAI program encompassed by HAI surveillance (ECOSS and prescribing), the *C difficile* programme, MRSA/MSSA, SSI surveillance program, Reference laboratories, and guideline production.
- Contributing author of the Scottish Antimicrobial Prescribing Group (SAPG) - Report on Antimicrobial Use and Resistance in Humans in 2008-12.
- Chaired the National Carbapenamase producing Enterobacteraceae (CPE) guidance group 2013. Member of the UK PHE CPE guideline group.
- Member of the UK multi-drug resistant Gram Negative group developing guidance for this new emergent threat. Published 2015.
- Chaired the National HPS *C difficile* guideline group. Published new Guidance 2014.
- Microbiology and Infection Control Doctor support to other teams within HPS; the HAI ICPT team, Environment and Health, Immunisation and Vaccine Preventable diseases, Respiratory Infections and Travel Health.
- Developed and piloted *E coli* bacteraemia surveillance systems within HPS
- Support to ISD regarding data collection and user front end access to web platforms through the ECOSS team.
- Member of the Reference Laboratory Working Group since 2006 and have been involved with appraising services, tests and commissioning of the Scottish Reference labs. Developed and streamlined the Scottish SLA with PHE for reference services provided outwith Scotland, realising a [redacted] saving.
- Provided microbiology input into the MRSA Pathfinder Programme and special studies on hospital transmission of MRSA leading to the recommendation on admission screening for MRSA.
- Attended and contributed to NAG, SAPG, HAI Programme Board, IC Network, SMVN, HAI Commodities Steering Group,HPN committees. and the HAI Policy Group.
- Member of several short life groups within HPS and Nationally eg PID assessments, HAITF Surveillance sub group.

2005 – 2008 Lead Clinician, Microbiology Service, NHS Lanarkshire

- Lead Clinician for Microbiology within Lanarkshire. I led the Microbiology Specialist Sub Group reporting to the Core Directorate Team. The main role was developing the strategic direction of the Microbiology Service in consultation with key stakeholders, providing clinical leadership in the

operational delivery of the implementation plans and ensuring the service delivery was consistent with the Clinical Governance framework and fit for purpose. A main challenge of the role was the functional integration of the three disparate Microbiology Departments. This involved managing peoples' expectations of the service redesign, standardising testing procedures, integrating the on-call service, and developing Area services based on single sites. This was achieved through supporting others during the process, along with robust communication. I was responsible for staff job planning and staff appraisal for 65 members of staff.

- **Key outputs as Lead Clinician:**
- Developing a strategic NHS Lanarkshire Microbiology framework, set within Lanarkshire's Picture of Health Plan
- Implementation of a Quality management system throughout the Microbiology Departments
- Delivery of single site Area services for chlamydia, antenatal testing, and hepatitis testing
- A rolling programme developing standardised SOPs
- A single NHS Lanarkshire laboratory handbook
- Uniformity in computer reporting styles and report comments across the three departments
- Rotation of staff, both medical and BMS between sites
- Developing formal linkages with Community Health Partnerships management teams and GPs.

1998-2005 Consultant Microbiologist, Monklands Hospital, Airdrie

- This was a single handed position responsible for a Microbiology Department of 28 people processing 290,000 specimens per annum. This large workload necessitated the introduction of automation. The Department had over the years successfully introduced the Vitek 2, the Aura (for sensitivity testing), the Sysmex UF100 (urine analysis) and the COBAS (Chlamydia and Neisseria PCR).
  The Department performed a wide range of microbiology tests, acted as the area mycology centre for NHS Lanarkshire (NHSL) and is the area centre for Chlamydia and Neisseria PCR. Approximately 60,000 serological specimens were processed annually.
- As Head of Department I was responsible for policy, staff training, quality assurance, and Health & Safety within the Dept and for communicating and liaising with other Microbiologists within the County.
- Diagnostic, clinical and Infection Control advice to a 550 bed hospital with daily ITU rounds, Renal unit ward rounds and Haematology ward rounds. I had very close links with the ID Unit attending the unit on a daily basis and at weekly case conferences. I also attended the Haematology weekly case conference. I have had several years of direct paediatric experience when the NHSL paediatric service which was based at Monklands Hospital prior to it being moved off site to Wishaw. Being single handed I was used to, and capable of handling a high clinical workload and the attendant stress.
- Diagnostic, clinical and Infection Control advice to the majority of the County's GPs. The laboratory at Monklands served approximately 85% of the

Lanarkshire GPs.

2001-2006 Lead Infection Control Doctor within Lanarkshire Acute Division

- I was the Lead Infection Control Doctor within Lanarkshire Acute Division for 5 years (2001-2006) working with a team of 21 people, which included, Nurse Consultant, Infection Control Nurses, Tissue Viability Nurses, TB contact tracing service, and Surveillance Nurses. The Lead role involved chairing the Divisional Infection Control Committee, reporting to the Health Board Area Communicable Disease Committee, policy production and implementation, and leading the Division in attaining Quality Improvement Scotland compliance. A key role was the integration and co-ordination of the previously independent three Infection Control Teams into a unified Area IC Team.
- I also led, on a NHSL basis, on other central policies, eg decontamination as per the Glennie report. Whilst performing this Lead role I was responsible for the implementation of Local and National HAI policies within NHS Lanarkshire.

  I have wide experience of outbreak management, starting in 1996 with the Lanarkshire O157 outbreak, and have experience of MRSA, meningococcal, Norovirus, *C difficile* and Salmonella outbreaks both within hospitals and the community.

  I provided the Infection Control input into the planning process for Wishaw General Hospital, meeting with architects, project managers, staff and estates from the initial 1:200 plans through to the detailed floor plans.

1998-2001 Infection Control Doctor Monklands Hospital, Airdrie

- Responsible for Infection Control and clinical advice to colleagues in Monklands Hospital, a 550 bed District General.
- Chair of the Hospital IC Committee and member of the Area Control of Communicable Disease Committee.
- Wide range of IC experience including outbreak control, theatre commissioning, estates planning, liaising clinically and providing ICPT advice to the ID Unit, Renal unit and Heamatology Unit.
- Member of the Area Drug and Therapeutics Committee

March 1996 -1998 Consultant Microbiologist/ICD Law Hospital, Carluke

- Responsible for a Microbiology Department of 15 people processing 75,000 specimens per annum.
- Responsible for Infection Control and clinical advice to colleagues in Law Hospital, a 500 bed District General.
- Chairman of the Infection Control Committee, Chairman of the Clinical Waste Committee, Member of the Drug and Therapeutic Committee, Member of the Area Ethics Committee, Member of the Area Control of Communicable Disease Committee.

July 1993 - March 1996 Senior Registrar
Western Infirmary, Glasgow

Feb 1993 - July 1993	Career Registrar Western Infirmary, Glasgow
Dec 1991 - Feb 1993	Senior House Officer Southern General Hospital, Glasgow
Aug 1991 - Dec 1991	Senior House Officer (Infectious Diseases) Ruchill Hospital, Glasgow
Apr 1990 - July 1991	Research Fellow (Microbiology) Department of Medical Microbiology Aberdeen University
Aug 1988 - Mar 1990	Medical Officer British Antarctic Survey
Feb 1988 - July 1988	Junior House Officer (Surgical) Vale of Leven Hospital
Aug 1987 - Jan 1988	Junior House Officer (Medical) Southern General Hospital

1.

COMMITEES

International (Past)

- Chair of the Local Scientific Programme Committee. 13th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID). This was a 6,000 delegate International Conference.
- Member of the European ECCMID Programme Committee 2003.

National (Past)

- Treasurer: British Infection Association. This is a UK wide Professional Society. As Treasurer and Council member I was involved with a large number of UK Government consultations, strategic direction setting within the UK Infection/HAI agenda and administrative business. BIA has [redacted] in assets, and 1,400 professional members. 2006-2013.
- Member of the Royal College of Pathologists Infection Research Committee, representing the Scottish Infection Research Network. This is a UK group tasked with embedding research into the RCPath curriculum for training. 2008-2010.
- Member: Scottish Regional Council of the Royal College of Pathologists 2004-7.
- Member: Association of Clinical Pathologists Committee on Microbiology.. 2002-7

- Member of SIGN Guideline 104; Antibiotic prophylaxis in surgery. This National group reviewed, developed and published antibiotic prophylaxis guidelines for elective surgery. 2005-08. Update group 2013.
- Meeting secretary/ Member: Scottish Microbiology Association 1996-2009
- Member: NHS Education Scotland: Advisory Group e-library HAI portal 2004-6
- SISS Antibiotic Prescribing working Group 2003-2004. Published National guidance on treatment of MRSA infection.

2. PROFESSIONAL ACTIVITIES

3. Present

- Chair of the Advisory Committee on Antimicrobial Prescribing, Resistance and Healthcare Associated Infection (APRHAI). This is a four Nation advisory committee that advises 4 CMOs within the UK Governments on antimicrobial resistance, Healthcare Associated Infection and antimicrobial prescribing.
- RCPath Reviewers Panel: Review professional performance issues for the College 2005- present
- Peer reviewer for CSO Grant Proposals

4. Past

- Examination question writer for the Royal College of Physicians (Infectious Disease) Knowledge Based Assessments. This sets examination questions and papers for the Royal College of Physicians (London) KBA. 2007- 2010.
- Assistant Editor of the Journal of Hospital Infection 2005-2007
- Inspector NHS Quality Improvement Scotland; Healthcare Associated Infection: infection control standards
- Chair: Working group to produce the Scottish HAI Induction training: NHS Education Scotland
- Co-founder and contributor to the Flemingforum meetings and website. The site attracted over 200,000 hits per year from approximately 40,000 people and was an educational resource for medical microbiologists, virologists, infection control personnel and tissue viability nurses. This was run through a Limited Company 1999-2009.
- Responsible for NHS Lanarkshire Acute Division QIS compliance 2002-2004.
- Inspector NHS QIS; Healthcare Associated Infection control standards 2002-2004

RESEARCH/GRANTS

- Principal Investigator and Director Scottish HAI Prevention Institute (SHAIPI). This is a newly awarded National research Consortium of 6 Scottish Universities, 5 Chief-investigators and 19 Co-Investigators. Total funding [redacted]. 2015-19
- **Antimicrobial prescribing for urinary tract infection in the community: its effect on bacterial resistance and clinical outcome.** A Leanord**, W Malcolm, C Wuiff, S Berry, C McCowan, [redacted] SIRN/CSO 2013.**
- **The diagnostic use of metabolomics for the early recognition of sepsis** A Leanord**, A Davidson, A Roe [redacted] SIRN/CSO 2013**
- **Case control study to identify the risk factors for the development of *S aureus* and *E coli* bacteraemias within NHS Scotland** A Leanord, **O Blatchford, J Wilson, C Wuiff, C McCowan. [redacted] SIRN/CSO 2013.**
- **Where is norovirus control lost?** A Leanord, **C McCowan, E Curran. [redacted] SIRN/CSO 2013.**

- **Clinical and Operational Assessment of the HINS-light Environmental Decontamination System within a large Intensive Care Unit. J Anderson, M MacClean, M Booth, J Coia,** A Leanord**, S McGregor [redacted] SIRN/CSO 2013.**
- **The role of *Clostridium difficile* and viral gastro-enteritis as a cause of hospital outbreaks in patients with severe diarrhoea. W Carman,** A Leanord**, J Coia. [redacted] SEHD. 2007. This study evaluated PCR for the diagnosis of *C difficile* from primary samples.**
- The molecular genomic evaluation of the effect of sub-inhibitory antibiotics on *Streptococcus pneumoniae*. **A Leanord**, T Mitchell. [redacted] SEHD 2007.
- *Streptococcus pneumoniae* protein arrrays to assess immunogenic protein profiles and the diversity of the humoral immune response towards *S. pneumoniae*. T Mitchell, **A Leanord**. 2006
- Early v late ligation of the inferior mesenteric artery. V Shoemeckou, A MacDonald, **A Leanord**, E Simpson. 2007
- The molecular epidemiology of *H influenzae*. Bayer [redacted]. 2003-4

5. PUBLICATIONS
6. Books

Consultant Editor Managing Infections: decision making options in clinical practice. Bartzokas CA, Smith GW. BIOS Scientific Publishers, 1998.

7.
8. Papers

- Probabilistic Modelling of Hospital Admission Screening Strategies for Carbapenemase Producing Enterobacteriaceae (CPE) in the United Kingdom S Manoukian, S Stewart, S J Dancer, H Mason, N Graves, C Robertson, **A Leanord**, S Kennedy, K Kavanagh, B Parcell, J Reilly Applied Health Economics and Health Policyv (in press)
- Epidemiological situation, laboratory capacity and preparedness for carbapenem-resistant *Acinetobacter baumannii* in Europe, 2019. Felix Lötsch et al. Euro Surveill. 2020;25(45):pii=2001735. https://doi.org/10.2807/1560-7917.ES.2020.25.45.2001735
- Cost burden of Clostridioides difficile infection to the health service: A retrospective cohort study in Scotland C. Robertson, J. Pan a, K. Kavanagh, I. Ford, C. McCowan, M. Bennie, C. Marwick**, A. Leanord** doi.org/10.1016/j.jhin.2020.07.019
- **The changing face of methicillin-resistant *Staphylococcus aureus* infections.** Alistair T Leanord **and John Coia. Med J Aust 2017; 207 (9): 379-380. || doi: 10.5694/mja17.00641**
- **Testing Greco-Roman medicinal minerals: the case of solfataric alum**

E. Photos-Jones, G.E. Christidis , M. Piochi , C. Keane , A. Mormone, G. Balassone, V. Perdikatsis , A. Leanord **Journal of Archaeological Science: Reports 2016:10:82-95**. http://dx.doi.org/10.1016/j.jasrep.2016.08.042

- Archaeological Medicinal Earths as Antibacterial Agents: the case of the Basel Lemnian sphragides" by Effie Photos-Jones, Christine Edwards, Flavio Haener, Chloe Keane, Linda Lawton, **Alistair Leanord**, and Vassilis Perdikatsis (2016 in Press)
- Prevention and control of multi-drug-resistant Gram-negative bacteria: recommendations from a Joint Working Party. A.P.R. Wilson, D.M. Livermore, J.A. Otter, R.E. Warren d, P. Jenks, D.A. Enoch, W. Newsholme, B. Oppenheim, **A. Leanord**, C. McNulty, G. Tanner, S. Bennett, M. Cann, J. Bostock, E. Collins, S. Peckitt, L. Ritchie, C. Fry, P. Hawkey. J Hosp Infect 2015 http://dx.doi.org/10.1016/j.jhin.2015.08.007
- Testing Dioscorides' Medicinal Clays for their Antibacterial Properties: the case of Samian Earth. E. Photos-Jones, C. Keane, A.X. Jones, M. Stamatakis, P. Robertson, A.J.

Hall, **A. Leanord**. Journal of Archaeological Science (2015), pp. 257-267 DOI information: 10.1016/j.jas.2015.01.020

- Where is Norovirus Control Lost (WINCL) Study: an enhanced surveillance project to identify norovirus index cases in care settings in the UK and Ireland. Evonne T Curran, Jennie Wilson, Caroline E Haig, Colin McCowan, **Alistair Leanord** and Heather Loveday. Journal of Infection Prevention 2015: 1– 7. DOI: 10.1177/1757177415613133
- MRSA screening: where, how and when? J Coia, **A Leanord**, J Reilly. BMJ 2014:349:g5075
- To wet or not to wet- a comparison of wet and dry swabs for nasal MRSA screening. **A Leanord** et al ://www.journalofinfection.com/article/S0163-4453(11)00174-5/pdf
- Boron and Samian Earth: Literary evidence, geological occurrence and past medicinal applications. M. Stamatakis, E. Photos-Jones, **A. Leanord**, A J Hall. Archaeology, School of Humanities, University of Glasgow, Glasgow, UK. 6th Helenic Conference, Athens 2013.
- Cross-sectional study of *Clostridium difficile* ribotypes in Scotland (July 2010 to June 2012 A. Banks, D.F.J. Brown, C. Wiuff, H. Mather, **A. Leanord**, J.E. Coia
- Intervention study on the impact of PCV7 and Prevenar13 on invasive pneumococcal disease in Scotland J. Wilson, D. Henderson, G. Edwards, **A. Leanord**, C. Wiuff. Abstract Nr. 2768 ECCMID Berlin. Oral presentation
- Effects of Clarithromycin at Sub-Minimum Inhibitory Concentrations on Early ermB Gene Expression, Metabolic Activity and Growth of an erm(B)-Expressing Macrolide-Resistant Strain of Streptococcus pneumoniae
  Riana Cockeran, H. C. Steel, N. Wolter, L. de Gouveia, A. von Gottberg, K. P. Klugman, **A. T. Leanord**, D. J. Inverarity, T. J. Mitchell, C. Feldman, R. Anderson Open Journal of Respiratory Diseases Volume 02, Number 01 (February 2012) PP.1-8, Pub. Date: 2012-02-29, DOI: 10.4236/ojrd.2012.21001
- A Retrospective Cohort Study into Acquisition of MRSA and Associated Risk Factors after Implementation of Universal Screening in Scottish Hospitals. E. V. H. van Velzen, J. S. Reilly, K. Kavanagh, **A. Leanord**, G. F. S. Edwards, E. K. Girvan, I. M. Gould, F. M. MacKenzie, R. Masterton *Infection Control and Hospital Epidemiology*, Vol. 32, No. 9 (September 2011), pp. 889-896
- Epidemiology and management of candidaemia- a retrospective, multicentre study in five hospitals in the UK. Chalmers C, Gaur S, Chew J, Wright T, Kumar A, Mathur S, Wan WY, Gould IM, **Leanord A**, Bal AM. Mycoses 2011; 54 (6): e795-800.
- Comparison of BD Phoenix, Vitek 2, and MicroScan Automated Systems for Detection and Inference of Mechanisms Responsible for Carbapenem Resistance in *Enterobacteriaceae.* Neil Woodford, Anne T. Eastaway, Michael Ford, **Alistair Leanord**, Chloe Keane, Reinhard M. Quayle, Jane A. Steer, Jiancheng Zhang, and David M. Livermore. J. Clin. Microbiol. August 2010 48: 2999-3002;
- Exposure of Macrolide-Resistant Strains of *Streptococcus pneumoniae* to Sub-Minimum Inhibitory Concentrations of Clarithromycin Results in Transient Inhibition of Bacterial Growth. R. Cockeran, H.C. Steel, N. Wolter, M. du Plessis, A. von Gottberg, K.P. Klugman, **A.T. Leanord**, D.J. Inverarity,T.J. Mitchell, C. Feldman, R. Anderson. Submitted 2011 Int J Antimicrobial Agent
- Quantitative analysis of bacteria in forefoot surgery: a comparison of skin preparation techniques. K Cheng, H Robertson, JP St Mart, **A Leanord**, I McLeod. Foot and Ankle International 2009;30:992-997..

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- Gunnson R, **Leanord AT**, Carman W. First rotavirus; now astrovirus: The evolving benefits of RT-PCR. Comm Dis and Public Health Journal 2003;6:66-67
- **Leanord AT**, Williams C. *Haemophilus influenzae* in acute exacerbations of chronic obstructive pulmonary disease. Int J Antimicrob Agents 2002;19: 371-375
- MacKay WG, **Leanord AT**, Williams C. Water, water everywhere nor any a sterile drop to rinse your endoscope. J Hosp Infect 2002;51:256-262
- M G Morgan, C Stewart, **A T Leanord**, M Enright. *Citrobacter diversus* brain abscess: case report and molecular epidemiology. Journal of Medical Microbiology 1992; 36; 273 -278.