SCOTTISH HOSPITALS INQUIRY

Hearings Commencing
19 August 2024

Day 23
25 September 2024
Dr Iain Kennedy

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10:00

THE CHAIR: Good morning. Now, I think, Mr Mackintosh, we're able to begin with Dr Kennedy?

MR MACKINTOSH: Dr Kennedy, indeed, my Lord, yes.

THE WITNESS: Good morning.

THE CHAIR: Good morning, Dr Kennedy. As you understand, you are about to be asked questions by Mr Mackintosh, who is sitting opposite you, but first I understand you are willing to take the oath.

THE WITNESS: I am, yes.

Dr Iain Kennedy
Sworn

THE CHAIR: Thank you very much, Dr Kennedy. Now, I anticipate that your evidence may take much of the day. We usually break at about half past eleven for coffee, but if at any stage you wish to take a break, feel free just to give an indication and we can do that. Now, Mr Mackintosh?

Questioned by Mr Mackintosh

Q Thank you, my Lord. I wonder if you can give us your full name?

A Iain Thomas Robert Kennedy.

Q And you're currently a public health consultant with NHS Greater Glasgow and Clyde?

A Correct.

Q Fine, right. Now, did you produce a statement for the Inquiry?

A I did.

Q Would you be willing to adopt it as part of your evidence?

A I am.

Q Thank you. Now, what I want to say is that the statement you produced, particularly in its narrative section, covers the events in quite a level of detail and in chronological order, and you won't mind me saying it's quite an easy read in that section. So, what I'm proposing to do is to really just pick up issues in the events between 2015 and 2019 that arise from the narrative and do that first, and that will take us most of the morning, I would imagine. Then I'll want to turn to your two epidemiology reports and reports that were around at the time from other organisations and people in the hospital and perhaps discuss them and see if we can understand why they are different, if they are, and what's going on.

So, what I propose to do is to start with two questions we've been asking lots of people, which is what do you understand by an "unusual

microorganism"?

A So, in the context of----

Q Of these events.

A -- of these events, the use of "unusual" is probably better as "rare" because I think the unusual aspect is the frequency with which they occur, rather than any other particular attribute of the organism.

Q So various microbiologists have described it as something you rarely see in your career, you may never have seen it before, you may only have seen it once before, that sort of thing. Would you agree with that analysis?

A Yes.

Q Right. The next thing is what do you understand by the expression of "contaminated water"?

A So, I would understand that to be when there is some substance in the water supply that shouldn't be there, which might be a microorganism above the acceptable level, it might be a chemical, it might be something else, but it's something that has an impact on the wholesomeness or quality of the water.

Q And when you say an "acceptable level," would that acceptable level be the same in all circumstances or would it vary depending on the context of where the water was being used?

A It might vary. So, from a public health practice perspective, we're mainly concerned with the public water supply, where those limits are laid out in regulation, but in, for example, some hospital settings, you might want a stricter limit because the patient group who are using that water are potentially more vulnerable in a way the general population are not.

Q Thank you. Now, what I want to do is take you to paragraph 36 of your statement, which is page 128 of the bundle, and at this point you're discussing the role of HPS ARHAI, particularly their nurse consultants and nurses-- lead nurses, who are attending the IMTs that you attended. I see that you've said in the first sentence that you didn't feel that they worked with the IMT in a way you would have expected, given your experience working with national agencies in community outbreaks, and you felt they should have been more full members of the IMT and should have taken part in all aspects of it including consensus building.

Now, what I wanted just to do is-- I wonder if you have any specific examples of what you mean by that.

A So, in terms of examples of what I-- my experience of normal

practice?

Q No, the experience of not normal practice, in this case.

A So, I think it's a broader issue than this specific set of incidents. I think there is a different way that incidents being led by public health teams vary from incidents being led by Infection Control teams. We have these national agencies who provide expertise and advice and support and my normal experience of working with Incident Management teams is they are right in the middle-- they are part of the collegiate responsibility for the output, whereas with Infection Control, it's sometimes felt that it's more an external scrutiny role rather than a supportive role.

So, things like saying, "As HPS, we can't support this output," or some of the requests or changes to the minutes that happened during the incident, we'd often spend a long time in the Incident Management teams going over the previous meetings' minutes and a lot of that were HPS representatives wanting slight wording change to make it clear that they were not part of the consensus view, that it was the Board's Incident Management team and they were separate. I think that's unhelpful.

Q And are you talking about, effectively, 2019 at this point?

A Principally 2019.

Q Right, okay, because we've had some evidence on this subject from HPS ARHAI representatives, and I think in broad terms they have given some evidence that since 2019, at least, there was a tendency there to be a pushback or challenge to their involvement in IMTs from some GGC staff. Now, to be fair to the situation, we haven't yet asked the relevant member of the Infection and Prevention and Control Team about this, so we haven't got their perspective, but is that something that you're aware of or that you would agree with? Or how would you comment on it?

A No, it wouldn't be how I would characterise what was happening. I didn't feel that the Board were pushing HPS out. An example I might give there would be about the Water Technical Group and the HPS and HFS withdrew from that and----

Q So when you mean the Water Technical Group, you mean the Water Technical Group set up in March 2018----

A Yes.

Q -- chaired by Mary Ann Kane?

A Yes.

Q Right, yes.

A Which HPS and HFS attended initially and then became less frequent, and then I recall Annette Rankin describing it as saying, "We were no longer required, we were told we didn't need to be there," and I don't-- and my recollection is it was more than their decision.

Q Were you attending these meetings?

A Yes.

Q Now, I've formed the impression, reading your statement, and I wondered if this is correct, is that until at least late 2018 your involvement in the IMTs that related to the Children's Hospital, that are in our bundle 1, was to some extent at the request and intervention of Dr Armstrong who effectively, to some extent, asked for your help as Public Health-- Have I got that right?

A Yes, so it was Dr Armstrong who asked for Public Health to start attending the IMTs, but once I was there and part of the IMT, that was part of the ongoing process----

Q So, once we get to the autumn of 2018, you effectively stay because you are there, but before then you're in and out slightly. Would that be a fair broad-brush analysis? You're not attending every meeting in '17/'18, are you?

A I'm not involved at all in '17.

Q Yes, and in '18 you would only attend some of the meetings?

A From the start of March onwards. After that point, if I wasn't at a meeting, it would have been because I was on leave or had another----

Q Oh, right, so we should get the impression that, leave aside, you considered yourself to be a full member of the IMT from March 2018.

A Yes.

Q Well, that's helpful because you do miss a few and I wanted to get an understanding of that. Now, I wonder if we can go to paragraph 46 of your statement at page 132, where you, in the middle of the page-- We might zoom this up so we can get it easier to read on the screens. So if you make a half page of this, it would be good. Yes, there we are. This is paragraph 46, beginning:

> "Hospital infections linked to water can happen, but the complexity of this outbreak was very unusual due to the identification of different organisms identified in the

positive water sampling results in other parts of the hospital. The source of the contamination was unknown. If it's something like a damaged tap, you would expect the infection to be confined to one area, but this was not the case and this raised the possibility it was a systemic issue with the water in the hospital."

This was the first time you were aware of such concerns. Now, at this point, this is in-- according to your statement, this is in the early months of the IMT, so this is spring 2018.

A Yes.

Q What I want to do is when we come to the epidemiology this afternoon, I want in effect to have had looked at this by then. What effect do these sort of complexities that you are describing in this paragraph have on the way you do epidemiology to understand what is going on? For example, do you have to do particular things in your work to take account of there being many different microorganisms?

A Yes. Well, it depends what sort of epidemiology you're doing and this is something we might want to discuss, because I think it's an important point to note that the various epidemiology reports are all the same type, effectively. They're all about looking at long-term trends in positive blood culture results. There are other sorts of epidemiology that you can do as part of descriptive epidemiology, some of which is noted in the minutes and noted in my statement, for example, when I'm talking about the epidemiology around the Stenotrophomonas cases in that early part in 2018 where I look much more closely at the individual patients, which bedrooms they'd been in, what times they'd been in the hospital, there was a positive environmental sample, had anyone been in that room. That kind of epidemiology, essentially, you can only do when you have a single organism.

Q I see. So, effectively, if you have this multiplicity of organisms, you're limited to this descriptive epidemiology.

A Yes.

Q Whereas if you had one case of MRSA or multiple cases of MRSA, you would be able to do that and work out who had been where and who----

A Yes.

Q -- had used which bit of equipment and that sort of stuff. I see, right. Well, what I want to do is I want to remember this and come back to

this and look at your report because the question I will then ask you is, how do you understand the complexity of the outbreak as a factor within analysing it? So I'm just parking that as a thought to come back to.

If we could move onto page 134 of your statement, paragraph 54, you are asked to discuss at this point. This is March 2018, so, again, it is still early on in the water incident. Your paragraph beginning:

> "At the IMT minutes, Dr Inkster discussed the epidemiology highlighted. Since the opening of the RHC, there have been three cases of Cupriavidus reported."

Now, at the end of the sentence-- paragraph, you say:

> "I agree with this statement based on information available at the time. It's a reasonable view to take, as they've identified a patient with the organism and identified a water outlet with the organism in proximity to the ward area, so it's a likely source."

Now, the way I read that is that your view might have changed since then. Am I right in reading that in there? Or is it just that you're observing the-- what you thought at the time without----

A I'm observing what I thought at the time.

Q Do you have a view from now, looking backwards?

A No, I don't think my view of that will have changed.

Q If we go again to page 139 of your statement, paragraph 69. Well, let's look at 67 while it is on the screen. So, we are going to come to a series of HPS reports and it may be able to take this short. You've observed in a number of places in your statement that the HPS reports did not turn up when you were expecting them to be. Is that a fair summary?

A Yes.

Q It has been suggested that the reason-- well, there has been evidence that the reason that they-- the ones in 2018 did not turn up when they were expected to turn up, as quickly as they'd hoped. It is because HPS were reacting to the incident and felt it would be better to do that work reflectively, after the incident had been put under control. Was that something you were aware about at the time?

A No. I was aware that one of the reasons cited for the delay in this work was the broader piece of work that was being taken forward by HPS, in terms of-- they described it as

the “root and branch” review of Wards 2A, 2B that they were visiting, looking at schematics and all that kind of stuff ,that they were putting their resource into doing that first and then would return to the epidemiology work. The question for me would then be, would there have been additional resource in HPS to do those things in parallel?

Q Right, because you-- it might have, in your view, helped to have the epidemiology earlier.

A Yes.

Q Now, if you nod, the person doing the transcript will get terribly sad, so please do answer the question. If we go to paragraph 69. I wanted to put this in context first. So, we are looking again at 27 March 2018, in paragraph 68, and there is discussion in that minute – I don’t think we need to go to it – of there being some water test positive for gram-negative pathogens and some high fungal counts in a number of locations in the hospital. I want to just look at paragraph 69 because I am wondering whether I have got chronologically confused. Were the filters in place on 27 March 2018 when that IMT is happening? The one in the previous paragraph.

A I thought they were, yes, because we then stand down the IMT at that point. This is the last----

Q The IMT was stood down in May. Could we look at bundle 1, document 90? Sorry, I’ll give you a page reference. Yes, so in the sequence-- Sorry, this is page 75.

A Yes.

Q This is the sixth IMT, the first one having taken place only on 2 March, so three weeks later, and so I wonder when you thought that the filters were fitted. Because the IMT review isn’t until May and the water incident IMTs continue-- well, they continue until June.

A If we could just go later in that----

Q Yes, the next page, please. Next page. Yes, there is a discussion of filters, you’re right, page 78. In that case, I am wrong and you are right. Filters had been fitted in those three wards and in occupied beds in 4B. The question then arises is if these are pre-filter samples, what about the risks to patients who go elsewhere in the hospital?

A Okay, so the first thing I’m thinking in these minutes is I can’t see mention of those results, so I do wonder whether there’s also-- I perhaps-- I’m meaning me----

Q All right. Well, let’s take this off the screen because I think I

would stick with the better question that I should have asked first, which is you have rightly observed that there were samples which show gram-negative and you have made the observation they're less of an issue because they're pre-filter. In a sense, it does not really matter for the purpose of this question when this is. The question for you is if you are getting pre-filter samples with the microorganisms in them, it's fine that you fitted filters in certain wards, in what eventually are described as "high-risk wards", and the numbers increase, but is there not actually a real risk to patients who are within the vulnerable group, who go elsewhere in the hospital for x-rays, operations, other appointments and are exposed to the water?

A Yes, it would be related to that particular vulnerable group because the general patient population are at very limited risk from these organisms, and that's something that is followed up through the IMT at various points. Are there other locations that have been missed? Has the patient journey been followed through completely?

Q Because that issue is still arising in 2019 when the Mycobacterium chelonae cases become live, isn't it?

A Yes.

Q And effectively we have a conclusion in 2019 that the patient who contracted Mycobacterium chelonae in May, or possibly slightly earlier in 2018, might have been exposed when they went elsewhere in the hospital away from the filters. Do I have that right?

A Yes.

Q Thank you. But as you say, it confirmed there was an issue with the water supply. Let's move onto-- We'll go to paragraph 71 on page 140, which is the next page. So we're now moving the autumn IMTs, because your statement's covered everything in-- quite detailed up to this point. If we look at bundle 1, document 33. So, your position is that you've been continuously involved, apart from the fact that you were on leave up until this point?

A Yes.

Q Right. Sorry, page 140. If we go on to the next page of your statement, so that's page 141, this appears to be a discussion of what you are reporting happens after the IMT of 3 July 2018. Or do you think this is you referring to something that happens after the September IMTs? Because I'm slightly lost about the

chronology.

A This will be after the September----

Q Ah, right, okay. Fine. So this is after the decision to decant has been promulgated?

A So this is before that, this will be the week before.

Q All right. Well, in that case, why don't we go and look at page 169 of bundle 1? This is an IMT from 17 March 2018 and you are recorded as being present. It's chaired by Dr Inkster and this is, for chronology, a meeting at which-- If we go on to the next page and then the page after, at the bottom we have a contingency decant and Kevin Hill feeds back from the executive meeting which happened on Friday afternoon after the IMT. Is that the meeting you're talking about in paragraph 74?

A Yes.

Q Right, which must have taken place on 14 September.

A Yes.

Q What I simply wanted to know was, in this note, in the minute, we haven't got a minute of 14 September in the Inquiry, but we have got this report by Mr Hill, and so in it, in the second-- third sentence is:

"Giving consideration to the options, the executive group will wait until drainage expert will give a preliminary scope on how they will carry out their work and see what they find."

I'm conscious these are minutes, but what was it that was encouraging the executive group on the 14th to wait for a drainage expert?

A I'm not sure that was discussed at the meeting on the 14th or was agreed at the meeting on the 14th. My recollection of that meeting is there was a lot of information shared, the options were discussed and it was a case of the executive were going to go away and have further conversations and considerations about it. I would interpret this minute as Kevin Hill reporting back on those discussions.

Q Later conversations?

A Those later conversations, which I wouldn't've been part of.

Q Yes, so from your point of view, as not a member of the executive group but from someone who's at the meeting of the 14th on the Friday, that meeting does discuss the possibility of a decant. To be fair to it, it doesn't make a decision to approve the decant at that point and then what happens, that Kevin Hill has described here, happens presumably over the

weekend.

A Presumably, yes.

Q Presumably, and then he comes and reports this back on the Monday.

A Yes.

Q Yes, the Monday, and then the decision to recommend the decant is eventually remade at this meeting, by the IMT, and then the decision to actually decant is then made by an executive group, which is reported back the next day. Have I got that right?

A That's my understanding, yes. I wasn't present at the IMT the next day.

Q No. So that's helpful because we'll ask those members of the executive group. Who was present from the executive team at that Friday meeting, from your recollection?

A I remember Jane Grant, the chief executive, was present. I know Jennifer Armstrong would have been there. I can't be definite about others but there was several. I imagine the chief operating officer would've been there as well.

Q That was Grant Archibald?

A Yes.

Q Right, well, there are people we can ask. That's helpful. Now, what I want to do then is to move on to page 194 of this bundle, which is the IMT of 28 September. The reason I've gone to this is because an event seems to happen at this where you report-- If we look at your statement as well, so your statement, paragraph 84, page 143. So, here, you're reporting that you:

> "…gave a brief presentation of your epidemiology findings at that IMT [the one we're swapping between] and then there was a discussion about the HPS report will be ready and I recall Professor Gibson, how I-- what I reported compared to the presentation that Dr Peters had given at the recent routine haemato-oncology antimicrobial use meeting. I replied that I could not comment as I had not seen Dr Peters' report."

Now, leaving the substance for this afternoon, in a sense, it's helpful that you've explained that you were told about this at the time, but that was 28 September 2018. When, if ever, did you see Dr Peters'-- either the presentation that was made of that meeting or the subsequent report she produced with Ms Harvey-Wood?

A Later in 2018. I couldn't

be definitive whether it was October or November, but there was a point, I think, towards the end of October, possibly where Dr Inkster was wanting to bring together the various epidemiology reports, so she could combine them into a whole and it was shared with me at that point.

Q So, by the end of October, you think you probably had seen----

A Yes.

Q Right, that's very helpful. We'll talk about the substance this afternoon. If we go back, look at your statement and go onto the next page, this seems to be you discussing Dr Inkster sending you an email on 10 October:

> "…asking for comments on the epidemiology reports available, prior to working to combine them into a single document."

Is that what, effectively, you're discussing, that moment when they all come together?

A Yes.

Q And at that point can we be sure that you, Dr Peters, Ms Harvey-Wood are all aware of what each other's doing at that point, even if you weren't before?

A Yes.

Q Right. So, could it be that your October 2018 report was only actually discussed at the 28 September IMT and then not discussed at an IMT later that year? Have I got that right?

A What I would say was it wasn't even the report; it was a brief verbal presentation I gave where I described where I'd seen particular peaks and troughs in the positivity of the blood cultures. The report itself I don't believe was ever circulated to the IMT or discussed again.

Q Right, and of course Ms Harvey-Wood and Dr Peters' thing, we don't see that was discussed either.

A No.

Q And the HPS report hasn't turned up at this point?

A No.

Q Now, just again to keep ourselves grounded, these are all three pieces of descriptive epidemiology?

A Yes.

Q Right. If we go onto paragraph 91 of your statement, which is – I think – page 146. Now, this is discussing an IMT on 30 November 2018, so we see that at the bottom of the page, and what I wanted to understand here is that at this point

we're still waiting for the-- If you go over the page, we see there we're still waiting for the HPS report. You haven't got it by this point.

A Correct, yes.

Q Yes. Now, I want just to pick up the narrative section:

> "However, since the patients have been decanted from wards, there's been a marked reduction in bacteraemia, which fits with the hypothesis. Dr Inkster expressed that, as a result of this, any future meetings discussed, report may not be required. The decrease in bacteraemia following the decant does support the hypothesis and the chosen control measures, though it does not prove it."

Now, I want to just expand on that with you. We'll obviously deal with what the reports say this afternoon but just from your point of view as an epidemiologist, what are the methods that one uses to intellectually structure the question, "Is there a link?" How would you go about that as an epidemiologist, a public health doctor?

A So it's about combining evidence of different types from different sources because all outbreak epidemiology, whether descriptive or analytical, is effectively observational. So you can never prove something the way you can, for example, in a randomised, controlled trial when you're testing a drug, which is interventional and prospective. So you need to----

Q And can you help us? We want to make sure. What do you mean by interventional and prospective at this point?

A So, when you're testing a new drug, you have a-- your study participants, you randomise them into two different groups, you give one the drug you're trialling and you give the other group a placebo or the alternative current gold standard therapy and you compare the two groups. Because of that study methodology, you have much stronger evidence to demonstrate causality that it's your drug that's working, and that's because of that----

Q Because you control all the other----

A Yes, and the randomisation element effectively controls for the variables you've not thought of or that you can't control. In studies like these, we're observing population groups where we don't have control over the exposures----

Q And you don't even have

full knowledge.

A No.

Q No.

A So you do have to build up the evidence. When you think about things like-- As I mentioned before about the Cupriavidus, we've got the same organism in the patient and in a potential source, locally, in that tap, so that strengthens that association. You always take the epidemiology and the microbiology and the environmental investigation as a whole; you don't take one piece of that. So, here, what we have is we've had a hypothesis that has been supported by both looking at the patient epidemiology, the-- this is a particular group of patients with a particular vulnerability, given their underlying diagnosis and their treatment, they're in a particular location in the hospital.

At this point, although there are multiple organisms involved, it's-- there are some predominating. There are a series of positive samples, like the water, demonstrating that the water supply isn't as wholesome as it should be, and then you put in the control measures and you see the control measures have a positive impact. So the control measures match your hypothesis, which is another string to the bow of the evidence that you gather.

Q Now, we've heard in a number of documents, including the report from Mr Mookerjee but also submissions from various core participants, and in responses to the case notes review from the Health Board, that there is an analytical approach known as-- from Professor Bradford Hill.

A Yes.

Q Is that something you're familiar with?

A Yes.

Q Merely as an aide-memoire, because he happens to have listed it, I'm going to put up bundle 21, volume 1, page 42 on the screen, and I'm going to encourage people not to look at the right-hand column because I don't want to get into the substance of what Mr Mookerjee is saying, but this-- he lists the Bradford Hill postulates and I wonder if we can just walk through them and discuss with-- them with you. So, again, ignoring the right-hand column, because that's what he's doing in his report, we have just three columns, index 1, guideline, explanation. I wondered if you could help me about, firstly, are these postulates and guidelines that you would use in your work?

A I wouldn't use them formally. I wouldn't sit in an IMT and go, "Well, we've got this one and this one and this one," but they are concepts that we train on in public health.

Q Right, so they're a structure in your mind rather than a tick box?

A Yes.

Q Right. To be fair to Mr Mookerjee, he has set them out as a series of boxes, but the first one, the strength or degree of association, is that in some way about the numbers?

A Yes.

Q So it's if you have more cases at a particular time, then that gives you a strength of association?

A Not necessarily, because in the criteria, as you can see, it lays out there it's about the relative position between two groups. It's not about the absolute numbers. It's about, well, this group have got lots more and the group who-- So it might be helpful to think about them in the context they were developed, to go back to the studies around smoking and cancer which is where these were built. People who smoked, much more likely to get lung cancer than people who didn't smoke.

Q I see, and then

consistency, is this that you, effectively-- what Mr Mookerjee has written down here, effectively, that if you keep getting this association when the same thing happens, that's another factor?

A Yes, or additionally to that, if you have different people doing similar studies on the same topic and they keep coming out with the same results.

Q Right. Now, specificity, have I understood that to be more that-- the absence of other explanations, in a sense? In the context of going back to the cancer and smoking, there isn't another explanation for why these two-- this association would happen with this level of consistency and therefore that's specific? Is that what we mean by----

A Yes.

Q -- specificity? Right, okay, and then when we come to-- over the next page, temporality seems to be, to us lawyers, obvious it's happening at the same time.

A Or the exposure happens before the outcome.

Q Yes, and a biological gradient is the worse things get, the more you get of the thing that's caused by that measure.

A Yes. If you smoke 40 a

day, your risk is greater than if you smoke 10 a day.

Q And then plausibility is a scientific understanding of how it might happen if it was happening.

A Yes.

Q So if you can't explain why all these things have happened, that's a problem.

A Yes.

Q Right. Now, coherence, how would that work in the context of understanding an infection in a hospital? When would there be a discoherence between-- If you have a putative microorganism, you find it in some patients, you find it in the-- you have these cases, when would you show a non-coherence?

A So, I think there's a good example of that in the statement, in the minutes and back to the descriptive epidemiology around the Stenotrophomonas cases that I was discussing. Epidemiologically, that seems like quite a strong association that these cases will be linked, given-- We use the phrase "time, place, person." So we had those particular individuals effectively mixing on the wards together. Even if not directly, they were in rooms next to each other, they were in the room at the same time----

Q Same taps----

A They were using the same taps. At least two were in the room with the showerhead where it was found. So that's a strong epidemiological association and there's a strong basic microbiological association in that they all had the same organism, but then you have the issue of the typing----

Q This is the whole genome sequencing?

A No, prior to that, this was-- the typing came back as saying they were all unique. So this is the----

Q So, the bacteria involved in all these locations and all these patients were unique?

A Yes, which is where you have a lack of coherence, and then that gets you into the topic that I know (inaudible) how much does typing tell you in this sort of----

Q I want to do that this afternoon in substance, but it's useful to hook it in here so we know we're going to do it. And then experiment, is this where you look at interventions and see whether they have an effect in this context of epidemiology?

A Yes.

Q So if you put the filters on, for example, and you have reduction, if you fit chlorine dioxide,

you have a reduction.

A Yes.

Q But of course you can't often tell which is the one that's working and which are just nice.

A Yes, and that's a very well recognised issue in hospital and infection control, that control measures are often done as bundles.

Q Because you do everything you can do?

A Yes.

Q Right, and I think I've-- we've understood that at some point there's a dispute in 2019 about what part of the consequence is due to line safety improvements, what parts do with hand cleansing and what parts to do with water. Is that an example of this overlap of things being done?

A Yes.

Q Right, and then the final one he lists is analogy and I found that a little bit hard to understand. Next page, please. What would, in the context of a hospital epidemiology outbreak, be analogy as a factor? What would we be looking at? Because you may be able to helpfully connect it-- these things to our story.

A Yes, so if I give the smoking example again, first, smoking is very clearly associated with lung cancer but it's also associated with other types of cancer as well in other parts of the body. So, because we've got the evidence on smoking and lung cancer, the analogy is it may well cause similar problems in other organs. From a hospital perspective, I think the analogy would be other outbreaks occurring in other locations. Have other hospital locations dealt with outbreaks of a similar nature----

Q When you say "other locations", do you mean other hospitals?

A Other hospitals, other jurisdictions, not necessarily even in the UK. Have they had similar things? How did they deal with them? What was the outcome? I was----

Q So, you might, for example, in our environment, be looking at the Northern Irish issues with taps, for example, as an analogy.

A Yes.

Q Right, that's very helpful. We'll take that off the screen. What I wanted to do was to ask you just in terms of our approach to these things. So this is an Inquiry that set itself the task of answering certain questions, one of which is, to what extent is there a link between the infections in the hospital environment? Do you see that form of an analytical structure as something that we might consider

using to work out our answer and if you don't, why, and if you do, are there any pitfalls?

A So I think it is a useful analytical structure. I suppose the principal pitfall is the-- at this time and distance, how sure can we be about whether certain things happened. I don't know if that makes sense.

Q No, I think it does, because we've had great difficulty working out what's-- Just watch you and me have a misunderstanding about when the filters were fitted. So that would be the main thing, it's just being sure what happened when it happened.

A Yes.

Q Okay, well, that's helpful. Now, what I want to do is go on to the bottom of page 146 of your statement. I just wanted to check something, maybe my misunderstanding again, paragraph 94. So, at this point, you're talking about the autumn-- well, November of 2018. You've just been discussing when your October report-- when you had the email exchange with Dr Peters about all the epidemiology reports and we looked at IMTs from then, and you say:

> "The IMT was still functioning at this time, although – given the outstanding reports that were awaited – there were some loose ends that should've been pursued rather dropped."

I've got the impression from all the evidence that there were multiple IMTs. This particular one, the water incident IMT, did end in November, and then another IMT was set up, a brief one for a different infection, then the Cryptococcus comes along and then there's another one for gram-negative the following year. So when you say "the IMT," do you mean the water incident IMT?

A Yes, this sequence of IMT meetings, and I think that – maybe excluding some of the things that could have gone better – is because you have the February/March to May water, we have the summer water and drains and then we have the subsequent IMTs in the September to November and then the Cryptococcus and then back to the issues around gram-negatives and potential environmental exposures in the summer of 2019, and they all run into each other and bleed into each other a bit.

Q They do, it's quite hard to work out what's going on. Before you go a bit further, let's try and understand what's going on.

THE CHAIR: Can I just really make sure that I've got the note of what Dr Kennedy has said? We're using the definition of IMT as an indication of potentially a series of meetings dealing with what is seen, at the time, to be a particular problem. And I'm right so far?

A Yes.

Q Right. Now, you have given us a useful rundown of what you saw as the problems being dealt with in the IMT meetings in 2018 and 2019. I really just want to take it at dictation speed, your listing. So you began with February/March 2018 and the problem, as you saw it, as you understood it then was----

A That was the water supply issues. That was the first one I was involved in.

Q Right, so we can call that the water incident.

A Yes.

Q You then mentioned somewhere water and drains?

A And that was in the summer of 2018.

Q You then mentioned something which I missed.

A And then you have, effectively, the IMT meetings continuing in the autumn of 2018. Again, this is about water and drains and this is where the decant is ultimately agreed and those meetings continue to the November.

MR MACKINTOSH: Which is when we get this marked reduction in-- which is discussed at the top of the page that's been on the screen. Right.

THE CHAIR: The next problem was Cryptococcus.

A Cryptococcus, which was December to February 2019.

MR MACKINTOSH: Which we're about to come to, my Lord.

THE CHAIR: And the final one was gram-negatives.

A Recurrence of gram-negatives, which was summer and autumn 2019.

Q Thank you.

MR MACKINTOSH: Early on in the Inquiry, I put to various of the HPS nurses that there hadn't been wrap-up debriefs at the end of IMTs and I received-- or the Inquiry then received copies of hot debriefs carried out by Dr Inkster after some of the IMTs, not just the ones you're talking about, the ones beforehand. So it does seem there was a practice of, at least on many occasions, carrying out a hot debrief at the end of an IMT. Is that something you are aware of?

A Yes, but before I come to that, could I just pick up a point from

Lord Brodie around the definition of IMT?

Q Yes, of course.

A This might be quite helpful because we often use IMT as a shorthand for the committee meetings being held by the Incident Management team, but they are two very closely related but separate things. The IMT is the multi-disciplinary, multi-agency group you've brought together to deal with----

Q The team is more than just the meeting?

A Yes, absolutely. I think that's an important point.

Q So----

THE CHAIR: I think that's an important point to make. Thank you.

MR MACKINTOSH: There seems to be some material that suggests that certainly up until the end of the water incident it was the practice to do some relatively informal hot debriefs at the end of IMTs. Is that something you were aware of?

A Yes, that would be standard practice for any IMT. You do-- It's almost a two-stage process. You do the hot debrief, which is fairly soon after the ending of an IMT, usually within a couple of weeks or a month or so, and that's usually structured around the fairly standard three questions. What went well? What didn't go so well? What could we do better next time? And that information is all gathered to catch any initial learning, and subsequent to that there would then be a report of the IMT into the incident, and we are probably less good at doing that, and they can come in various forms. We have in the National Guidance, the MPHI document template for a minimum dataset of the----

Q And the MPHI is the public health version, as it were?

A I would say it's the senior document, in terms of it's the Scottish Government guidance on how incident management should function when led by the NHS.

Q So, you would see the National Infection and Prevention Control Manual, section 3, that deals with IMTs as, in some sort of structural way, subordinated to that document. Is that right? Am I going to get outrage from various people that you said that?

A The way I would describe it is that chapter 3 of the National Manual describes some of the basics of incident management and in particular where incident management processes might be different for a hospital-related incident, the most obvious example being the required

reporting and communication chains. Some of the definitions of an outbreak are slightly different, but it's not comprehensive. Whereas the MPHI document has a lot of information----

Q Is this the MPHI document?

A MPHI, which is short for the Management of Public Health Incidents by NHS-led Incident Management teams.

Q I'm sure that will make the person doing the transcripts very happy. Having worked out that there are-- there were the hot debriefs, and I'll come back to whether substantive reports were done in a moment, there was – but I don't think you were at it – a late-May 2018 debrief meeting from the water incident, chaired by Ms Imrie from HPS. Were you aware of that happening?

A Yes, I've certainly seen the record of that meeting, if I wasn't present at it.

Q And there seems to have been a report produced from that meeting. I wonder if you'd seen it? I'll see if I can get it-- It's listed in your documents. It's bundle 27, volume 5, document 18, page 46. So this appears to be a report following that debrief in May 2018. Have you seen this before we put it in your bundle?

A So, I don't recall having seen it. I comment on that in my statement that this is the sort of incident report I would expect to see. I don't recall having seen it, but it would be, in my view, normal practice for it to be sent to all IMT members, so I may well have received it, but I haven't----

Q Well, I'll just ask you about-- I think it may be a standard form document because you see at the bottom of the page, after type of incident and it reports environmental gram-negatives and fungi from biofilm and bacteria, it then says, "Main primary exposure: food," which surprises everybody, until you read the-- turn the-- go to the next page and we see that water is highlighted. So it looks like it's a template. Would that be right that this will be a template-style document?

A Yes, and it's very similar to-- I mentioned the minimum dataset included in MPHI. It's very similar to that.

Q Right, so we can take that off the screen because obviously if it's not something you've seen, that's-- I won't put it to you directly, but I get the impression from those who were involved in that debrief that it was quite a big exercise and that was the end of May. Would that have been quite a

big IMT from your point of view? Would you agree with that?

A Yes.

Q Yes, and so could it be that one of the reasons why there weren't similar debriefs and reports later on that year is that to some extent the pressure of work on the IPC team, and particularly Dr Inkster, was huge by November 2018? Would you accept that?

A Absolutely.

Q How would you react to the suggestion that whilst it's good practice to do what you said, that's only really if there's the resource available to do it? Do the follow-up work. You only do the follow-up work if you've got the people and the time and the space in your head.

A Yes, and that's something that both infection control and public health teams find fairly frequently that doing that, particularly full IMT reports, is something that is often overtaken by the next reactive issue that's coming in. I think I'm probably more referring to actions that have started in the IMT – for example, "Let's have epidemiology reports and look at them" – not being closed off rather than the subsequent reporting.

Q Right, so the point you'd like us to hear is that you feel that by the time it got to November, it would have been good if that comparison exercise that Dr Peters had started had been finished and that your report and Harvey-Wood's report and the HPS report, whenever it turns up, will be looked at together and some thoughts, conclusions reached? Is that what you're effectively saying?

A Yes. I think it was Dr Inkster who was going to bring them together but the-- and because, as well as supporting the incident response, it can also be used to support the understanding of the antecedence of the incident: why did this happen in the first place and can we understand better what's going on in the hospital, even if it doesn't directly affect the decisions around the acute control measures?

Q Now, this is quite a difficult question to ask you, but I want-- I'm interested to see what the answer is. We've had evidence that throughout the period of '18-- in fact before then, certainly back to the opening of the hospital and possibly before, relations within the Infection Prevention and Control team in NHS Glasgow in South Sector hadn't been as good as they could be, to keep it very high level, and that people are under pressure, people have resigned,

there have been attempts to reorganise it and restructure it. How much were you aware of this cultural-- these cultural issues when you are taking part in this IMT in 2018?

A At the IMT in 2018, not at all. That's not something that's being raised in the IMT.

Q So, you're effectively coming in from outside and you don't know the context, however toxic it might or might not be?

A I had a very limited understanding of, there were issues because I recall going to an Infection Control senior management team meeting when Anne Cruickshank has been brought in as the clinical director.

Q Yes, that was much earlier.

A Yes, because of-- there were issues. I didn't have any understanding of what those issues were, other than there were issues within the team, so a more senior medical manager had been brought in to support that team.

Q And by the time we get to these events, Anne Cruickshank no longer was in post. Her post had ended.

A Yes.

Q Yes. How would you react to the suggestion that you're slightly coming at this from an idealist perspective? I'm now putting this entirely at a too exaggerated level to see what your reaction is, but you've come in from public health where things happen-- and I don't think they happen calmly at all, but things happen in a different way. You've arrived in the middle of what must have been a very, very busy year for Infection Prevention and Control and now you've got all these suggestions of how it could be done better. How would you react to the suggestion that that's not-- you're not really getting the context at this point, that things are actually a little bit harder than you're giving them credit for? How would you react to that suggestion?

A So I think it's absolutely fair to say, yes, I didn't have that context. I'm not sure I would describe the suggestions of how to do things better as being idealist, because it's-- one of the aspects of public health practice is the recognition of, you can't do everything in an ideal way. So some of the things that are suggested in terms of improvements of how IMTs could function are things that are more, I would say, just common sense and routine best practice, things that we didn't previously have written into our local incident management plan

because we just expect that to be what happens, whereas now we're stating it in black and white.

I think it's one of the keynotes of public health practice, is pragmatism and proportionality. For example, if we're looking at control measures, there are often control measures suggested in guidance for a particular disease that we would do in an ideal world, but we just can't make happen or the proportionality is not there. So I wouldn't describe it as being idealistic or an attempt for perfection, no.

Q Now, what I want to do now is move on to Cryptococcus and page 148 of your statement. Your statement was produced, I think, before Dr Peters produced her statement and before she gave evidence and I wanted just to put two things to you about your interaction with her and the events in Cryptococcus. Now, one of them, I'm not sure actually when she came to be aware-- she quite went as far as she went in the statement, but she observed that-- she'd described it in her statement as detecting an undertone of casual sexism about her views and her experience.

Now, to be fair, in that paragraph it looked as if she could've been describing that to a number of people and in evidence she seemed to be describing it more to the Estates people involved, but do you have any comment to make on that particular part of her statement which was-- in that particular observation by her?

A Yes, and I did look back at the transcript of her evidence and I think she's very clear, her understanding matches my recollection, which was we didn't actually have any conversations of that nature at all between myself and Dr Peters.

Q Well, that's helpful, so we can move on. The other bit was more a meeting that I think did happen and I want to understand what you were doing when you were doing it. So there's a discussion in a number of people's statements who are present at the Cryptococcus IMT that you were googling information in the middle of the meeting about the size of Cryptococcus spores and the quality and effectiveness of filters. Now, you have a particular take on what you were looking for that isn't reflected in your statement because it predates you seeing that information. So what, in that IMT, were you looking for on your computer?

A Yes, I certainly wasn't randomly googling Cryptococcus. As

part of preparation for IMTs, particularly something like Cryptococcus, where our involvement is-- or our experience is much less, I had been reading up on Cryptococcus. I'd been looking at peer-reviewed journal articles summarising the nature of Cryptococcus and its presence in the healthcare environment and I was trying to relocate one of those review articles because I thought it was relevant to the discussion that was ongoing.

The discussions are ongoing in an IMT like that, particularly if you're getting into things like air handling units and filter sizes and can be fast moving and can be confusing. So what I was trying to do was make sure I had the understanding of what was being discussed and checking whether actually what was being discussed matched with what my understanding from reading the background literature was.

Q What was being discussed at that point?

A I think it was about whether or not the filters that were in place were suitable or effective enough to stop Cryptococcal spores from entering the hospital.

Q So that's the filters that were in place at the time, not any potential filters that should or may have been fitted?

A Yes.

Q Right. Do you recollect what the debate was about at that point, who took different positions and what's the ultimate conclusion that the IMT reached?

A I can't recall who took what positions or what was precisely said. There's an action in the minutes that says different filters were going to be sourced and fitted.

Q Right. So it may well be that the filters that were there weren't quite as good as they could have been, but you can't remember the details?

A Yes, I think there's a comment in one of the minutes about-- I can't remember the exact wording, but it-- the gist of it is they're probably good against quite a lot of-- they'll stop a lot of the spores but aren't guaranteed to stop all of the spores getting through.

Q Well, I want to go to your report on Cryptococcus, which is bundle 24, volume 3, document 3, page 18. Now, this report is in your standard style, so it's easy to recognise.

A Yes.

Q This appears from your

statement to be a report that you were asked to produce by Dr Armstrong. Have I got that right or am I misunderstanding there?

A No, I think that was produced following discussion at the IMT, not at Dr Armstrong's request, no.

Q This report, you have some conclusions and I wanted just to take through, firstly, when this is produced. So if we go to the end, so page 19, "Special Report," next page. Yes, keep going to the end. I think I'd better get mine on my screen so I can give a page reference. Yes, so if we go to page----

A I think it's just been----

Q 20. So, you have a summary at the bottom. So, what I want to do is just check that we understand-- So, firstly, do you recollect exactly when this was produced?

A The version I've got, it's got a date at the bottom of 10 January 2019.

Q That's helpful because we didn't have a date. So this is quite early on in the Cryptococcus IMT's life?

A Yes.

Q If we could look at that page, and I want to just take from you a little bit more about these observations. The first line, the statement, "The Cryptococcus species as a whole are rare with only 19 cases over ten years", is that in Glasgow?

A Yes.

Q Now, we've obtained a report from a Mr Bennett which I haven't put to you, but he has obtained information from the reference laboratory which suggests that the number of cases in the whole UK of Cryptococcus neoformans may be in the 30s. Would that be something that would surprise you? So it's not a very large number, even across the whole UK, annually, 30 or so cases.

A That would-- 19 over 10 years. I'm just thinking of multiplying up.

Q That's all Cryptococcus, remember, if you're-- that row, isn't it?

A Yes, and it would also only be those isolates that are forged onto the reference lab, and I don't know what proportion of----

Q Well, indeed, that's one thing he observes, but it's certainly rare is the main point.

A Yes.

Q Right. You observed in the earlier part of the study period, the cases are dominated by patients with HIV and the recent year is mixed, and then the third, you talk about the

highest number of cases clustered in the second half of the year and the second item is 2010. In 2018, it's the fifth bullet point:

> "The cases are predominantly in patients with underlying haematological conditions. [And then] As well as the two previous HIV cases, there were five cases attributable with hospital"----

A Healthcare-associated----

Q Yes, right. Could you just explain the difference for us? Because it's an issue for various people.

A Yes, so hospital-acquired infection is assigned when the belief, the preponderance of evidence, is that the infection has been caught in the hospital environment.

Q Is that because of a time control?

A Mostly. So there are standard definitions used for surveillance of certain infections, particularly Staphylococcus aureus bacteraemia where there is routine surveillance and reporting from all hospitals in Scotland and there is a very set definition of 48 hours.

Q So, that's a hard Scottish definition for reporting purposes?

A For those surveillance systems, and they are very useful for surveillance because you want to be precise about which infections fit in which categories----

Q And you want to be comparable as well?

A Yes. When you're dealing with an outbreak, that might not necessarily be the most appropriate cut-off but it's the starting point.

Q And so if it's not within the-- after 48 hours of arrival, then it becomes a healthcare-associated infection? Effectively, it's a binary choice, one way or the other.

A No, because the third choice is community. So, healthcare-associated infection is where there is-- it doesn't meet the definition of a hospital-acquired infection but there has been some form of healthcare interaction recently that might cause a route of transmission. So the example I've given there is if you have bloods taken within 30 days of your infection, that's counted as being healthcare-associated because you've had a needle breaking the skin. And it might be that you have been discharged from hospital recently, so although you might have got it in the community, maybe you got it in the hospital.

Q So, before we come to Cryptococcus and how it affects them, just while we're talking about it, if you have----

THE CHAIR: Could I just check something? I understand the distinction you've just drawn between an infection which is classified as hospital-acquired because it's observed within 48 hours of inpatient admission to a hospital as opposed to an infection which arises, I think you said, within 30 days of some health intervention.

A Yes, and there are additional items under that definition, but yes.

Q Right. Now, just checking, where are you drawing that definition from? Because my recollection, which may be imperfect, is that the use of HAI and HCAI are not always quite as clear cut as you've just defined. So what's the document or source for your cutoff?

A So in terms of the 48-hours cutoff, that's part of the-- I'm trying to find the right word, the statement of process for national surveillance of certain infections.

MR MACKINTOSH: So that's coming from the people who do the surveillance. "We want you to report it this way"?

A That's too coming from ARHAI, yes.

THE CHAIR: That's coming from ARHAI?

A Yes.

MR MACKINTOSH: I'm going to come back to an alternative definition in a moment, but what I want to do is just understand the practical consequence of this in a different patient cohort before we get to Cryptococcus.

A Yes.

Q We've obviously had a lot of evidence in this Inquiry about the cancer journey of children and young people in the Schiehallion Unit and so we've heard how people will not only come in, children will come in, for long residence stays and treatment as inpatients for many, many days, but also will come into what's now Ward 2B and then go home and then come in again and go home.

So, if someone is coming in as a day case, even though they might have been admitted to the hospital but they don't stay overnight, they're never going to reach the 48-hour rule, are they? So they will never be a HAI by the ARHAI definition.

A Correct.

Q But they will be, potentially, a healthcare-associated

infection.

A And, in fact, my understanding of the definitions is because they have the indwelling lines, they will always be an HCAI, because they have that present, whether they have come in for a day case recently or not. Because they have the line-in, that is sufficient to meet the definition----

Q So they're permanently in one category?

A Yes.

Q Which most of the people in that category are going home and getting on with their lives, but these particular group of patients permanently sit in HCAI? They can never be HAI until they're admitted overnight, and not for 48 hours, but they have a high level of contact with the hospital?

A Yes.

Q Yes, right, and then when it comes to Cryptococcus, might there be another difficulty to do with the dormancy period of the time it takes to come out and infect you? Have I got that right?

A Yes.

Q So, how would that, as it were, interact with the definitions?

A So, I think one of the big problems with the dormancy period is its variability.

Q For Cryptococcus?

A Yes. We can only use the definitions we have in that sense, and it would be beyond public health competence to come up with different definitions specifically for Cryptococcus.

Q But the consequence is that you might have a patient who is exposed to Cryptococcus at home, maybe because they have pigeons, and they then come into the hospital some months later and their test is more than 48 hours after they arrive in the hospital, and certainly people might start thinking of them as a hospital-acquired infection even though they're not. Have I got that----

A Yes, that's possible.

Q Possible. But, equally, you might have a patient who has no association with any source of Cryptococcus, comes into the hospital, spends a few weeks there, goes home, gets on with what's going on in their life for a bit, then comes into hospital and-- and gets a positive test, but they're not a hospital-acquired infection because it's been so long ago that they've actually been in the hospital.

A Yes.

Q Again, there's a problem

with that, and so you're telling us, don't start messing around with the national definitions because it will confuse people, effectively, is your position. The definitions of HAIs and HCIs.

A No. What I'm saying is they're very useful if you're doing something like surveillance and you're looking for that comparability across time. When you have an outbreak situation, you might want to think more broadly, and COVID is being considered elsewhere, but one of the things with COVID is we had definitions that we were using, in terms of how long we asked people to stay at home for, which were actually slightly longer than the average incubation period for COVID, which in itself is four or five days longer than that 48-hour HAI rule.

Q So, you were missing potentially, in some senses, what might be HAI----

A Or potentially incorrectly attributing HAI to someone.

Q Yes, so these are important definitions for the purposes of surveillance, but you might need to be a bit more bespoke when you're doing analysis for a particular----

A Yes.

Q Right. Now, what I want to do is, having looked at these

summaries, go back to table. It's two pages back. Yes. Page 19, please, sorry. Now, very conscious that this is very bright and colourful, but the reason I want to show it to you is because I'd like to understand something and ask you a question. If I understand it correctly, you are ascribing-- you're reporting that in the--4/2014, the majority of patients are HIV patients.

A Yes.

Q And there are quite a lot also of advanced liver disease patients, which I'm assuming what ALD is.

A Yes, alcoholic liver disease.

Q Alcoholic liver disease, sorry. And am I right in understanding that Cryptococcus is certainly rare but a more common infection or more frequently found infection in those two patient groups than other patient groups? Is that something that we've understood correctly?

A Yes.

Q Right. So, whilst individual infections are extremely bad for individual patients, there is something – as it were – non-surprising about seeing those green and red squares. Is that a fair way of understanding it?

A Yes.

Q We then have four cases recorded in 2018 in blue and these are haematology patients.

A Yes.

Q What do the asterisks mean?

A So the asterisks are those who meet that standard surveillance definition of either HAI or HCAI.

Q Right. So, you have two patients who do meet the definition, and, in fact, [redacted] 2018.

A Yes.

Q Yes, and then we have two further patients who don't meet the definition of HAI.

A Mm-hmm, in the blue haematology group, one who does, one who doesn't.

A One doesn't, right. Then, we have another patient at the top who's not a haematology patient who does meet the definition.

A Yes.

Q Now, am I right in thinking the reason they're all in the column is because they're all relevant to your work? You're just mentioning on the way past that some do and don't meet the definitions.

A Yes, so if we talk about the relevance of the work----

Q Yes.

A -- and the purpose of this type of report----

Q Yes.

A -- so it does include the two patients who were subject to the investigation in the process of the IMT, but lots who don't. So, this is a process called case finding----

Q Yes.

A -- which is part of the standard outbreak and incident management process, you do a step of case finding, and so what we're doing here is looking-- are there any other-- We know about these two patients. Are there any other relevant patients?

Q And this is you doing case finding, effectively?

A Yes.

Q Right. The reason I thought that case finding was interesting was-- These cases, would they all be cases where there is a consensus that the patient actually did have Cryptococcus and not where there's a debate over whether they had Cryptococcus?

A So, these are patients who had a positive Cryptococcus blood culture result. So there isn't a clinical element added to that.

Q Okay, and why do you not add a clinical element?

A It's about what data is available to us in Public Health and the time to complete. So, what we've done is we've identified the results, identified which patient that results to, and then reviewed the electronic notes.

Q So, you can do this, effectively, without disturbing-- without reading the notes? You're just looking at the high level-- what blood tests they were having, effectively.

A No, we're looking at the-- So, we have an electronic medical record system. So we can see some of the notes made with our inpatients. We can see any referral letters or test results or any things like that.

Q Now, you-- There was eventually a Cryptococcus expert sub-group created following on from the IMT, and you weren't a member of that?

A No.

Q It seems-- Since you did this work, why were you not a member of it? How did that come about?

A I don't know how the membership of that group was agreed. I wouldn't necessarily see us as being an essential part of it because, as I said, all we're doing here is doing that

case-finding piece, and we were probably in this IMT, think, do you want to include any of these cases or not in your case definition and look at them as part of the IMT? And the reason you do case finding is because if you have-- if you're missing cases, you don't have all the information about the outbreak.

Q Yes.

A But, given the clinical histories we could access about the other patients – as I said, the two patients whose condition had prompted IMT are included in this, they're on this chart – having concluded that these patients weren't relevant for the IMT, there is no justification for doing any further work with them or looking at them in more depth.

Q Because the thing that intrigues me about the work of the-- Have you read the Cryptococcus expert sub-group's report?

A Only in the bundle.

Q Only in the bundle. I won't put it to you for that reason, but I want to just draw out an observation that I've had to see what you think of it. It also does some patient finding, and it doesn't quite find the same patients. There's a slight difference, but it, broadly speaking, has the same

shape----

A Yes.

Q -- of the table or the graph. Its report is finalised two years later in 2020-- well, four years later in 2022-- three years later, and I'd like to understand this patient-finding concept with you, because there is a case which the Inquiry is aware of in the summer of 2020 which involves a child who does have a positive blood test result for Cryptococcus neoformans but is not assessed by the then lead infection control doctor as being a Cryptococcus case. There is a discussion about whether it is, and there's a disagreement between him and the treating clinician, and the Health Board position is that is not a Cryptococcus neoformans case, but it would meet your test in this patient-finding exercise because it has a positive test and [redacted] was an inpatient in the hospital.

When you're doing an analysis of the context of the cases you're investigating – investigating the two cases in the hospital that we see on-- that we saw on the table where the patients [redacted], that's what they're investigating – would it be relevant, from your perspective, to take account of a patient a year or so later, who had a positive bloodstream-- PSI result for Cryptococcus even though other people, including the lead infection control doctor, conclude that, "No, actually, it's not a Cryptococcus case"? Would you still put it in the mix to have a think or would you exclude it? How would you say best practice encourages you to go?

A Yes, so if we go step-wise----

Q Yes.

A -- first, with the case finding, you've identified these cases, and in this case, with this report, the view is they weren't relevant. If you thought, "Well, they might be relevant," that is-- then you get into the conversation about, "Is this a genuine case? What's the clinical picture? Do they meet our case definition?"----

Q So, you'd have to have a case definition?

A -- which is effectively the step before in-- and we often teach outbreak management as a 10-step process, and the case-finding step for case definition would be step 3. So, a key part of any IMT's role is to agree the case definitions to say, "Well, what"----

Q So, before you did this, would the IMT have agreed the case definition before you did this piece of work?

A Yes, there should be a case definition recorded in the minutes.

Q Right, and-- Well, why don't we look for it? Because I think it might be-- Why don't we have a coffee break and I'll look for it? That's probably more efficient. I'll just see if there's a couple of questions I can pick up before we do this. (After a pause) If there's nothing to do, my Lord, I might suggest we have a short break. I'll find that minute. We're a little bit early.

THE CHAIR: So, we'll take a coffee break now.

MR MACKINTOSH: Take a coffee break. I'll find it. Otherwise, that might just take a bit of time, me charging around the screen and finding it.

THE CHAIR: Right. Dr Kennedy, could I ask you to be back for-- Just checking-- Well, let's say quarter to twelve.

THE WITNESS: Certainly.

THE CHAIR: Thank you.

(<u>Short break</u>)

THE CHAIR: Mr Mackintosh.

MR MACKINTOSH: Yes, so what it was, Dr Kennedy, before we broke for the coffee break, is that you'd mentioned that your report would have come at a stage after a case definition would have been produced for investigating the potential incident, and we thought we might find a copy of the case definition in the IMT minutes. Now, I haven't found it, but I found something that might be similar, so I thought I'd take you to bundle 1, page 288, which is in a minute-- If we go back to page 286, it's a meeting of 24 January.

So, this is the eighth meeting of the IMT, and if we go to page 288, we have a "Microbiology reports" section, which doesn't seem to concern-- report your actions, but there might be something on the next page. (After a pause) No, it's not there. If we go back to 248, perhaps – we'll try that instead. So, this-- if we go back to the previous page-- before that, 245. Here we are, 20 December – so we start off the meeting – it probably wasn't then because your report's dated January. We should probably be looking at the IMT minutes after the-- after your report. So I think we should go and look at the IMT of 17 January, which is document 59, page 266.

So this is a meeting which you're at in the morning. It's a long meeting on 17 January. Do you remember how long these meetings were?

A Yes, I think there might have been a-- we might have reconvened later in the day that day, though.

Q You did, yes. So, the section that I wanted to look at is-- This meeting follows your data of the report. We don't have, at this meeting, any discussion of you doing a report or producing a report, and there's not one at the afternoon meeting either, but there is something on the one the day before on 16 January, which is on page 261. Do you see, "Current risk to patients," at the bottom there? Dr Inkster had contacted Bristol, and there's a discussion of, "The strain had only been seen once in NHS Greater Glasgow." Do you see you're mentioned there?

A Yes.

Q Now, what I'm beginning to suspect from my sort of flailing around these minutes is there isn't a happy paragraph that says, "The case definition is X." How sure are you that there was a discussion of the case definition in early 2019?

A I'm not. I think before the break I was of kind of talking of what the best practice would be----

Q Right, okay. So----

A -- to explain why-- what the process of the IMT, considering the outputs of the report I produced, would be, that if any of them had been considered relevant, the case definition should be applied. I----

Q Because there's also not in these minutes any discussion of your report either.

A I think there should be in one of the meetings, because there's a meeting that I didn't attend but Hilda Crookshanks, one of my nurse specialists, did attend, which might have been this time.

Q I think what I'll do with that, I'll leave this now.

A Yes.

Q You've got bundle 1 on your computer, I understand?

A Yes.

Q I'm going to set you some lunch homework to find this entry because I can't find it, but we'll move on. I want to turn to something in Dr Walker's report for the Inquiry, which is bundle 21, volume 1, document 5, page 180. So this is the report, and I want to go to page 251 and you see at 5.51, Dr Walker's given the definition of:

> "A healthcare associated infection (HAI) is a problem which develops as a direct result of healthcare interventions, for

example, medical or surgical treatment, or as a result of direct contact with a healthcare setting."

Now, he references that to NICE. I wonder what you-- how you feel about that as a definition of HAI.

A So I think that's a definition of HCAI.

Q Right.

A Because we would use the initialism "HAI" to refer to-- specifically to hospital acquired.

Q Yes, well, this is hospital associated.

A Yes, or healthcare associated.

Q Healthcare -

A So what we would refer to as HCAI.

Q Yes. So, he's taken his abbreviation in a different way?

A Yes.

Q And we'll ask him whether we should read HAI throughout his report by that definition. Take that off the screen. What I want to do now is to go to paragraph 141 of your statement, page 160, which is a discussion of Mycobacterium chelonae. Now, actually, it starts the previous page, paragraph 140, and you discuss the minutes of the 25 June 2019 IMT meeting.

Over the page, and there are six-- of the six cases, two were hospital acquired infections and the other four were healthcare associated infections. Two cases of Mycobacterium chelonae in the past 12 months. The last case had been a blood culture taken in May 2018, and most recently a sample in May 2019. Now, I understand you might have produced a briefing document on this for Dr Armstrong.

A So, I produced a briefing document for Dr Armstrong on atypical mycobacteria generally. I didn't produce a briefing document on these cases or the specific incident.

Q Ah. Okay. Well, we can find the email about this at----

A Yes, I think I reference it in another paragraph in my statement.

Q You do, and I'm trying to put the two together, forgive me. If we look at bundle 14, volume 2, page 562, and then go to the next page and keep going past the next page, we get to the start of it. So, 13 August 2019, so it's a bit later on, you seem to be sending to a group of people, a briefing note on-- a non-tuberculosis mycobacteria briefing note and you're asking for comments. Now, we don't have the note, so all we have is the comments, which is the next page. We have a long email from Dr Inkster for-- Yes, that's the one, yes, and that's her take

on the matters.

Now, the reason I wondered whether this report might have discussed actual cases is because Dr Inkster's comments discuss actual cases. So would your report have discussed the actual experience of the hospital for atypical mycobacteria in recent times? Your briefing note, sorry?

A I don't recall it doing that, it would be more general. I'm sure I could find a copy for the Inquiry, if that would be helpful.

Q I think it might be helpful. The reason is, is that Dr Inkster believes that there was a proposal to somehow remove, from that report, references to Mycobacterium chelonae, and now, I'll ask her next week about how that came about and how she knows it, but we haven't got a copy of the report so it makes us slightly less efficient.

A So, I think when Dr Inkster is referring to removing mentions of the specific organism from a report, that's not referring to the briefing note I did for Dr Armstrong but for the HAIRT, the routine infection control report that goes to the public board meeting.

Q I see. Right, that makes more sense. In fact, don't produce the briefing note. So, what's your take on these events that she's describing?

A So it had been a meeting of the Board Infection Control Committee that Dr Armstrong was chairing.

Q Can we take this off the screen?

A There's always a discussion about the reports to the Board, the HAIRT at BICC. It goes through that as part of the governance chain and Dr Armstrong asked for a background note for her personal use in case she got asked any questions about atypical mycobacteria by Board members.

Q Right.

A Not specifically about the outbreak.

Q Right, and that's the briefing note that you produced?

A That's the briefing note that I produced. I recall Dr Inkster wasn't at that meeting of BICC.

Q So, that would have been in August 2019? Early August 2019.

A Yes. Yes, I believe my recollection was that she'd initially given apologies for lateness because she was attending a meeting about the rebuild of 2A that was running on. So I prepared that.

Q Could it have been at the

end of July, about 29 July? Would that be a possibility?

A Yes. Yes.

Q Because you're there and she's not?

A Yes.

Q Right.

A And we do have some experience of mycobacteria in public health. We look after the TB liaison service. We'd handled some atypical mycobacteria situations. It's a literature review. It's something well within the competence of the public health team to develop that report. I'm sure it's equally in the competence of the microbiology team to do it but it had been tasked to me by Dr Armstrong, but I wanted to make sure that I had gotten all the relevant information and feedback before it went to Dr Armstrong, hence, sending it to that small group of people who were relevant. So it's Dr Inkster, Sandra Devine and Tom Steele who asked for their feedback.

You've got the email there of Teresa's feedback, where I think she does misinterpret the purpose or misunderstand the purpose of what Dr Armstrong has asked for. She hasn't asked for a report on the incident. Dr Inkster does provide some very helpful comments and additional references,

which I then incorporate, and that's the briefing note that then went to Dr Armstrong.

Q So, effectively, what we have is potentially someone who's not at the meeting receives your briefing note, thinks it's something else and wants to add more stuff to it?

A Yes.

Q Right. Now, you mentioned that there might have been discussion at the meeting on 29 July, have I got that right, of '19, of changing the report to the Public Board? Or was that----

A I don't know if it was discussed at that meeting, but I know about it because it's mentioned in the email trail. I don't remember it specifically.

Q Right.

A But they were having discussions about, particularly if you're talking about single cases, how appropriate it is of how much information should go into the public domain in case it makes those individuals identifiable.

Q Well, because that is one of these problems with-- well, it's a problem for us as well as it is for the Board. I think, presumably, you'd agree with-- the Mycobacterium chelonae cases are somewhat

troubling at the time?

A Yes.

Q They've happened twice in 12 months. There's been a lot of meetings and discussions, none of which-- not which you're involved in. It's a matter of sort of public notoriety at the time. There is great concern.

In the world of unusual microorganisms, how does a health board successfully brief its non-executive board members and sort of do its governance work when discussing individual microorganisms, where you almost certainly will have identified a patient? Because there's only one case-- only two cases. How do you get around that governance problem of being well-governed and informing your Board, whilst at the same time not exposing individual patients to unwelcome attention?

A So, there's a couple-- there's making the individual decision what the appropriate balance is. So, for example, although the organism wasn't named, the case was still included in the public report but also you can do things like have the Board meet in private.

Q Right.

A So not include the information in the public report, have the Board meet in private and brief them, and I know that's certainly done at least once.

Q So, are you-- I mean, stop me when I say things you don't know about because it's possible. Are you aware of whether it's possible that the-- There was an earlier case of Mycobacterium chelonae in the very early months of 2016. I gave you a reference to a page in Dr Mumford's report. Did you find the footnote that I pointed you towards?

A No.

Q No. Well, then, let's take you to it because I think it's only fair to show you the document. So, if we could go to bundle 21, volume 1, page 139. Now, this is a section from Dr Mumford's report and the second bullet point, the one that gives, "There were further 19 cases," and in the third line, "and including one case of Mycobacterium chelonae in 2016," at footnote 95, and the footnote 95 is the blood culture samples dataset that we've been given in this Inquiry. So, take that off the screen. When you are involved in these discussions about Mycobacterium chelonae in 2019, did you have any awareness there might have been a 2016 case?

A No.

Q No. Do you have anything you feel you can contribute to

the question of how can a hospital infection prevention control team spot-- what's the best way of spotting unusual microorganisms? Because it's easy to spot ones that are on the actual list, you can have a flag on the computer, and Mr Walsh has a system. How do you spot unusual ones?

A So, what you're trying to do is identify things that don't come up in routine practice, and that is where professional judgment of senior clinical staff comes in.

Q Ultimately, that means the microbiologists.

A Microbiologists and the clinical team looking after the patient.

Q Yes.

A And that's a dialogue between them.

Q Right. So that's the only way to do it?

A Yes.

Q Right. Well, what I want to do now is to move on to paragraph 142 of your statement. So where you say at the time you were beginning to have concerns about the functions of the IMT, and it goes beyond the-- what you describe as the minor issues of efficiency you mentioned earlier in-- regarding the 2018 IMTs, "the IMTs were losing focus and direction and

interaction between the IMT members were becoming strained." Why, in your view at the time as someone who was there, were the interactions becoming strained?

A It was to do with a combination of process issues. If we come back, for example, the concept of case definition, there was a case definition but it was very broad, and we had a number of different microorganisms in different patients, and this comes back to the point about all the IMTs bleeding into each other. So that we were starting to jump back to, "Well, the control measures you put in place aren't working," when we didn't necessarily have evidence that that was the case, and----

Q But just on that issue----

A Yes.

Q -- I mean, we're now in summer 2019, I think we're in August. It's not rational to look back at what happened in 2018 and the chlorine dioxide and the filters and the third filter system in the basement plantrooms and think about those as issues that-- Surely, one would do that and look at what happened the year before.

A Yes, but what you shouldn't do is assume that that's the same problem recurring until you've

done that looking, and my recollection at the time is the filters were in place, the chlorine dioxide was in place, the water sampling was good, we weren't finding things in the water supply. So if there is an environmental source, it's a different one or it might be more than one, and this is where you start getting to conversations about these cases which are all definitely cases of infection that needs investigated. Do they, together as a cluster, constitute an outbreak with a source we can identify and control or are there more than one thing going on here?

So I think one of the things that-- It was coming back and where some of that strain was coming, I think perhaps it was asking that question, was challenged back with a, "So you don't think there's any problem?" which was never a position I stated or held. So it's not to say that there's thing going on here but it's saying are we being too narrow in our focus because of our experience of 2018? Should we be looking more broadly?

Q I mean----

A And that was where I think I mentioned to you of being-- "Well, you're not keeping an open mind," saying, "Well, what other-- let's not assume it's only this. Let's-- I think, more broadly, let's take into account all the evidence we can gather."

Q Because the-- I understand that, but the first question I suppose is that sounds like a discussion between you and Dr Inkster, i.e. people who are knowledgeable and understanding of public health and infection control and epidemiology. Am I right to see it as a conversation amongst people who can talk epidemiology and is that the right way to see it?

A Yes, coming in the IMT.

Q In the IMT, and at that stage, there's this strain, and I recognise it's not the strongest word, extending out to people who are coming in from, say, Estates or from senior management, or is it really at this level being conducted between you and Dr Inkster and some of the microbiologists and nurses who are all present?

A I think there was strain or other-- you know, negative interaction between microbiology and Estates was visible earlier, in terms of interpersonal reactions or things like that, the conversations with Peter Hoffman and whether-- who should be in the room? Should it be both microbiology and Estates or should it be just Estates having these conversations?

Q Yes, because there seems to be some sort of view that one shouldn't go off and talk to Mr Hoffman without Estates being present. There seems to be a view that----

A Well, that had been agreed as an action at the IMT that there would be-- because I think Dr Inkster had spoken to Peter Hoffman and there was then going to be another conversation with both microbiology and Estates present.

Q And that didn't happen?

A And that didn't happen.

Q Right. So, we've got this sort of tension, and before we go on to what then happens, I want to just press you on-- Because over the summer or the early part of that IMT, one gets the impression from all the papers that there might have been multiple potential hypotheses out there. So, there was a, "Is it the same thing as last year?" conversation. Was that something that was being discussed at the IMT?

A Yes.

Q Yes. A sort of extended-- a more exaggerated version in a new setting of the drains problem from the from the previous autumn.

A Yes.

Q Yes. Something around about chilled beams and dust?

A Chilled beams, yes.

Q Something around about chilled beams and leaks from the chilled beams?

A I can't recall if leaks had been risen at that point or not. They may have been.

Q Yes. Discussion about the physical quality of the fabric of Ward 6A?

A Yes.

Q Yes. I'm assuming, by this point, the work had happened and there wasn't any particular anxiety about line health at this point?

A So that was an ongoing process at this point.

Q Right, and then hand hygiene and that sort of stuff, that was a possibility as well?

A Yes, and there were kind of observed practice sessions by the infection control nurses going on in the wards and----

Q Watching the clinicians in action?

A Yes.

Q And then there will always be the question of, could it be that it's being brought in from outside by patients or families and businesses, and that's an issue possibly as well.

A Yes.

Q Right. So, I appreciate that there is a sort of clarity of the way you're putting it that one has to have an open mind and look at all these options and not just go back to the previous year, but given how difficult the previous year had been for the patients, for the clinicians, for the-- everyone else involved, is it not understandable that people would look back and go, "Oh gosh, did it not work?" as a thought process?

A Yes, and I think that's reasonable, but when you looked at things like the environmental sampling, the water sampling, for example, we weren't seeing the same problematic results as we saw in 2018 prior to the control measures being put in place.

Q But you were seeing some. I mean, there were Mycobacterium chelonae being found inside the filters.

A Yes.

Q Yes?

A Yes.

Q Yes, and there was some gram-negative, just not as much?

A I think very few, but----

Q So, let's move on to what happens, because you described in your statement on page 162 a meeting that took place on 20 August 2019, and I want to look into this in

somewhat more detail. Can I show you bundle 14, volume 2, document 144, page 568? So this appears to be-- Well, what is this? Did you get this email on 16 August?

A I did, yes.

Q Yes. So, what is it?

A Well, it's an invitation to a meeting to discuss the IMT.

Q Well, it doesn't say that, does it?

A No, but I would have read it from the context of, I had had earlier conversations with Dr de Caestecker about the IMT performance and she was going to take this action to bring people together to discuss.

Q So, this wasn't a surprise to you?

A No.

Q No, but it's not actually a meeting that tells you, "We're going to have a meeting to discuss the IMT." I'm not quite sure why we've removed all the letters T and I from the document, but we'll-- no doubt there's a reason for that, but if we insert the letter T/I whenever there's a space in the middle of words like "meeting," it reads like a number of issues regarding haemato-oncology unit. Now, firstly, does the invitation list contain any clinicians working in the

haemato-oncology unit?

A No.

Q No. Apart from Dr Inkster, it contains Dr Inkster, and it contains Ms Devine. Mr Walsh, by this point, has moved on to other posts. So it doesn't contain-- it doesn't invite the people from HPS or ARHAI?

A No.

Q No. You, of course, knew what this meeting was going to be about. You're nodding.

A Yes.

Q Yes, but would you accept that it might well be that Dr Inkster didn't know what this meeting was going to be about, if she got this email?

A It's possible, yes. Yes.

Q Yes, and can you tell me-- I mean, I'm sure I can ask Dr de Caestecker when I get to her next week but-- week after next, but why is this restriction-- why does the-- why are all the members of the Incident Management team not invited?

A I don't know.

Q Because you were quite keen for us to understand an IMT as a group of people, as well as a meeting.

A Yes.

Q If you're discussing an IMT, surely you want to speak, maybe not at one meeting, I appreciate that, to all members of the IMT. Would that not make sense?

A Not necessarily everyone who attends an IMT, but certainly those key individuals representing the agencies, for example, it would make sense for Dr de Caestecker to have spoken to Professor Gibson, for example.

Q It would make sense----

A Yes.

Q -- and we'll ask her whether she did that.

A Yes.

Q But the main thing I'm concerned about at this stage is that there are people on this meeting, and I wondered why they're on the-- in the IMT. So given that you've said that the IMT is a team working from the bottom upwards from the list, alphabetically, I think it is, Professor Steele, very senior Board member, director of estates----

A Yes.

Q -- how is it that the director of estates ends up part of the IMT, the team? How does that work?

A When you're bringing together the membership of the IMT, what you're looking for are decision-makers. You need people who are able to commit on behalf of their agency or their department to carry forward the agreed actions of the IMT.

What you don't want in an IMT is being in a position where the IMT makes a recommendation, but that recommendation hasn't involved any discussion with the people who can then make that happen. So in larger, more complex incidents, you would anticipate having more senior individuals from the organisation present.

Q Because that's sort of what happened in September 2018, isn't it, that the IMT decided, "We should probably have a decant"----

A Yes.

Q -- and then over that weekend we discussed earlier this morning, on the 14th and 17th and 18 September, a different group of people, the executive review group, water executive review group, I think, decided to approve the decision. So, you would see the inclusion of people like Professor Steele in the IMT as a means of ensuring that it's effective.

A Yes.

Q Right. Now, returning to this meeting, if this had been a meeting about a meeting-- an IMT that you were chairing and you had received this email without the pre-briefing from Dr de Caestecker, how would you feel if you turned up at that meeting to discover it was about your

IMT and the way it was being run?

A It would be a difficult meeting. It would be challenging. It would be-- but I wouldn't-- I think, given the place the IMT had got into this situation, I wouldn't find it surprising if those issues were raised.

Q I appreciate that it wouldn't be surprising, but would it be fair to, effectively, invite someone to a meeting in an invitation that doesn't mention the topic to then discuss what's gone wrong with their IMT with no notice? Is that fair?

A No, I think it would have been best if it had been more explicit that the meeting had been called because of concerns of IMT performance that had been raised to Dr de Caestecker.

Q Would it-- Given the sort of obligation on doctors to treat their colleagues with respect, does it treat Dr Inkster with respect to invite her to a meeting that's going to discuss what she's doing wrong, in the eyes of some people, and how she might be replaced without giving her notice?

A I think it would have been appropriate to give more information in that email.

Q Right. Let's look at the minute itself, which is bundle 6, document 22, page 70. So, firstly, do

you remember the meeting?

A Yes.

Q Yes, and you are recorded as being present. There were ten other people there, plus Mr Forrester, who's obviously from administration. Now, I get the impression from this that six of you have been at the IMT, either at the previous meeting or the one before that and that would be Dr Deighan, you've been at the meeting-- he's been at the meeting in the past?

A Yes.

Q And Tom Steele's been at the meeting?

A Yes.

Q Mr Redfern's been at the meeting?

A Yes.

Q And you've been at the meeting?

A Yes.

Q And Ms Devine's been at the meeting?

A Yes.

Q And Ms Rodgers has been at the meeting?

A Yes.

Q And I think even Mr-- Dr Mathers has been at the meeting, but not recently?

A Correct.

Q Right. Now, had Dr Green, Mr Best and Dr McGuire ever attended the IMT?

A Not to my recollection.

Q Right.

A I mean, they may have done, but----

Q And Dr Inkster's apologies are recorded?

A Yes.

Q Now, her position is she was actually off sick at this point?

A Yes.

Q So, I want to just clear that, in the first paragraph of the meeting, it's clear that meeting was about the IMT that was running for gram-negative bacteria in Ward 6A. There's no doubt in your mind it was about any other IMT?

A Correct.

Q Right. If we can go back to your statement, please, at page 153, where you explained that Dr Inkster's off sick. 164, sorry, and you described that there was confusion at the next IMT.

A Yes.

Q Were the people who were confused at the next IMT on 23 August present at the meeting on 20 August?

A Yes, I think some of them were.

Q So, who do you think at

the meeting of the 23 August was confused, that was-- or had confusion, because you said there was confusion.

A Well, I think there was confusion because Dr Crichton had been asked and I've actually, since preparing this statement, found a further email which I was copied into where she was asked.

Q Right.

A So, certainly, she was asked, she was asked by Dr de Caestecker on the Thursday night, the evening before.

Q That's what she says in her statement, yes.

A And just says, "We need someone from public health to chair this meeting," and that doesn't say because Dr Inkster is no longer the chair.

Q It doesn't give a reason.

A It doesn't give a reason. And my understanding from the previous meeting, the meeting on the 20th, had been that this would be a discussion with Dr Inkster about what happens next.

Q But there wasn't discussion, so far as we can tell?

A I believe Sandra Devine was trying to have those discussions and her understanding was ----

Q But what I mean is, when you get to the meeting, it becomes apparent that there hasn't been a discussion.

A Yes, correct.

Q Yes, and so the question I'm trying to work out is that we've got you describing at the meeting there's some confusion.

A Yes.

Q And we've got a-- the minute of the meeting on 20 August, if we go back to that in bundle 6, had the subset of the IMT's membership there. And what you're going to end up with, I would suggest to you, which is probably inevitable, is that all these people that had this conversation, which is minuted over the next three pages in some detail about what should happen, they're going to turn up at the IMT and however much briefing or emails or phone calls are done, that there's going to be-- people at the IMT have no idea what's going on. Would that be an inevitability of this process?

A Yes.

Q Yes. Why were the views-- There's no discussion in this minute, and I can ask other people who were present and I will, was there any discussion in this-- at this meeting about obtaining the views of everyone else on the IMT, or was it just going to

be the views of these people that mattered?

A There was certainly a discussion on getting Dr Inkster's views.

Q Well, apart from that?

A Not that I recall.

Q No, okay. So, there was no discussion of getting a clinicians' views, for example? No discussion of getting the clinicians' views?

A Not that I recall, no.

Q All right. If we can go back to your statement, please, at page 165. So, you've given your views on these events, and at paragraph 156-- Stay on this page. At the top of the page, you recall having a discussion about how Dr Inkster didn't want to relinquish the role. Do you see the four lines down from the top?

A Yes.

Q And Dr Inkster would put it that she did, in fact, attempt to demit the chair in September 2018. Were you aware of that?

A No.

A No. Now-- And it's minuted, I think, in a minute of a meeting you weren't at. So you weren't aware of that?

A No, I wasn't.

Q No. Okay. Let's go to the IMT, 23 August. So that's bundle 1, document 78, page 348. Now, was there a pre-meeting before this meeting in the room involving certain people who end up at the IMT?

A Yes.

Q And were you in that meeting?

A Yes.

Q Who else was there?

A Dr Crichton, Dr Deighan, Sandra Devine, I recall being there. There were others, I can't recall exactly.

Q What was the purpose of the pre-meeting?

A My understanding, the purpose was to get Dr Crichton up to speed about-- We had a new chair in, she hadn't been involved previously. There was a lot of background, a lot of detail to get through.

Q Given that there were some tensions, the meeting had become strained before this----

A Yes.

Q -- do you think having a pre-meeting in the room beforehand is going to help reduce the level of strain?

A No, and I think, particularly as it ran on, I certainly felt increasingly uncomfortable that we had senior staff standing outside the room, not doing their day job, waiting

to get in.

Q Yes, from Professor Gibson downwards.

A Yes.

Q Now, if we go back to bundle 6, page 70, and this is the minute again of 20 August, and we go to page 71, do you see how the third action is there should be a pre-meeting:

> "There should be a pre-meeting before very complex IMTs especially if the results or reports available have not been circulated to the whole IMT, to allow key members to review this prior to the meeting. This would enable a transparent review of all the information and a proper risk assessment to discuss at the full meeting."

Firstly, do you remember that being discussed on 20 August, the idea of having a pre-meeting in the future?

A I don't.

Q No. Do you think that idea of having a pre-meeting involving key members, whoever they are, is consistent with the team approach of running IMTs set out in the various manuals and guidance on how to do so?

A It's certainly within practice to, particularly in complex IMTs, have subgroups or other groups, other teams meetings. So you might, for example, have an epidemiology group, or you might have a technical group----

Q Yes.

A -- or you might have a (inaudible) investigation group, who will go in and look at things like the results or what's taken action, and then report back. So it's certainly well within the bounds of normal IMT practice that not everything gets discussed at the full meeting.

Q And, indeed, we had that with the Water Technical Group in 2018?

A Yes.

Q Yes, right.

A My-- As I said, I don't recall the discussion, but my interpretation of that action 3 is about dealing with-- one of the issues that was coming up was we were often getting results very late. In effect, it was-- Teresa would have had written notes from the lab. That's the only way we would ever get results or see the results. It wouldn't have been collated, investigated, circulated beforehand, and my interpretation of that paragraph is perhaps trying to do

that curation and contextualisation of the information that was coming into the IMT, so the IMT is better prepared.

It's one of the things I mentioned in my statement is one of the errors incident management teams can make is trying to do the investigation in the IMT meeting itself, whereas what you should be doing is looking at the results of the investigation and considering through the implications of that.

Q Going back to my, sort of, challenge earlier about your criticisms, potentially my word, not anyone else's, of being idealist. To what extent did you have any knowledge, at that time, of the pressures in terms of work pressure, in terms of amount of work on Dr Inkster in the early part of 2019, that she had, for example, a request to bring in two additional sessions a week in February approved, although it didn't happen? Were you aware of that?

A I wouldn't have been aware of that.

Q No.

A I would have been aware of, having myself chaired complex IMTs over-- the amount of work and pressure simply the IMT puts on you, but I wouldn't be aware of any broader workforce or work planning issues.

Q No, and I'm wondering whether there's a difference between public health IMTs and hospital IMTs from the point of view of the chair, and we'll go with this for a bit and see what you think of it. In a hospital public health IMT, the chair is possibly an infection control doctor. He might be doing some sessions of infection control, but he's also a consultant microbiologist and has a caseload to do as well. I mean, that's----

A Yes.

Q You understand that? And in public health, without wishing to minimise the pressure on a small and probably overworked specialism, public health is your only job. Is that-- Have I got that right?

A Yes.

Q But is it----

A But-- but----

Q -- not a different thing-- but, yes, no, do expand the "but".

A Yes, absolutely. The reactive work, the running incident management teams, is only a small part of that public health job. So whilst all the work we do is public health and I'd say more broadly that the outbreak investigation and running incident management teams is a core function of all public health consultants working in territorial boards. Maybe not--

overgeneralised that, but most of us, rather than-- I would draw a distinction there with infection control doctors where it is more limited and isn't necessarily part of every microbiologist's role.

Q Yes, and so I'm just wondering, to some extent, whether this observation at action 3, but the general, sort of, tone of the anxieties about these IMTs might be partly grounded in a lack of realisation of the limited resource available from, ultimately, Dr Inkster and previously other IMT chairs to do this job and therefore actually doing it on the hoof with bits of paper from the lab is the only way to do it because there's no other system.

A I think there is a couple of additions I would make. The first is, it's absolutely standard practice and good practice in IMTs, and we do see this in August 2019, of having a second consultant from the same specialty as the chair to attend the IMT to, in fact, split that role, so you have one person that's a public health consultant or a microbiologist in the hospital leading the IMT, doing that, and it goes beyond just chairing a meeting. Well, they are-- that's a large part of it. It's the whole coordination of response, and then having a second

specialist from the same field who's there to deliver the specialist advice, so the chair isn't doing both of those roles----

Q That would rather require there to be such doctors available.

A Yes.

Q Yes.

A But that would be good practice.

Q Okay.

A And the other point was in terms of pre-meeting and thinking around the incident management team, again, slightly different roles in a hospital outbreak but when we think about a community outbreak, we have a core team of the public health consultant, senior environmental health officer, and then usually a microbiologist or maybe a toxicologist, whoever is a specialist in the field of the relevant pathogen as kind of the core, and we will often have between-meeting conversations or email exchanges or sharing evidence and documentation, in terms of doing a lot of the work that is needed to make the IMT function.

So, you'd have the core team and then other participants who are relevant within the meetings or taking actions between the meetings or sitting on subgroups, and it is-- and I think-- I

think there is a point which we practically-- that you get to, not that we have more resource available on a day-to-day basis, but in public health we are probably more willing or able or accepted to redirect resource when we're dealing with complex investigations. So, one of the----

Q Your activities are more unusual from the point view of the people we're dealing with. It's a surprise when you turn up.

A Yes.

Q Which it isn't a surprise when there's an IMT----

A Yes.

Q -- in this hospital four years after opening, is it?

A No.

Q No.

A So, if I can give a very small example, which I mentioned, it was sometimes there were issues of getting a room to hold an IMT meeting in-- during 2018/2019.

Q The thing that----

A From a public health perspective, I would have chucked the other people out of the room. You know, I would have----

Q Yes, you've got the clout.

A That's how we would have dealt with it.

Q I suppose one thing to

say about that idea of having the people involved in running the IMT meeting beforehand, just to work out what's going on, I didn't read – I don't know if you agree with me – that paragraph, action 3 on page 71, bundle 6, as about those people, that is maybe the IMT chair, the lead infection control nurse, someone from microbiology, the clinician. I read it as the people coming from the executive.

Now, am I being unfair to see the key people in that paragraph, in the context of the whole meeting, and the way it's been set up is that's not the people who normally run a quiet, non-notorious IMT? It's the deputy medical director. It's the head of Estates. It's the senior people. Am I being unfair? Let's just read that in there.

A I wouldn't read it that way, no.

Q How would you read it? Who are the key people in this context?

A I think it's the people who are-- I think as you laid out in the hospital IMT, it would be the IMT chair. It would be the lead ICN. If there was-- It might be the general manager for that hospital area who would have your day-to-day operational responsibilities.

Q It's rapidly becoming the

IMT though, isn't it?

A But a smaller-- a subset of the IMT, yeah.

Q Okay. Well, let's move on to-- back to your statement, to page 166, where you have a section from page-- paragraph 160 of late-2019 IMTs. Now, I want to take this relatively quickly without referring to too many documents, because you discuss the IMTs that happen after, as it were, Dr Crichton's taken the chair.

A Yes.

Q And you've given your particular take on the various events and all I really wanted to ask you was this is, do you consider there was a change of approach in the IMT after the change of chair?

A Yes. I think it's that point on focus which was precisely where are we, what are our hypotheses, what actions have we taken to sort of-- what point do we need to get to, to be in a position to stand down the incident response? And I think that was-- Dr Crichton's focus was, there is an objective to the IMT. The IMT is not just about reactively managing the new things that come up. It's about getting the-- in this case, the hospital, the service back to a position where it moves back to a business as usual position, as best as they can when

they're not in their normal ward.

Q Because we've had evidence in the Glasgow II hearing from a number of clinicians who attended these IMTs, and I'll go through what their evidence is in some detail, but the broad brush of it is that there was a change in methodological approach, but the change was-- previously the IMT had sought an explanation for what was seen as an unusual pattern of infections but after the change of chair, the clinicians felt the emphasis was on disproving the validity of the underlying suspicion. In essence, they felt that there was-- that an unusual pattern had to be positively proved to exist before it could be investigated.

Now, we've got some evidence from some-- I'll come to that. In broad terms, how would you react to that sort of summary by me of what the evidence said?

A It wouldn't be my characterisation of it at all, no, and I think this is one of the areas where there is-- or there was dispute, and I mentioned in my statement about it being insisted that I didn't "believe there was any infections", was the phrase used by one of the clinicians.

Q Yes.

A And I think that's an

unfair characterisation of what I was trying to say, what others were trying to say, which is we have a number of infections. They are gram-negative infections. They are infections that are rare. They're infections that it's entirely understandable that many of the-- results hadn't seen before because you might only see one every three or five years of this particular infection. That doesn't mean they're not valid to investigate.

I think there was-- Perhaps we'll catch up on using the term "outbreak" or declaring it as an outbreak as a, kind of, shibboleth almost in terms of, "Well, if you don't want to treat it as an outbreak, then you must think everything's fine." Whereas, for example, these cases may come from different issues, because more than one hypothesis could be true. Perhaps someone has caught it from something from the chilled beams. Perhaps someone has got it because they went to an unprotected water source. Perhaps someone else has got it because it's an endogenous gut organism that's translocated, and they are all different things that need slightly different actions and slightly different responses but might not necessarily be an outbreak the way 2018 was, where we were linking everything to the single issue or the dual issues of contamination of the water and the problems with the drains.

Q But is that a fair characterisation of 2018? Because whilst it's true that the water in the drains was the big issue, we saw it in the report in May 2018 as being flagged as water as the primary source, chilled beams was being talked about in 2018, just perhaps not as loudly. Do you not recollect that?

A There may have been an-- and certainly ventilation came in much later on in the conversations than the water and drains but there was then-- wasn't being discussed, I think, in terms of the ventilation as the source. It's a case of, our control measures might not be as effective because the ventilation isn't the standard it should be but the source is the water.

Q Because I'm wondering whether part of this-- if it is a disagreement, part of this tension might have in its roots the fact that you, having arrived to some extent after a few previous involvements in early 2018 in these events, haven't been trying to work out what's wrong with the ventilation system, been dealing with the previous infections

and how this-- and this may be the arrival of the DMA Canyon report and its concerns wasn't quite as shocking to you as the people who'd, as it were, been through the previous three years and, therefore, they see it as a whole thing and you see it as a-- it's just now. Do you see that as a possible tension----

A Yes.

Q -- a division? Right, because in terms of managing the relationship with the clinicians, I think you recognise the existence of the criticisms. I'm not going to take you through what they've actually said. How could the relationship with the clinicians in 2019, the second half of the year, last four months of the year, have been managed better to it-- Because they wrote letters of concern to Dr Armstrong, amongst others. How could that have been managed better to ensure that they weren't so perturbed by events?

A I can only really talk from my own perspective and my interactions and, from my view, my reflections on it would be that working through those issues doesn't start in 2019, in the sense of, as you like to say, coming in in February, March 2018, and I don't have the same relationship with these-- such as the staff who were working every day in the hospital, whether that's the general manager or the microbiologist, and not just accepting that the data being presented is speaking for itself, but spending time on helping them understand where I was coming from and what I was doing and what that data really meant. I think things like, for-- I can think of a few, but they have regular unit meetings. Maybe it would have been helpful for me to go along and join a conversation with them in a less formal surrounding than the IMT, so we could have more discussion and debate and getting that common understanding. I also think one of the issues potentially about the epidemiology work was it was never formally presented and discussed at the IMT.

Q Yes. No, you mention that in your statement. So, we'll deal with what it means because you've touched on that already this afternoon, but your second paper, your October 29----

A Yes.

Q -- paper, that emerges after Dr Crichton takes over?

A No, just before.

Q Just before, in July?

A In August.

Q Yes.

A So, I think it's the August 14th meeting, which is the one that----

Q Yes, I think it was mentioned there, yes.

A The discussion which I wasn't-- that I missed.

Q You arrived at the very end?

A Yes, and it had been the previous meeting so it was the 8th or 9 August, we were in this discussion around, "Well, what do we do next? If this is an escalating issue, what are the remaining options for us?" and the (inaudible) was closing the ward-- closing the----

Q And there's a big squabble about the minutes around who's going to approve that change that happens on the 14th that probably won't involve you?

A Yes, and my recollection of the meeting, as I said, I can't quite recall if it was the 8th or 9th, but, you know, the previous meeting was particularly to and fro. Myself, Dr Inkster, Professor Gibson, in particular, talking about, "Well, how do we make this decision?" and there was a point made, I think, by one of the clinicians about, "Well, what's the data showing?" and it was the point I said, "Well, I have done this report. You have not seen it. Dr Inkster has got it. It'd be helpful, perhaps, if this goes out to the IMT." So it was only me asking that in the IMT that resulted in it being shared.

There was then this to and fro in that meeting about, "Well, this will take time to look at and not just-- the whole situation to make the decision and everyone's busy and no one's got time," and I said, "Well, we're all sitting here just now," but that meeting ended without a decision being made and the decision to close the ward, I think, happened outwith the IMT.

Q Yes, and so I'll talk to you about what the reports say after lunch but I want to turn to page 168 of your statement where you discuss at paragraph 165, there we are:

> "Professor Jones and Professor Leanord agreeing in their opinion that from a microbiological point of view, Ward 6A was safe at the present time and the IMT members accepted their position."

Now, I think there's a moment when HPS require further convincing but I'll just put that quietly to one side for the moment and look at, in a sense, why you-- you seem to be comfortable with this conclusion.

A Yes.

Q Am I right in thinking-- Right. Now, the thought I have-- we're going to come to the actual epidemiology at the time, but earlier in your statement, on page 146, you say something that possibly seems relevant. We've talked about it earlier, paragraph 92, halfway through:

> "It's also important from an incident management principles point of view that you take epidemiology, microbiology, environmental, and the clinical picture as a whole. You should not rely just on one of them and say we do not need the epidemiology anymore, as that's not keeping with best practice."

How would you react to the criticism that the conclusion that was made that the ward's microbiology is safe, in the autumn of 2019, was to some extent doing that, in that it was relying rather heavily on the combination of two sources, whole genome sequencing and your epidemiology report, maybe a little bit from an HPS report as well, and not paying sufficient attention to the clinical picture as a whole, to the environmental issues? It was a sort of partial analysis. How do you respond to that? I mean, clearly Professor Leanord can talk about it himself next week.

A Yeah, and I-- for me, the problem was of, it was just the microbiology. It was that, "These are the unusual organisms and therefore..." but we weren't taking into account the epidemiology. As I said, it was-- I had to push for my IP report to be shared. There hadn't been any real broader descriptive epidemiology carried out----

Q In 2019?

A -- in 2019 by the Infection Control team or HPS. There was, at that meeting on 14 August, the presentation on environmental sampling. I'd read the presentation when it had come around in the papers and I'd seen the notes in the minutes about effectively using that presentation to say, "Well, it doesn't matter that the environmental samples are fine because they're too unreliable," and I have an issue with that, that two of the key things, the epidemiology and the environmental sampling, were being put to one side.

So, if we take the environmental sampling, yes, I absolutely take the point that only a proportion of any swabs you take will pick something up, and there's 25 per cent, that's what's in the literature, and that's fine but we

hadn't done one swab or 10 swabs. There were dozens of environmental swabs and hundreds of water samples. They were coming back principally really well. There were good results. So, although-- So, it felt like those negative results from the samples were being dismissed.

Q Right. So, you would, in a sense, say there's a tension between one group of people in those meetings saying, "The environmental samples, we should dismiss those, be focused on the epidemiology in the ward and the story and the place and our fears," and you would say you focus on your epidemiology, the environmental samples, and the whole genome sequencing to tell the other story?

A Not quite. I wouldn't-- I think there was a-- You have the clinical picture, which is really important, and I was always very-- you know, these were real patients with real infections. These are kids who are sick, and the microbiology and the nature of the microbiology on one side. Personally, I wouldn't say it's-- it should be between those two things.

Q It should be a mix of them all?

A It should be a mix of all of them.

Q Okay. Now, what I want

to do is go back to page 168 of your statement, paragraph 167. This is a teleconference IMT on 20 September. We have the minute, which is bundle 1, document 82, which is page 370 and in it there is-- Who's JRO? Jennifer Rodgers?

A Jennifer Rodgers, yes.

Q And you circulate a PowerPoint presentation with all the current data, and for some reason, as far as we can tell, we don't have this. I'd be grateful if you could find it.

A Yes.

Q And if you pass it to your legal representatives and then they can get it to us. I think it would be just good to get the complete story because I don't want to go into it in detail with you. I'm assuming that it fits in with the rest of your statement and it's just background information, but given it's got numbers in it, I think it would be nice to see----

A Yes.

Q -- how it-- Did it differ in any substantial way from your 2019 report that you had already produced?

A It had more data and it, sort of, had the specific numbers for each infection, each species of infection----

Q It had-- It went down by species level rather than by----

A Yes.

Q -- genus level? Right, and did it extend further in time as well?

A I think it probably would have done, yes.

Q And so would it help us to understand your understanding, at the time, of the diversity of organisms at point?

A Yes.

Q Yes. So, if you could dig it out, that would be most-- of great assistance. Now, the next thing is that over the page-- I think it's over the page. No, it's the page before, sorry. So, page 168, the paragraph before, "I've been asked by the Inquiry for my view on"-- No, sorry. Statement bundle, page 168. That's it, " I've been"-- 166:

> "I've been asked by the Inquiry for my view on the current infection rates. I have not directly interrogated or reviewed the data since 2019. However, on the basis of the reporting through the infection control committees"--

So, is that basically just you reading minutes, effectively?

A Well, I'm still in attendance at the infection control----

Q Right, yes, "There are no issues in infection rates currently."

So, what I'd like to understand, in a broad sense, we've got five minutes before lunch, is how's that been achieved? The current, "There are no issues..." I appreciate there's been a pandemic and lots of time has passed, but from your point narratively and in process, how have you got to the position you are in now?

A So, there's been-- indeed, there was a pandemic. So, from, kind of, December 2019 onwards, I've stepped away from all of this. So, there were the control measures already in place. There were the additional measures taken through the various hypotheses of the Autumn 2019 IMT. For example, there was----

Q They were cleaning the chilled beams.

A Yeah, cleaning the chilled beams, putting the disinfectants in----

Q In the water supply?

A Further work on the fabric of 6A, but there was also the return to the newly refurbished Wards 2A, 2B.

Q Yes.

A I think that will have a-- that environment is, my understanding of it, the best possible environment for

that patient cohort.

Q And in terms of the non-environmental factors that were in discussion in '18 and '19, particularly in '19, around lines, handwashing practice, people bringing in things they shouldn't bring in, not that they're doing it deliberately but they come in on their bodies, has there been any developments in that area that seem important to you that have produced benefit?

A Not that I'm aware of. As I said, I've not been involved recently.

Q Because-- Before we get to the epidemiology because the statement I make is a deeply non epidemiological statement, it's just a, sort of, bald statement. If it's the case, as it does seem to be, that the rates are already well down (inaudible), and the events that have happened, the actions that have happened, the interventions that have happened since the autumn of 2019 are all pretty much environmental related. So they are cleaning the chilled beams when they were around, there are no chilled beams in 2A, sorting out the chilled water of the chilled beams in 6A, sorting out the fabric, and then moving back to 2A, which is an impressively different space than 6A with all its air change rates and its filters and its

lobby and its pressures and its everything. Is that not a relatively powerful piece of evidence that the environment was a problem? Because getting rid of the environment is what ultimately got rid of the problem.

A Yes, and this comes back to our discussion in the first section when we were talking about the stepping down of that early 2018 IMT and the move from the old 2A to 6A improved things.

Q There's another example of that----

A The move back from 6A to 2A has improved things further.

Q Yes.

A But I'd also want to be clear, and I hope this is accepted, that-- and it comes back to bundles, all those things around, for example, good line care and hand hygiene remain really important, and maintaining those standards, it is really important, and this is back to the chain of infection. Because you have a source, but there needs to be a way of how does that source-- passing from that source, then get into the patient, get into the patient's line? So, absolutely acknowledging the benefits that the improved environment shouldn't be a reason to let up on all the other items in terms of infection

prevention.

Q Okay. Thank you. What I'm proposing to do, my Lord, is suggest that we might break now, because my next section says, "Epidemiological reports," and I think we should probably do that clean at two o'clock.

THE CHAIR: Absolutely. Dr Kennedy, we'll take our lunch break now and we'll sit again at two o'clock with the promise of some epidemiology.

MR MACKINTOSH: And if you could look at the IMT minutes for Cryptococcus and see if there is a reference to a case definition. I don't think there is, but if you can find it, I'd be obliged.

THE WITNESS: Okay.

MR MACKINTOSH: Thank you.

(Adjourned for a short time)

THE CHAIR: Good afternoon, Dr Kennedy. Now, Mr Mackintosh.

MR MACKINTOSH: Thank you, my Lord. Dr Kennedy, first thing's first, did you manage to find a reference in the IMT minutes about a case definition?

A No, I can't see a formal case definition.

Q Anything close to that?

A So, 20 December, so the first meeting.

Q 20 December 2018. So that would be page 245 of bundle 1. 245. Thank you. So, where do you find this?

A So, under some of the redacted bits, actually, I just have the unredacted minutes----

Q Well, give me a second and we'll get that, although--------

A -- but you have, in that general situation statement----

Q -- I'm not going to display it, I have access to the unredacted minutes, so let me just get it in front of me and then you can say what you (inaudible). Hopefully you're not going to say anything that identifies a patient, but I'm going to have to trust you on that. So, this would be on the-- in the paragraph that's heavily redacted under "incident update" or the one under "patient report"?

A The one under "general situation statement."

Q Yes, and so which-- Is it in the----

A So, there's two sort of parts of it. In the first paragraph, you have kind of the kernel of a case definition, you've got Cryptococcus Neoformans, you've got the organism----

Q In blood cultures from haematology patients?

A Yes.

Q Is what? What's that?

A So you then have the sample type, you've got the patient group and then, in the next paragraph, which is totally redacted, is the-- just to note the statement of, "They are both hospital-acquired infections."

Q So there's a redaction, which I think I can break because it doesn't say anything that's not a surprise-- is that, after the word Cryptococcus in the first line, it goes "Neoformans" and then there's a block of text, and that is, "... in blood cultures from haematology patients."

A Yes.

Q So, effectively, you're saying that the case definition will be looking at blood cultures in haematology patients?

A Yes.

Q Yes.

A You would look for a bit more when we-- Perhaps, if you were going to lay it out formally, you'd look at clinical criteria: "time, place, person" criteria and a laboratory criteria.

Q So the laboratory criteria is the blood cultures?

A Yes.

Q The place is that they are in the hospital?

A Yes.

Q And the time will be that they are a hospital-acquired infection, so more than 48 hours after admission?

A Or the relatedness in time in terms of they are, given this is a rare organism, there's been two in a couple of months and then the person one is obviously the patient group that they're in.

Q Thank you.

A So that's what you would see as the patient definition?

A Yes.

Q Right. Well, we might use that and ask people questions based on that. Thank you. Now, if we can put away bundle 1, what I want to do now is just to check on a couple of things. In your evidence, when I was asking about hospital-acquired infections, you mentioned that-- we talked briefly about a 30 days. Do you remember we were discussing how hospital-- healthcare-associated infection might be a case that's 30 days before, so, "They might have a blood test and then they go into hospital 30 days later and it'd be a healthcare-associated infection" is roughly what you said.

A You wouldn't necessarily

need the hospital admission.

Q Right, but is it the 30-day thing? Is that from a published piece of HPS criteria, or is that just an example?

A It's from published criteria.

Q Published criteria.

A So there would be multiple different criteria.

Q So, within the 30 days, they have to have something that associates them with healthcare?

A Yes.

Q Right, thank you. Now, what I want to do now is turn to the epidemiology. Just so we know where we are, let's identify the reports we're going to talk about. So, we'll start off-- We'll do them in chronological order, if you don't mind, so we'll start with bundle 27, volume 6, document 9, page 107. 107. Yes. So this, we understand, is a presentation by Dr Peters and Kathleen Harvey-Wood that was given to a haematology meeting Professor Gibson refers to in an IMT and that you've explained that you'd acquired by October?

A Yes.

Q As part of Dr Peters' efforts to bring everything together?

A So, I don't think I had the presentation but the related report.

Q Well, let's look at the report, just so we make sure it's the right thing. So, that's bundle six, document 27, page 95. That's your report, sorry. Bundle 19, document 19, page 143. This is the report that you saw?

A Yes.

Q Right.

Q Now, you've had an opportunity to look at the presentation which Ms Harvey-Wood discussed at some length when she gave evidence last week?

A Yes.

Q And would you accept that they're broadly the same data, presentational, although there may be some differences of detail, between the presentation and this report which you've seen?

A Yes, my reading of it is that presentation excerpted graphs from this report.

Q Right, thank you. Now, what we then have is the document that you produced, which I went to by mistake, which is bundle 6, page 95, (inaudible), and this is your October '18 report?

A Yes.

Q And this is produced early in October? I'm just checking. Is it produced before Dr Peters effectively

gets you the other document? Is she reacting to you or are you preceding her? How does the chronology work?

A Yes, I've sent it to Dr Inkster before I have seen----

Q So before you've seen Peters Harvey-Wood, you've done this? Right, that's helpful. We'll come back to the detail in a moment.

A The date's in the statement somewhere.

Q It is, yes. I think it's 1 October, or certainly the first few days of October. Now, if we then go to bundle 7, document 5, page 194, we have a situational awareness for Wards 2A/2B at the Royal Hospital for Children, NHS Greater Glasgow and Clyde, and it's dated at the bottom June 2019, but we have evidence from Ms Imrie from ARHAI-- Dr Imrie, sorry, from ARHAI that this was provided to NHS Greater Glasgow early in 2019.

A Yes, I recall first seeing it in January 2019 when it was sent to the Board to check for factual accuracy.

Q That's consistent with Ms Imrie's evidence. Now, if we go over to page 205, we have an appendix, which is the report, the epidemiology that I'm going to-- we're going to come to in substance in a moment. So you'd have seen that in January 2019?

A Yes.

Q Yes, right. We then have your second report, which is bundle 6, document 28, page 104, and that's the July 2019 report you were just giving evidence about trying to raise it as an IMT in early September 2019. We then have a fifth document, which is another HPS report, from-- which is dated October or November, depending which date you believe. 2019, bundle 7, document 7, page 250. 2-5-0, and that's from October 2019, and I think we also have a draft. You would have seen this presumably in October or November 2019?

A Yes.

Q Right. We then have your second report, which is bundle 6, document 28, page 104, and that's the July 2019 report you were just giving evidence about trying to raise it as an IMT in early September 2019.

A August.

Q August, sorry. We then have a fifth document, which is another HSPS report from-- which is dated October or November, depending which date you believe, 2019. Bundle 6-- Bundle 7, sorry, document 7, page 250. 250, and that's from October 2019, and I think we also have a draft. You would have seen this, presumably in October or

November 2019?

A Yes.

Q Right. Now, we also have – and I'm going to touch on it briefly, but you've given a detailed response anyway so I don't feel I need to rehash it – a report by Mr Mookerjee for the Inquiry, which is bundle 21, volume 1, page 3.

So, now, what I want-- what I'm proposing to do, if we could take that off the screen for the moment, is to work through each the reports, and ultimately for this purpose: first, just in 2018, so the three reports that use the data from 2018, look at them and then ask you this question, which is, if it's the case that they have produced different conclusions – and, of course, it might not be, but if it is the case – why is that? What is it about the data, the way the data is handled and the way the reports are produced, that seems to produce different conclusions? That's the question I want to get to, and then we'll repeat the exercise, to some degree, not quite the same, for 2019.

So I propose to go first to-- We'll do it off the PowerPoint presentation, if only because that's where I've got my page numbers noted. So if we can go to bundle 6, page 95 and your first

report. Now, am I right in thinking that you and Ms Harvey-Wood and Dr Peters and the author of appendix 4 of the HPS report are covering the same ground chronologically?

A I think, for the most part, yes.

Q For the most part. Now, what I'm wondering is, in terms of the coverage of what they're trying to achieve, you've already tried to explain to us the difference between descriptive and analytical epidemiology, and I think you've explained these are all descriptive epidemiological reports. At a very high level, is there any obvious difference in the way they are approached, the three different documents?

A So the two key differences that spring immediately to mind-- the first is the HPS report uses more formal framework in terms of the statistical process control charts.

Q This is where you have lines that tell you where there's been a change beyond what you might expect?

A It's one type of analysis that does that. There are others, and it's one that's quite commonly used in the NHS, particularly in quality improvement methodology, and that's where it comes from, from industry

quality improvement methodology, and it's designed in a way that anyone can pick it up and use it and do it in a very simple, straightforward way without having particular detailed statistical knowledge. It uses rules rather than analytical techniques.

Q Is there an obvious difference, at a high level – and we'll get into the detailed differences because there are detailed differences – between the Peters/Harvey-Wood approach project paper and your one in terms of what they're trying to achieve?

A In terms of what they're trying to achieve? No, I don't think there is.

Q Right, okay. What we'll do is let's go and look at-- Well, firstly, in your statement, you explain that you didn't have an externally set term of reference for this report.

A Correct.

Q I don't think it's their position-- They're not saying they got externally set terms of reference either. Now, what I want to do is to look at-- Firstly, I'll look at the things that I think might be interesting, and then, of course, I'm going to give you an opportunity to say if there's anything else I've missed that's a significant difference. So let's look at your report in terms of what microorganisms you're looking at. So, if we go to page 95, you're effectively looking at just gram-negative microorganisms. Have I got that right?

A I'm looking at the organisms that have been associated with the incident. So, I use a list provided by Dr Inkster going to the Chair of the IMT to say what's relevant for the IMT----

Q Then, if we go onto the next page-- the page after that, sorry, this one doesn't have a table. This report doesn't have a table, does it? If we keep going. This table here. So this table here, is this-- should we take from this that this is effectively a part of a list or produced from a list that Dr Inkster has produced?

A Yes, the list should be in this document.

Q Yes, this should be a bit further on. I'm just going to get the page for that. I don't think the list is in this report, but it might be in the second report. I'm trying to work out-- I'm not immediately seeing where the list is, but you are very clear that the source is Dr Inkster?

A Yes.

Q So, in essence, if we are looking at the first on that table on page 98 that we've got on the screen,

Klebsiella pneumoniae is there because Dr Inkster put it there, effectively?

A Yes, although I'd go beyond that and say this comes back to the case definition question.

Q Right.

A So these reports are - Because they're to assist the IMT in its investigation, I only want to look at the organisms or the patients who have caught infections with the organism that would be covered by the case definition, but I've also gone a little bit beyond that in how I've searched and identified the results from the database----

Q So you're being----

A -- to do a bit of case finding on top of it.

Q Right, so whilst the list of the microorganisms here, including the "other" category-- would that only contain microorganisms that fell within the scope of the IMT?

A Yes, so it might be slightly wider. So the process I used, I was given a list at species level by Dr Inkster and, when I searched the database, I used genus levels----

Q So you went up a bit?

A I went up a level, yes, so we'd have captured other species within the same genus.

Q So, in a case of-- well, in a case of Enterobacter, there are multiple different species of Enterobacter?

A Yes, and Pseudomonas is a good example because there are infections with other Pseudomonas species, so you'd have Pseudomonas putida, for example.

Q So you've taken the species that are on Dr Inkster's list and then you've widened it to include every infection in the same genus as the species on Dr Inkster's list?

A Yes.

Q Right, and they'll be reflected in this table?

A Yes.

Q And obviously, within "other" are a lot of "ones," just one case.

A Yes.

Q Right. Now, if we go to the presentation by Dr Harvey-Wood, which would be page 116 on bundle 6-- sorry, bundle 27, volume 6, page 116. Go to page 116. So we have a list of environmental organisms here, and what other organisms has Dr Peters and Ms Harvey-Wood used in their presentation?

If we go back to page 110-- In fact, maybe we should go to the report, it's going to be easier, isn't it? So,

that's bundle 19, page 143, and, in that section on methods, do we-- and we see that they've included more-- a different-- Is there a different approach to the microorganisms involved that we see through the various tables?

A So, you can see in the method that they have extracted all positive blood cultures, whether gram-negative, gram-positive, something else because they're interested in the broader group of all infections involving this patient group.

Q Right, so that's the distinction is that you focused on the case definition of the IMT and that's the purpose of your paper?

A Yes.

Q Albeit that it isn't ultimately ever presented to the IMT, and this paper is broader, looking at all the bloodstream infections?

A Yes.

Q In fact, if we go-- work our way through this document, if we go to the next page, we see them reporting the number of blood cultures and then, the next page, the number of blood cultures taken each year, and then we have on the next page, at page 146, "Percentage of positive blood cultures per month," and that's an absolute count. It doesn't matter what the what the microorganism is, it's just, "Are there positive blood cultures?" So they're much broader than you in that respect.

A They are much broader. I also think there's a-- My understanding, these two charts, so if we go back one----

Q Go back one.

A -- that this isn't the total number of blood cultures but the total number of patients who had blood cultures taken, so the total number of blood cultures will be a multiple of that.

Q Okay, and then we've got the next page, which gives us, to the eyes of the authors – and I appreciate it's not your report – some form of trend in the number of-- in the rate of positive (inaudible) blood cultures but then there's a next----

A (Inaudible)----

Q Carry on.

A And again, just making sure-- My understanding (inaudible) this is all positive blood cultures----

Q Whatever the reason.

A Without-- Well, both-- Regardless of what the infection is but also without any deduplication.

Q Yes.

A So if someone had multiple positives, you know, if they

had a blood culture on a Monday and a blood culture on a Wednesday, that person's appearing twice in this chart.

Q Yes, I appreciate that. So there's no deduplication at this stage, although there is discussion earlier on-- if we go back to page 143, there is mention of deduplication, bottom, but that may not apply to that table. It may apply to a later----

A Yes, later.

Q So, if we go onto a later table and we go to page 148, it's another-- Effectively, you're not doing any of this because you're looking-- focusing down to just what's in the IMT?

A Yes.

Q Right, so you don't need to look at the total number of percentage blood cultures across the hospital because you know you're looking at particular microorganisms?

A Correct.

Q Right, and if we go onto the next page at 149, they've then deduplicated, but, again, they're taking all of the infections?

A Yes.

Q In there will be gram-negatives and gram-positives and non-environmental and environmental. It's all mixed in.

A Yes.

Q Yes. I suppose one of the consequences of the approach you're taking is that you're only looking at the microorganisms that are part of the hypothesis that they might be environmentally linked, in a sense. Is that not the practical consequence of what you do? Because the IMT is only looking at the ones that are (inaudible)----

A Yes, and because you only want to-- It's coming back to making sure you get your case definition right because, if you include patients with infections who are not relevant to the outbreak----

Q So, for example, line infections might not be relevant to the outbreak if they're----

A Well, for example, E.coli, which is, you know, another gram-negative, you wouldn't want to include those, but also if you-- your case definition is too restrictive and you exclude some cases, you should include in both scenarios-- again (inaudible) not having the complete picture of what's happening in your outbreak and potentially misdirecting your action.

Q So, in a sense, your approach is to narrow down to what is suspected to be an outbreak----

A Yes.

Q -- and try and understand that? This paper, as you understand it, looks at the whole activity in the hospital?

A Yes, my understanding of it, because this was to be presented to the regular haemato-oncology microbiology meeting and, for example, lots of later papers about antimicrobial resistance, for example, which is very important and is related to the broader care of the patient group.

Q On we go to page 150. Do we begin to see an attempt to break down by different classes of bacteria?

A Yes.

Q Now, to what extent is the decision to split between gram-positive and gram-negative something that can give you information about potential environmental connection?

A The split between gram-negative and gram-positive is used a lot because it's one of the most basic techniques within the laboratory and it is very long-standing and, again, generalisations hide specifics, but, in general, the more environmentally related bacteria would tend to be gram-negative and others which are going to be more related to things like line care tend to be gram-positive.

Q And that's a generalisation?

A Yes.

Q But it's a helpful one to give you some insights?

A Yes.

Q So, if you see a difference between-- I mean, not necessarily looking at this graph but at any-- in any graph, between the numbers of gram-negative and gram-positive and the way they change, I presume it's not unreasonable to start thinking, "Well, what does that tell me about what's good and what's bad in the ward?" Does that----

A In particular how they change.

Q Yes, how they change, right. So, if we move onto page 152, so we now have a graph-- Again, it's all, as I understand it, of the gram-positive blood cultures. Now, at this point, I want to introduce the concept of denominators into our conversation.

A Yes.

Q Because we haven't touched on that so far. This hasn't got a denominator. This is just totals, isn't it, this particular page?

A Yes.

Q For example, we can look at that and go, "April '16 to June '16, there were just over 20 gram-

positive microorganisms which we think have been deduplicated."

A Yes, and we would refer to this as "count data."

Q "Count data," right, okay, and then, if we go onto page 154, we now move to gram-negative. It's the same count data, effectively.

A Yes.

Q So, for the same period of time, April '16 to June '16, there are five positive blood cultures, the gram-negatives, at that point.

A Yes.

Q Okay, and there's no denominator here, right, and then actually they then go on to do, at 155, a similar thing for environmental and, at 156, they break it down in a different way which we'll pass over because I'm not sure it's directly comparable. But, if we can go to 157, these are still count data numbers, or are we moving to a denominator here?

A So, this is displaying both, so the blue line is count data and the red line is a rate.

Q Is a rate. So although----

A (Inaudible) percentage.

Q It's using as the denominator, the divider, the number of blood cultures.

A Yes.

Q And you've used

occupied bed days.

A Yes.

Q Now, in your statement, you've provided some detail why you think occupied bed days are a good thing and, in summary, because they're a good measure of activity. Is it as simple as that?

A The phrase we would use would be, "Person time at risk," so it's not simply that an activity has occurred, but how long has that activity gone on for? So if there is a concern about, for example, the hospital environment as a source, if you're in that environment for one night, your risk is different from if you're in that same environment for three weeks.

That's similar to if we look more broadly at any disease epidemiology, whether it's an infection or a non-communicable disease. When we look at the incidence in populations, we will usually refer to it as, "Incidence per 100,000 population per year."

So we have both a count of the number of things occurring and how long they occur for. If I give another relevant example in terms of hospital infection, we sometimes use, and this is what the CLABSI data uses-- is line days.

Q So the number of days they (inaudible)----

A The number of days the line has been in for, that's the denominator.

THE CHAIR: Dr Kennedy, could you just give me help on, I think, a very basic thing, which I no doubt should know but don't? Now, we're looking at graph 10 in Ms Harvey-Wood's presentation, and you point out that the red line is a rate. As we can see, it's a percentage of blood cultures. Now, as I say, I should know it: what is the trigger point or decision point which leads to a blood culture being taken? Because what I'm understanding is, it's a percentage of positives in the total number of blood cultures. So, can you tell me what leads to a blood culture being taken?

A If you have a suspicion of a systemic infection or a blood infection. So, for example, if a patient presents unwell, with a fever, and no obvious source, because someone might present unwell with a fever, but they've got a large abscess on their leg that's clearly infected, but otherwise you might take a blood culture.

Q Right, and if you get a positive, the hypothesis, as it were, that it's a bloodstream infection?

A Yes.

Q It's confirmed. And if you get a negative?

A You keep looking.

Q You keep looking?

A So, you may repeat the blood cultures, you may look for other sources. For example, you might have taken a respiratory sample, a sputum, or such like as well.

Q Thank you.

MR MACKINTOSH: So, before we leave this report, is there any merit-- other than ease, because I think that might be the back story here, it's easy to do it this way. Is there any merit in using the percentage of positive blood cultures as opposed to the percentage of occupied bed days to analyse whether there's been a change over time for this sort of exercise?

A So, it's a less good measure, because it doesn't include that time at risk aspect. It's not wholly inappropriate either, and if I give another example, where you solve percentage positivity – or you might also use the phrase "diagnostic yield" – how much of the test you do positive is something we included in our epidemiology during COVID.

Q We remember.

A We did it because there were so many changes to the policy of who could get tested when. Simply using count data wasn't entirely

informative because, for example, we were saying, “Well, here’s a group of the population who are no longer allowed to be tested.”

Q Yes.

A So, we would use the percentage positivity alongside the count data or the testing rate, incidence rate, to try and understand that better. So it does have a place.

I think one of the issues with using it in these circumstances are, as well as the person time at risk, there’s also an issue of-- I’m going to use the-- this is a generic term and I’m using it wrongly here, but autocorrelation. If you use blood cultures as your denominator, if there is a risk in an increased number of infections, you have more patients who are symptomatic, so you are going to do more blood cultures, so your denominator will also go up.

Q I suppose that might be the reason why the table exists at page 144 in this paper, to tell us that there is an upward trend but maybe it’s not extreme or shows the peaks when there was more activity. I suppose you’d have to look at this with some care and balance it and you’re thinking about----

A You’re taking the various pieces of data together.

Q Yes. Now, the authors of this paper, if we go to page 168-- No, sorry, bundle 19, 166, please. Yes. So, they reached some conclusions. They look at-- they notice a significant increase in bacteraemia rates in 2015, with a peak in April-June 2017 with a static population, and they make certain conclusions. Now, I appreciate that this hasn’t done bed days and I appreciate that this hasn’t focused purely on the IMT case definition, it’s taken a broader approach, but I suppose the advantage of taking the broader approach is that it’s been able to look at gram-positives as well and look across the whole piece. Would that be a fair point? A benefit of this sort of piece of work?

A Yes.

Q But the disadvantage, as you just explained, was that your denominator is at risk of being multiplied as everyone worries more and takes more blood cultures.

A Yes, and I think it also creates the issue with the last phrase on the first bullet of “with a static at risk population”, because later on in 2017, maybe end of 2016, it’s on one of the other charts, the total activity, the number of bed days, actually goes up.

Q Right.

A So, there is a higher at

risk population at that time, but the overall conclusion of-- particularly competing across in terms of gram-negatives and-- where there is a peak in 2017 and there's a peak in the first quarter of 2018, and that conclusion is the same across both reports.

Q They haven't expressed a view about whether there's a difference between pre-move to the new hospital, as far as I can see in this paper, and I wondered if you'd agree with me they haven't actually said that. Although the time is covered in the graphs, there's no reference in the conclusions to there being a change since the change.

A It's not in the conclusions. It is suggested by that red trend line on the earlier chart, and there's a common (inaudible) -

Q Yes, so if we went back to page 157. Oh, no. The first one, you mean?

A Yes.

Q So, the first trend line there, which is page 146, suggests – with the caveats you've suggested – there is some form of increase going on, but we don't know quite what its cause is.

A Yes. You have the trend line and you have the month of the move to the new hospital marked in red.

Q Yes.

A So, there is clearly an indication from the chart that that's being thought of, even if it's not in the conclusions.

Q Yes.

A Although I'm not sure of the appropriateness of having a trend line that crosses the two hospitals.

Q Well, that's an interesting question. So, if we take that off the chart, we'll move on to the next report in a moment, but Ms Harvey-Wood gave evidence that there's a clear upward trend in positive blood cultures in the hospital and that's something to be worried about. Now, is that something you'd accept or disagree with? How do you react to that?

A So, I'm not sure I would use "trend" in the sense of that red line drawn across the graph. I think there is clear indications of – particularly 2017/2018 – you know, it's a higher rate of positive blood cultures or bacteraemias occurring.

Q Why wouldn't you draw a trend line across the change of location? Because that seemed to be what you were just saying a moment ago.

A Yes, the trend should be about the-- Trend lines are

continuous, and there's a discontinuity when you change to the hospital.

Q Right.

A So, you might have a trend line for the old hospital and a trend line for the new hospital.

Q And then you'd look at the difference----

A Yes.

Q -- but you wouldn't run the same line? I see.

THE CHAIR: I suppose you could have a trend line for more than one institution depending on what you were wanting to demonstrate?

A Depending on the purpose of-- You know, what is the aim and objective of the (inaudible)----

Q It depends on the purpose of the trend line, but your observation would seem to be apposite, where we're considering whether the conditions in the second institution are in some way different or produce a different result from the situation in the first.

A Yes.

Q Yes.

MR MACKINTOSH: Now, what we're going to do is we'll look at the HPS report and then we'll come back to yours. So, we go to bundle 7, page 205. So, you've already explained how you saw this in January of 2019.

You've explained in your statement how, in a sense, it was, for some reason, late. You saw it when it was being checked – presumably by you, I suspect.

A Yes, and a number of other folks, yes.

Q Yes. In your statement, paragraph 64, on page 138 of your statement, do you see how, when you're discussing, as it were, the delay in the HPS report, you explained that Annette Rankin's going to do a "root and branch" review, as you've described it, "that would involve a comparison with Ward 2A in the old Schiehallion Ward, Yorkhill Hospital".

A Yes, that's the wording from the minute.

Q Yes, and so that's before you see this HPS report.

A Yes.

Q Well, if we go back to the HPS report in bundle 7, is this, as you understand it, attempting to be some form of comparison between Ward 2A and the old Schiehallion at Yorkhill Hospital?

A So, I think that root and branch view is the main part of this document----

Q The first part, yes.

A -- rather than the appendix, but this is looking at the

numbers across both hospitals, yes.

Q And so, in some sense, it is a comparison?

A Yes.

Q Right. Now, again, let's do a methodological comparison much quicker this time. It's covering the same time period. Now, this seems to be covering more-- is this covering more, in a sense, the microorganisms more like the Harvey-Wood approach than your approach?

A Yes.

Q So, it's covering gram-positives, gram-negatives, environmental, non-environmental?

A Yes.

Q Of course, it's for a different purpose, perhaps. What do you think its purpose is, this report?

A It's there to provide a broader understanding of infections within this patient cohort, and it also includes a comparison with-- if this is the (inaudible)----

Q It does make a comparison.

A -- comparisons to Aberdeen and Edinburgh.

Q Briefly at the end, which-- we'll come to that. Right. So, if we can go on to the next page. You've already, I think, almost answered my question about SPC graphs, but is this

an example of some analytical epidemiology, albeit at quite a simple level? Or am I putting words in your mouth?

A But just before we go there, just the page it's on, statements on "the following species were previously isolated in water samples", and, "previously isolated in drains", I believe those are the lists given to me by Dr Inkster.

Q Right, so you think that those two paragraphs below "fungi" are----

A Yes.

Q And they would read across to your report?

A Yes.

Q But this report is wider than that.

A Yes.

Q So if, for example, we look at-- we go back one page, just to annoy my colleague with the presentation, at the bottom of the page, all gram-negative bacteria are a category, not just the gram-negative bacteria in Dr Inkster's list.

A Yes.

Q Yes. If we go over the page, back to where we were going to-- the bottom of the page, there's a discussion of the analytical methods. Am I right in thinking from what you

said a few minutes ago that the SPC graphs are a useful tool, slightly easier to apply, and they involve some analytical techniques?

A Yes, because you're getting into calculating statistics when you start calculating upper control limits.

Q And if you're going to-- Well, I think probably we should look at an SPC graph and ask the questions when we're looking at it, but we'll not look at the date-- we'll not look at what it's telling us, because that's the project. So, if we go on to page 208 and if we zoom in on the middle of the page-- and I don't want to worry about what it's saying, I just want to do this as a sort of understanding. So, this appears to be an SPC graph for gram-negative blood cultures per 1,000 total occupied days. So, first question, this presumably is trying to be the same denominator as your piece of work?

A Yes.

Q And we have a left-hand y-axis going from 0 to 16, whereas your report goes from 0 to 2.5, and I wondered if you had any thoughts about what's going on there. I failed to ask the author of this report when she gave evidence and I wondered if you had any thoughts what's going on here.

A So, it's all gram-negative, so the numbers would be higher than my report, but I do wonder-- I did wonder when looking at it whether it was mislabelled and whether this was count rather than rate, but I can't be certain

Q Well, we'll come back to what that's saying in a moment, but just in terms of the statistics, we have a series of lines drawn on the chart. So, what's the red line at 0 called "UCL"?

A So, could I perhaps start with the light blue line?

Q Of course.

A Because the others relate to it.

Q Right.

A So that line, that centre line, is the median average of the data points selected to be the baseline of the chart.

Q Would that not mean that, when using these charts, you rather need a consistent pattern you're comparing against in the past?

A Yes.

Q And so in this case – I don't know why it's there – but that initial peak that we see at the far left-hand end of this graph is going to pull upwards the initial trend, isn't it, to some degree?

A Yes, and my understanding, reading through this report, is that centre line has been calculated using the data points in the period in the chart, rather than a prior----

Q Yes.

A -- baseline. So, the rest of the lines are then actually all relative to the individual data points (inaudible)----

Q So, it gets rather circular, these lines?

A Yes.

Q And so, a risk when using these graphs is that, if you don't have a nice clear piece of history you can compare against, you can't actually do the simple statistics that's involved here?

A Yes.

Q Right.

A Or the fact that SPC charts are simple to use and have the rules can mean they can be potentially misused if you don't understand the underlying statistics.

Q Yes. So, you have to have an underlying trend to compare against?

A Yes.

Q Now, I know this isn't your report, but a lot of people have used SPC graphs----

THE CHAIR: Right, it's my fault for not being quick enough on my feet. You're taking to the central line, which now-- I'm not sure if I've heard you correctly. Is that the-- did you say median?

MR MACKINTOSH: I think you said mean.

THE CHAIR: Or did you say mean?

A I should say mean, sorry. That's my mistake, it should be the mean. It's the average (inaudible)----

Q Right. It's the average of the pre-- Now, is it showing the average for this period of time or for a previous period of time?

A So I believe in this report it's looking at this period of time.

Q Right, (inaudible)----

MR MACKINTOSH: So, it's the average between 2013 and 2018.

THE CHAIR: Right, okay. Thank you.

MR MACKINTOSH: I think, to be fair, that might have been what they said, but----

A Yes, they calculated.

Q And we see that at the bottom of page 206. So, the centre line of the SPC was calculated as the median of the monthly rates between July '13 and June '18.

A Yes, so it is median and

it is for the period in the graph. So you have, as you say, this circular aspect to it.

Q So, this median line from which the others flow – we will talk about what they do in a moment – is affected by both the events of the left-hand edge and the events at the right-hand edge and the events in the middle?

A Yes.

Q Right. If we go back to the page-- Yes, if we go back the page, and you were telling us about the other features of the graph as for the SPC.

A Yes, and then the other-- So, the other lines are then calculated from that centre line. So, the orange line above the centre line, the upper warning limit, would be two standard deviations from the centre line, and then the upper control limit is three standard deviations. That's the kind of-- where you calculate them and then you do the same down the way, because you're also interested in any sort of unwarranted variation that goes too far before, because that might be a concern about, for example, underreporting. If suddenly all the infections disappear way down here, it's something else you might want to look at.

Q Is there any particular reason that the orange line and the red line are not straight on the graph? Why is that happening?

A So, again, it will be to do with how they are calculated. So, if they're varying, it will be because the calculations are being updated as you put the data points----

Q At page 206?

A Yes.

Q And it doesn't seem to explain that, it just explains what the upper control limit is, three standard deviations. So, perhaps we'll pass over that----

A Yes.

Q -- because you're not the author of this report. What I wanted to understand, though, is really to do what you'd already touched on, which is to try and see why it is that your report shows one thing and these graphs show something possibly different for the period of time-- and we have a visual aid which I think you've been provided with. If not, my colleague will pass you this. So, we'll put this on the screen for the benefit of everybody else. So, this is bundle-- So, I haven't actually got a note of which bundle reference it is. No, it's the new one. There was a document handed out to CPs today. They should

all have this on their computers.

A I think it's on the Inquiry website as a separate document.

Q It is, yes, but I'm just making sure my colleagues aren't looking confused, which-- Right. Now, again correct me if I'm wrong here, but your table at the top, figure 1-- we haven't come to your report yet, but your figure 1 of your report appears to look at gram-negatives – albeit selected gram-negatives – between July '13 and July '18, and the HPS report below appears to look at all gram-negatives between July '13 and July '18.

I'm wondering, apart from the problem about potentially a mislabelled y-axis on the HPS graph, whether the differences in the shape between the two are possibly only because your report is focusing on selected gram-negatives and theirs is focusing on all gram-negatives. Can you think of any other reason why the main line would be different, these two figures?

A I would probably start by pointing out the similarities in them. I think when looking at my chart it should be the dotted blue line which is the----

Q The organism count.

A The organism count, so the total number of organisms, rather

than the red line which is about the number of patients. So, the blue line is higher because patients have had more than one infection. So, you can see there on July '13 or August '13, perhaps, the matching peak to that first peak in the----

Q Please don't do that. Keep the whole thing on the page.

A On the HPS chart, where it crosses the upper control limit for the first time, that red diamond----

Q What, on the far right-hand side?

A Left-hand side.

Q My left-hand side, yes.

A Corresponds. You can also see the two blue dotted peaks on the-- (inaudible) comparing and matching with the two peaks on the HPS graph at the same----

Q So, let's just do this for the poor person who has to read the transcript. You're identifying that on the upper graph – that's your graph – there is a peak for approximately late summer '13 that rises in the blue dot to 1.5, and you're also identifying on the lower graph, the HPS one, a red diamond which appears to be approximately the same period of time which is very high up the graph at a peak?

A Yes.

Q And then you're doing the same exercise on the right-hand side. On your graph, you've got two dotted line blue peaks in April or thereabouts 2018, and on the HPS graph there are two peaks with red diamonds for them in roughly the same position on the right-hand side of the HPS graph?

A Yes.

Q Yes. Now, you were about to do another one, but I wanted just to make sure we can describe them accurately.

A Yes, and very similarly, if you move on the top graph inwards from the right-hand side to around April-July '17, you can see again two peaks higher in July than April and you have a further two peaks, although the same size, around about the same time in the HPS chart.

Q In fact, without jumping back to it, we recollect there were similar peaks in the Harvey-Wood graph, albeit it's a different denominator.

A Yes.

Q Right. Thank you. Now----

A So, I just wanted to do the comparison of why they are actually perhaps closer in----

Q Yes, and then you're perhaps going to move on to figure out why they're different.

A Yes. So, the main reason will be the organisms included. If this is all gram-negatives versus the selected gram-negatives, that would be one. Another potential difference might be in how the individual case records were included, and this is something that's discussed in some of the methods-- sections of the various reports----

Q Yes.

A -- is, once you extract the data-- used your search terms, you've extracted the data from the databases, whether that is ECOSS, which is what both HPS and myself used, or whether it's the local laboratory information management system, the LIMS system – which should be pretty close, because ECOSS is just an extract out of all the local LIMS systems – you get a fairly long list of things, and that's where the de-duplication process comes in, first of all. The first run of that is literally spotting duplicate results.

So, for example, one that happened quite commonly when I was doing the de-duplication was, you might have a result that said "Enterobacter cloacae" and the next line will say "Enterobacter cloacae

ESBL", which is a marker of antibiotic resistance, but when you look, it's actually the same sample. It's the same specimen number.

Q And they have the same number?

A They have the same number. So, it's actually the same result, one's just got slightly more information in it. So you don't want to include that twice. So, that's the first kind of data cleansing exercise.

We also have, then, the process that's discussed in reports about the de-duplicating this 14-day rolling timeframe, where you want to note the fact that, actually, maybe this positive blood culture is the same infection rather than a new infection. So you don't want to count it twice.

The next process when looking at these-- Actually-- I will continue to explain, but it doesn't apply to this chart because this is the 2018 one rather than the 2019, where I'm just looking at the whole hospital.

Q Yes.

A But something that will come in later, with the 2019 report, is how do you decide whether to include one of these results as being a patient who is under the care of the haematology-oncology service?

Q Yes, because Mr

Mookerjee describes that as one of his great problems of trying to work out where the patients physically are located. Is that an issue?

A There are, again, different ways of doing it or different steps in doing it. So, you can use the ward location, which will be on the ECOSS report, for example. It will tell you which ward they're in, and we know which wards haematology-oncology patients are in. We also know who the haematology-oncology consultants are, so the consultant's name will be attached to the record. What you can do is use more than one of these.

So, when I was doing the 2019 update, I used a four-step process in doing this. So I had all the results from RHC, and the first thing I looked at was ward location, and if they didn't have-- So, if they had a haematology-oncology ward location, they go in that bracket. Those that were left, I then looked at the consultant. So, if it's haematology-oncology----

Q And then (inaudible)----

A -- consultant, they then moved across.

Q Right.

A What I then looked at was the clinical description of the reason for the test, which is included in

the ECOSS download, which gives an indication of what their underlying condition might be. So, for example, if it said something like, “neutropenic sepsis”, that’s a condition that I would strongly associate with haematology-oncology patients. So they would move into that. Then, with those that were left, I went and looked at the individual patient records to see what their underlying diagnosis was.

Q Right.

A Which is a more involved process than either HPS or Dr Peters and Ms Harvey-Wood used.

Q Or even Mr Mookerjee, because he didn’t have access to either. So, you could do that because you had access to the systems?

A Yes.

Q Right.

A So, I would have slightly more cases, a small number that would be there. I suppose I would just----

I was going to go onto your report, but do continue.

A I just want to make another observation on the comparison between these two charts, and I suppose one of the potential dangers of SPC charts on (inaudible), in our practice in public health, we do trend monitoring of certain diseases,

but we don’t use SPC charts, we use-- because we happen to have the resource with an epidemiologist a more sophisticated method that’s used by UKHSA, which takes account of some of these issues we’ve discussed, such as not having a steady baseline and, how do you account for a previous outbreak? So, there are statistical adjustments you can do to account for those things----

Q Right.

A -- which you don’t do in SPC charts. The other note on this SPC chart, I mentioned the comparison between the two peaks in April ‘17 and July ‘17. In the SPC chart, they’re just hitting the upper warning limit, which is, “Maybe this is something we should think about,” it’s not up to the upper control limit. Whereas I would look at or head in-- be more concerned about it than I would necessarily on the basis of----

Q Because on your graph, they’re higher.

A The SPC chart might give a-- it’s not a reassurance because it’s still hitting the warning limit, so you’d still might want to think about it, but it perhaps could-- downplays it a little bit.

Q So, before we leave the HPS report, I’d like to go back to

bundle 7, page 211, and talk about the final graphs approach that they used, which wasn't an SPC graph; it was this page. Now, I'm proposing that we just zoom in to the top half of the page, and keep the heading, please. Thank you. Now, the reason I want to go to this is that Ms Imrie who produced this, or one of the team that produced this, felt it was quite a significant graph, and she described how it was the type of bacteria that were emerging towards the-- in the later time, in the new hospital in '17/'18, were significant for their reasoning.

Now, you haven't produced anything like this, I appreciate that, but I'm wondering whether this difference in the population of gram-negatives in the dataset that's being-- so this is environmental-- different population of environmental organisms that's being reported here, and indeed any difference in the population of gram-negatives that happens in the sort of mix of type of species, that are in the mix in the wider gram-negative category has any effect on the utility of-- or has any effect on the output of your work.

Because, if we go back to your report, and we'll go and move to your report-- Hold this in our memory, that there's an extra complex population, and just hold that thought for the moment, and then we go and look at your report in bundle 6 and we go and look at page 107. So this is your report in 2018/2019. It's the second report and it's figure 1. Now, from what you've said so far, you have looked at only the organisms that were the subject of the IMT.

A Yes.

Q Yes.

A And I have now found where that list is in the-- it's the very last page of the 2018 report----

Q Well, let's just go and look at that. So, what page is that on?

A Page----

Q Well, you haven't got the page number, so it's----

A It's the very last page of the 2018 report, which will also be the very last page of the 2019 report.

Q Yes, it's page 121. So, 121 is the appendix of the list which was provided to you by Dr Inkster.

A Yes.

Q Right, thank you. So, if we go back to page 107, we've looked at the HPS report and the observation by them that the type of environmental bacteria – and I accept it was environmental bacteria on that table – was different in 2018/2017, than in the old hospital. But we've heard some,

as it were, parole evidence from nurses and doctors involved in infection control, and microbiologists, that the type of-- or all the microorganisms were different between ‘17, ‘18 and before, and their experience is it’s a different type of microorganism that’s coming up, this rareness. In your table 1, on figure 1, here on page 107, what are you trying to show? This is your 2019 report.

A Yeah, and what we’re showing is trying to look beyond the headline figure of the selected gram-negatives. What can we say about individual organisms, as best we can? For most of them throughout the-- I think I talked about this more in the 2018 report.

Q Well, in fact, let’s go and look at the 2018 because I realise that we’re actually going to confuse everybody if we do this. So, maybe we go back to page 102 instead. Not page 102, sorry, page 96. Is it easier to talk about with this graph-- page reference?

A I would go forward two pages to the table itself.

Q Right, page 98.

A Thanks.

Q So, you explain what you’re trying to do.

A So, what I’m trying to do is demonstrate how the different organisms have-- their incidence has changed over the time period, and given so many of them only occur in such small numbers, charting them individually is perhaps not helpful because, if you have, let’s say, maybe one case in 2013 and two in 2015 and one in 2019, that chart isn’t particularly informative as a chart. But I think it’s important to look below the headline of all the gram-negatives we looked at in the IMT, and in that table you can see clear increases in all of the named organisms and the other group, which would be comparable to the HPS chart with the blocks and dots----

Q Yes.

A -- we’ve just looked at.

Q So, this is, effectively, you doing the same sort of exercise, but gram-negatives, in your report by means of a table----

A Yes.

Q -- that they’ve done with blocks and dots. And effectively, what you draw out from this is there is an increase at 2018 levels, 2018, in these organisms in ‘17, ‘18 and ‘16, ‘17.

A Yes.

Q That was what you reported in October ‘18.

A Yes.

Q If we go back to the chart

I was trying to show you to, which is on page 96, because your chart goes back to before the opening of the new hospital – it doesn't go very far back – is it legitimate to draw any conclusions from this chart about whether there's been a change in the number of the selected gram-negatives between the old hospital and the new hospital, using this report as a basis?

A So, yeah, so it's a two-year period with the old Yorkhill and a three-year period with the new hospital. I wouldn't use it to say, "Here's what the normal rate is or the expected rate is," although you can see it's actually fairly stable through 2014 in the old Yorkhill Hospital. One of the key purposes of both the '18 and '19 document, the updated document – and I think this is important for the discussion – is, what conclusions can you draw from these documents?

Q Yes.

A And it has been, and I've (inaudible) seen the witness-- not the-- the minutes, the people with different views on what was going on. For example, Dr Deighan, Dr Peters both say Dr Kennedy's report says there's no problem now----

Q Yes.

A -- which is not a conclusion the report actually reaches---

Q I see.

A -- and isn't stated in the report; and I would go further to say it's not a conclusion this type of work could reach. They key----

Q Now, if you remember----

A -- the key aim of this sort of work is to support the IMT in asking more questions rather than giving them specific answers.

Q Now, obviously, this is the 2018 report----

A Yes.

Q -- so this isn't the report that Dr Deighan was talking about because he was busy doing nephrology at that point. So it wasn't anything to do with him, but the twin of it, in 2019, is methodologically the same?

A Yes.

Q Right. So, you can't use this report to say-- you can't use the report to say there's been no change, it was not a problem, but you can use it for what?

A So, you would look that and you would ask the question, well, there's obviously a big beacon around April/May 2017. What was happening---

Q Right.

A -- then, is that the same

as what's happening now? Why do we have the-- people seeing particularly the polymicrobial episodes in May? I would also be asking the question of, why does it dip so low in second half of 2015? What's happening there? What else has changed?

Q Is there not a slight snag here that is that this report and, indeed, your second report, but it's probably more relevant at this point, is focused on a list that Dr Inkster gave you at the start of the water incident IMT and is, therefore, focused on the things she was interested in then? It's basically-- What it is as far as we should understand it-- as you understand it, it's her list of what's interesting.

A Based on positive samples from the patients, the water supply and the drains.

Q And so if-- And I don't know whether this is the case, but I'm just raising it as a possibly: if there was a different sort of infection happening in 2016 involving different gram-negatives, it wouldn't come out because it wouldn't be in the list, whereas the Harvey-Wood approach of looking at them all would have captured that. Would that be a fair criticism of something this report wasn't designed to do?

A Yes.

Q Because it wasn't designed to look back at everything.

A Correct.

Q So, in a sense, this is a-- it's designed to look at what's happening now to the things we're interested in. It's not designed to look at what happened in the past to everything else.

A Correct----

Q Right.

A -- and that comes back to a couple of conversations from earlier around case definition. So, if we want to look at something else as part of the IMT process, we need to change our case definition, but also that discussion we had earlier about, if something new and unusual appears, how do we spot it?

Q And this is about trying to spot when the unusual things might have happened.

A No, if you don't yet know about it, this sort of study won't capture those things because you don't know it says-- It's an unknown unknown, which is why you rely on more than just the broad surveillance systems. If you're trying to identify, is there an issue here, might there be an outbreak, is there something that needs investigated, you have formal

surveillance systems, you have things like the alert organism list, but you also have--

So, in the hospital infection context, you're looking for the microbiologists to spot the unusual infection. From a public health perspective, we'll do things like, "Well, hang on, I recognise those postcodes are popping up more than they should do," or someone else, for example, an environmental health officer or a member of the public, phones in and says, "I've seen something worrying," and then you you look at it. So you rely on-- You can't just rely on a single system to identify problems.

Q Now, I'm going to ask you a question following that, but it'll have to wait till we get to the 2019 report. Before that, we just need to look at the HPS report from the summer of 2019. So that's in bundle 7, document 7, 250. I want to understand-- You read this report at the time?

A Yes.

Q Right. So, Ms Imrie has given evidence that the primary aim of the report was compare the datasets:

> "I think the Chair presented the data to support the IMT closing, and the ward be open to all admissions. If I remember right, there was a gram-positive and a gram-negative presentation. Professor Riley said if improvements on gram-positive ... they wouldn't necessarily"--

So that's not relevant. The main thing is the reports compare datasets.

If you move on to page 252, we see actually it's set out in the methods here. They're looking at all the different datasets. Is this an understanding that you have that this is a report, the purpose of which is to look at the difference between the CLABSI surveillance data, the ECOSS data, the LIMS data, the HPS dataset, or is it more than that?

A I think it's more than that.

Q Right, what do you think it is then?

A It's using the comparison of the datasets to-- firstly, are the datasets saying the same thing?

Q Yes.

A Which I think, broadly, that's the HPS conclusion, which I agree with, which is understandable----

Q So, you did that.

A -- because they all use ultimately the same----

Q They've all got slightly different selection of what's in there----

A Yeah.

Q -- but they're all the same thing, right?

A But then what does that mean for recommendations for the Board as to what to do next within the incident management process? And that's-- I think that comes through in the recommendations----

Q And, indeed, in the report, I mean, we can probably-- Just for completeness, so that we're not missing things out, an example of that would be, if we go to page 263, there is a discussion of case double data. Over on the next page 264, they pull out, "There was an upward shift of 10 data points in December to-- March to December 2017," for example.

A Yes.

Q And then if we went on to page 267, they have a section of the comparison with other health boards.

A Yes.

Q So there's other bits of data in there, but I suppose what I'm boiling it down to is, to the extent to which this report is comparable to your 2019 report that we are about to look at, because you sort of suggested that the 2018 report is broadly comparable, but is perhaps using a simpler set of statistical tools and is looking at all of the gram-negative, all the gram-positive, etc., is that the same points you would make about this report, or would you say something different?

A It's similar. I think there is more helpful commentary and expertise and advice being given----

Q Right.

A -- by HPS through this report, particularly when it gets to conclusions. I think the key thing is this uses later data than my 2019 report does. It is more up-to-date data. I think there's also a helpful thing to look at in terms of thinking of the box and dot diagram we've just looked at, in terms of figure 9 in this document.

Q Well, the snag with figure 9 is they redacted it rather impressively, so we don't have figure 9; that's on page 268. If you go to page 268----

A Yeah.

Q -- so that's not a lot of use to us. We must get the unredacted one. I think that probably would be a good lesson. But what I want to do now is move on to-- Well, let's look at their conclusions at 271----

A Yeah.

Q -- and then we'll move onto your report. So, do we see in, for example, the bottom of this page, on the third paragraph at the bottom:

> "The SPC charts included in this report describe that there's been instances of variation outside what would normally be expected in the patient population."

So they made these conclusions, and you've then gone and done your piece of work.

A Yes, they've also made some recommendations based on their conclusions----

Q Yes.

A -- which is what is then helpful to the IMT----

Q Well, let's go and look at 272, and we'll see what those are. So, is there any particular ones that you think stand out within the recommendations?

A Yes, it's the-- there's a few-- there's the-- that are helpful and important, the systematic-- collect clinical data, and I think an important conclusion of this report is all three methods were similar enough that they-- "Keep doing what you're doing; you don't need to change."

I think the key one is the fifth bullet down, which is the one saying you'd consider current control measures around restrictions on services for newly diagnosed patients because, at this point, the ward was closed, new patients weren't allowed to be admitted to the ward, but patients who were already in the ward were still there. And that conclusion reads as close as the HPS would say to ,"We've not seen a justification for you to keep the ward closed. You need to think about reopening the ward."

Q And, indeed, they eventually----

A Yes.

Q -- support the reopening of the ward.

Q Okay. Well, what I want to do is go to your report now, which is back in bundle 6, and it starts at page 104. Now, your report-- Well, before we do that, I think you've actually already answered my questions about SPC graphs, and you've expanded on your discussion about those in commentary about Mr Mookerjee's reports, I'm not going to revisit all that. I think you've explained what you think they're good for or what they're not good for, so we won't cover that again. But this report, does that have an origin in a report-- in a request from Dr Armstrong, this particular report?

A Indirectly, yes.

Q Because I think you mentioned that in paragraph 137 of your statement on page 158, and then we have an email I'd like to look at

which is bundle 4, document 36, page 151. So is this effectively part of what generates your report?

A Yes, the----

Q And therefore does it follow that, effectively, bottom of this page, we have what amounts to an SBAR from Dr Mathers, and then, as a result, one of the outcomes is that you do your report?

A Yeah, well, the outcome was myself and Sandra Devine met with Dr Mathers to get more of an understanding of what his conversations with Dr Inkster and Professor Gibson had been and what he saw as the way forward, in terms of responding to the concerns they were raising, as part of which I said, "Well, if it's helpful, I can update what I did in 2018 for now. I can look at the haematology-oncology patient cohort specifically which I couldn't do in 2018, and given that the IMT has restarted, it's a sensible thing to do anyway."

Q But your report doesn't seem to actually address the issues in the SBAR, does it really, or have I misunderstood?

A I think it's part of having, again, as many different pieces of evidence as possible. I mean, that was just one place. My understanding was that Dr Mathers had also

commissioned clinicians within the haematology-oncology service to do individual reviews of these cases, and that he was then going to bring together a conversation with-- or a group with himself and Sandra and Professor Jones to answer the-- or to look at the second question around, could things in 2017 have been picked up earlier? Was there an issue within the microbiology service?

Q Because the thing that just occurs to me is that in a sense it's slightly strange that, in March 2019, there's this anxiety that something has been missed in the past as a result of which many things are done, but one of those is a report, which when it finally comes out in the autumn and is used, it's actually used not to make a decision about the past, it's used to make a decision about returning the wards to normal operations. Is that odd or is that-- shall I just not worry about that?

A Well, I think it can serve more than one purpose. So, it's useful for the IMT, but from the work that Dr Mathers was taking forward, its usefulness is that I could repeat the work but only looking at the haematology-oncology patients. So, we'd be able to be clear about what happens in terms of the trend in

bloodstream infections through 2017, 2016, 2018, in that cohort----

Q But you're using the same list?

A It's the same data, yes, because it----

Q What I don't understand is that-- I understand why, in 2018, you took the list of microorganisms that were of interest to the IMT from Dr Inkster and did your work on them. And, as we've seen, Ms Harvey-Wood and Dr Peters did a different thing; they took all the gram-negatives and all the environmental-- all the gram-positives and did their piece of work. And I understand you've explained the reason you did it your way is because you were feeding into the IMT, and the IMT was interested in those organisms. That makes sense. The same organisms are the list that forms this report. That's right?

A Yes.

Q But it's a different IMT. Why are you not creating a new list of organisms for the new IMT? And, in fact, you're not doing this report for the IMT, are you?

A Not initially, but it was helpful to share with the IMT as part of this process so that-- My understanding would be that the cases from 2017 were already covered by

the list provided by Dr Inkster in that sense.

Q Well, could we just pass that? How sure would you be that would be the case? Because 2017 might have been different microorganisms. Did you get a list from Dr Mathers of what the microorganisms were?

A No.

Q No, and this report that you produced in 2019 is based on the list of organisms that was relevant in 2018.

A Yes.

Q Yes, and might that be a reason why this report isn't presented to the 2019 IMT because it's not been requested by 2019 IMT, has it?

A No.

Q No, but you produced it early in August and asked it to be presented.

A Yes.

Q Yes.

A It had been passed to Dr Inkster earlier than that.

Q But it wasn't actually looking at the same microorganisms as the 2019 IMT was looking at?

Q I wouldn't be a 100 per cent certain on that, but certainly Dr Inkster didn't say, "You've missed some organisms"----

Q Yes, but she didn't ask you to do this report did she?

A No, but she did have the report. She would----

Q No, but my concern is that I absolutely understand that, in early 2018, it would be possible to give you a list of what's relevant to the 2018 IMT, and you do your work, and you've done it, and we've discussed it, and two other people did something similar, and we'll come back to what the difference is between them at the end. But this report doesn't come out of the IMT, does it? It comes out of Dr Armstrong and the Mathers SBAR and this thread. Yes?

A Yes.

Q Yes, but you're re-running it, looking at the microorganisms that were relevant the previous year.

A Yes.

Q And so, to take one example, Mycobacterium chelonae wasn't on the list, was it?

A No.

Q No. Now, it was discussed in the IMT the previous year as Mycobacteroides abscessus, and it was reported to HPS – we have the email – but it wasn't in your list from Dr Inkster.

A Correct.

Q I mean, I haven't checked, but could it be there are other microorganisms that turned up in 2019 that aren't on this list?

A It's a possibility. The risk there is that a small number of cases are not included in the charts----

Q But it's a different ward. So this is a different ward and as I'm sure Professor Steele said in the IMTs, there's been a chlorine dioxide system fitted and there's filters. So it's a different environment, and that's right.

A Yes.

Q And you just told us this morning how it was really important not to keep harking back to last year, but haven't you just done that? You just harked back to last year, you've just rerun the work from last year, or am I being terribly unfair?

A So, it's about-- No, I take the point of, there may have been new gram-negatives involved. Well, I think that's partly what the October 2019 HPS report is demonstrating, that actually the three or four different methodologies actually come up with pretty much the same results, which I think is comfort in terms of, was there much missed? But there's also the importance of-- back to this point about comparability, if we're wanting to think about what was going on at that time.

So that's why it's an update of the 2018 report, principally to look at the haem-onc cohort separately rather than the whole of RHC, and taking the opportunity to also update in terms of time, so there was that comparability, and then, as a secondary benefit, providing that to the IMT.

Q I appreciate that you see it as a benefit, but I suppose the point that troubles me is, because where your report is eventually deployed in the latter months of 2019, it is deployed as one of the pieces of evidence that enables Professor Leanord and Professor Jones to determine the ward is microbacterially safe-- microbiologically safe, sorry, but it's not a piece of work done to consider the organisms that are in play that year, is it? They might overlap a bit, a lot, but then it's not same-- it's not the new list. It doesn't meet the case definition of the new IMT, does it?

A Well, the case definition of the IMT became extremely broad and was not based on organism. It was based on location and gram-negative infections. When I come back to the HPS October 2019 report, as I said, which has both the points on comparability of what is included in the reports and the similar conclusion

around what the current level of infections within the wards are. In terms of Professor Jones and Professor Leanord, their views are based not just on these pieces of work (inaudible)----

Q Oh, no, I appreciate that they have other bits to deal with. We can ask them about it, but it's just that, if the definition of the IMT's case theory is brought, it's all gram-negatives, it's all environmental, which I think is the case, you accept that?

A Yes.

Q Then we know there's a methodology out there from the previous year from Ms Harvey-Wood. We should look at all of them, and we-- That's fair, isn't it? That was what she looked at?

A Yes, yes, and again, I would come back to that there is very little difference in the actual data points included.

Q No, but I suppose----

A I mean, I'm very happy to-- I appreciate it to the point that the use of the same list from 2018 versus 2019 is a risk in terms of potentially missing some data points, but I'm not certain how different those two lists would actually be in practice because-- --

Q I suppose the worry I'm

trying to push you on is that that decision towards the end of '19 to declare the ward microbiologically safe had many sources of evidence, and I'm only focusing on the epidemiology at the moment, but your report seems to have required a certain amount of totemic value. It keeps being quoted by people, and I hadn't quite realised, I think, until the way you've explained it today, that it isn't actually based on the case theory of the IMT it's being used in, it's based on the previous year's IMT?

A Yes.

Q Now, what that makes me worried about is this, is that the previous year's IMT theory – we discussed it this morning – was the water.

A Yes.

Q The chilled beams and the cooling water and the drains were-- until after the summer, weren't the issue. The issue was, "Is the water contaminated?" That's correct?

A Yes.

Q Effectively, there was a broad consensus that the water was, to some extent, contaminated. As a result, the filters were fitted and chlorine dioxide was fitted, and that's all correct?

A Yes.

Q So you'd expect that cause to have reduced its potency by the end of 2019. Would that be a reasonable hope?

A Yes.

Q Right, but the unaddressed problems, the ones that aren't addressed by chlorine dioxide – that is the drains and the chilled beams – they wouldn't change because of the chlorine dioxide and the filters, would they?

A Well, in fact, in terms of the drains, they would, and this was a position the IMT took in terms of, once the initial work on the drains was completed, that the chlorine dioxide coming through the system would support keeping the drains clean.

In terms of organisms within the drains, it was the Klebsiella and the Enterobacter, so these-- the more common of the organisms which are included in the report. In terms of chilled beams, that might be a different issue, although, again, my understanding is the only positive sample back then was a Pseudomonas, which would have been captured----

Q But it didn't match the patient. I accept that, yes.

A But it would have been included in that report. I suppose the

other-- and I think you make an important point here, which was what I was alluding to earlier, about that it-- this work has gained a kind of totemic status for various people who've got different narratives, which would not be a position I would ever have wanted the report to have got into because I think it overstates the certainty that something like this can give.

Q Yes, and I suppose part of the problem might be that you, for reasons I think you've explained, start asking it to be presented at a series of IMTs when everything's getting rather strained, and certain people latch onto it and certain people criticise it.

A (No audible response).

Q You're nodding again, for the transcript.

A Yes, yes, sorry.

Q It's all right. Now, one of the things that, before we leave your report-- Your solicitor passed on a message to me that you felt it would be valuable to compare two of your charts and to draw a conclusion from it. I wonder if we can just look at this. I think it might be interesting. If we go to page 107 of bundle 6. So this, if I understand it, is your selected gram-negatives from the 2018 list in 2019?

A Yes.

Q And the table is the

updated version of the table we looked at before?

A Yes.

Q Right, and the next table over the page, what does this show?

A So this is the same information but limited solely to the Haemato-oncology patients.

Q So you've now excluded anyone else in the hospital?

A Yes.

Q Now, is it geographically constrained to 2A, or is it constrained to patient group?

A So, this was the-- I get why it's confusing because we're talking about this during the 2018 report, the piece about the four-step process I used.

Q Yes.

A So it was geography, consultant, clinical information on the lab report, underlying diagnosis within the clinical record, was used. All four of those were used. So, for example, if – and this is entirely hypothetical – you had a patient with leukaemia coming into the hospital who was septic and had blood cultures taken in the emergency department, they won't have the Haematology ward listed and they won't have a Haematology consultant listed because they've got the ED consultant listed. (Inaudible)---

-

Q They wouldn't (inaudible – overspeaking)----

A I would have picked them up because I would have then looked at the underlying diagnosis that that patient had and attributed them to the Haematology-oncology team.

Q So is this effectively quite close to attempting to identify the Schiehallion cohort?

A Yes, so this is the same data as the chart on the previous page but just limited to the Schiehallion cohort.

Q But it's not-- and this perhaps is important, I think, for the trouble that Mr Mookerjee has had: it's not geographically constrained to Ward 2A/Ward 6A?

A No.

Q No, right. Now, what do you think that this extra step brings, as it were, to the level of information we have?

A So, I mean, the reason I wanted to highlight is because we've had these conversations about denominator and denominator data and the use of whole-hospital denominator data as potentially masking the effect. So if you have a huge population who are not affected and a small population who are, if you look at it, you might lose the impact, and there's perhaps a tangential point to make about the fact that, actually, the new hospital has fewer beds than the old the hospital, so the denominator changes slightly. So, (inaudible), although the patterns are a little bit different, it is still clear. You wouldn't miss that there were issues going on somewhere in 2017 and 2018 just looking at the first chart.

Q No.

A They are still clear, so that was the-- that's the point----

Q So if we look at the-- If we jump back to 107 and jump back again, the '17 events and the '18 events are still there in page 108?

A Yes.

Q Yes. Please continue.

A No, that was it. That was the basic point. So it was a concern, it was recognised as a limitation, and that's an important point, I think, in terms of producing any scientific report is understanding the limitations that counter them, and it was one that I discussed in the 2018 report that it was something to be careful of. But then, in 2019, looking at the comparable results purely for the Schiehallion cohort, you can see that we haven't missed those incidents

using the whole hospital denominator.

Q Right.

A So it's providing some reassurance that the limitation and potential issue with the 2018 report hasn't come to fruition.

Q This is possibly the wrong thing to do in the middle of a hearing, but looking at page 108, we've already looked at the 107 before-- So we've jumped back to 107, and we've already discussed, as it were, the three higher points on this graph when we looked at it for the previous 2018 report: the one at the left-hand edge in 2013 that peaks in '17 and that peaks in '18.

Now, we do see a lower rate in '19 on this particular page. If we go back to page 108 and we look at the same passage of time, we again have something going on in 2013 and we have something going on in '17 and something going on in '18. What, if anything, can we draw from what's going on in '19 and the right-hand edge that chart?

A I think you can-- It's very limited at that point because this is only half of that year's information, and I think that comes back to point about its use by the IMT, is that we're then looking at data up to October. It looks like there is a slightly lower-- lower,

certainly, than 2018 level, but there's still quite high variability, and that's a comment-- I'm making the point there's still quite a lot of variability.

Q So one other thing that---

A In particular, the Enterobacter hasn't gone back.

Q Right, because we see that in the table on the previous page, 107? We see Enterobacter is still-- Okay, it's a table, not a graph, but it still seems as worryingly high in '18/'19?

A Yes.

Q Yes, right. Now, we discussed in the morning the view that-- and I recognise you didn't accept it, but the view that some of the treating clinicians had that there was a requirement to prove that there was an outbreak. Do you remember that conversation?

A Yes.

Q I think it was Dr Chaudhury that gave evidence on that, but other people have mentioned it in passing and in Glasgow, too, and what I'm intrigued about, and it may be there's other data sources people were looking at at the time, but to what extent does that last short section of this graph, or indeed the next one, enable anyone to draw any

conclusions about whether the rates in '19 were comparable to what you would expect, or the normal-- whatever way it might have been phrased?

A It's limited, and it's-- (inaudible) the point I just made of it; this decision wasn't made purely on the basis of data up to July 2019. We were making that decision in October, but I think it raises an interesting question, and a question which I myself asked in the IMT, which is, when looking at rates of bloodstream infections in this population, at which point should we move from considering this an incident that requires an incident management process and structure to when this becomes a question about quality improvement and reaching our irreducible minimum of these infections? And I think that's a legitimate point of discussion and professional agreement.

Q So this is just one piece of information that you'll put into that mix?

A Yes.

Q Right. Now, while we're just talking about Enterobacter, because you mentioned in your-- that there does seem to have still been an issue within Enterobacter after the end of 2019, and that we have IMTs for Enterobacter, and PAGs more frequently. Is that something you're aware of?

A No, I wouldn't have been aware, as the pandemic took over everything.

Q Yes. I mean, should we be worried that-- well, obviously we should worry for the individual patients, but in terms of understanding what's going on here epidemiologically, should we be worried about the fact that, to some extent, Enterobacter keeps popping up through 2021 in 6A, to the extent there are PAGs that we have in our documents from the Health Board? Is that something that should cause us anxiety about whether there is still an environmental connection going on?

A I'm not sure anxiety overall, but it certainly is an issue that requires investigation and control. It's not something that can be put aside. I wouldn't say, "Well, that's fine. It's just Enterobacter, that's what we have to live with now." That wouldn't be an appropriate response. It's definitely something that needs a response, yes.

Q Right. Well, let's go to page 111, look at your conclusion, because obviously, as you say, lots of people have used your report for other things, so we might as well focus on

what you think it says. So I think you've already discussed in the first sentence-- you've already mentioned that:

> "Since the previous draft report in October 2018, there has been a noticeable improvement in the incidence of gram-negative infections in the haematology/oncology population."

You've already mentioned that, I think we've discussed it, and then:

> "There has been both a decrease in the incidence of cases, but also importantly an absence of samples positive for multiple gram-negative organisms."

Now, the reason I want to push on that, and I'll just push you again on this idea that, although it's not immediately obvious-- We've sort of got to the bottom of it today. Your report is not looking at all the gram-negatives, is it?

A No.

Q No, so we have to read that with that just in our mind.

A Yes.

Q Right. Then, you narrate the structural changes, the chlorine dioxide, the monitoring, the high standards of practice, and then this sentence:

> "It can be hypothesised that all these various measures have contributed to the improvements."

Now, if they have contributed to the improvements, might that not be a reason to think that the presence of the things they were trying to fix is part of the cause? So, that if chlorine dioxide and structural changes and monitoring education is required, then the absence of chlorine dioxide, the inadequacy, if that's not the right word, of whatever the monitoring was monitoring and the education, is actually the cause, is there not a reasonable link you can make at this point?

A So I suppose it's the question of a reverse causation because we took control measure X, therefore that must be the----

Q Well, you took a lot of them, in fact.

A Yes, yes, so-- and I think we did discuss this this morning about the early 2018 IMT. The fact that your control measures work is added evidence that your hypothesis of the source of infection was correct.

Q Yes.

A So I agree with that. I

think sometimes I've seen it said that it proves, or because you did this, then why-- It's almost turned the other way around, do you see what I mean? It's-- I'm perhaps not explaining it the best way. (Inaudible), "Well, you're having an IMT, therefore you must have an outbreak," to paraphrase, and I don't think you should draw the causal line backwards. You know, at first, we had a hypothesis, this was the issue, so we put in the control measures and they worked, therefore that strengthens our hypothesis, is how I'd phrase it. It may be a distinction without a difference, perhaps, but----

Q Well, that enables me to just ask you a final thing about this report before I've got a couple extra questions. It's about Yorkhill, and we've touched on Yorkhill. Did you have any involvement in Yorkhill before or----?

A I worked there as a junior doctor, but I was never involved in any of the----

Q Because we've had some evidence about the water system from a number of witnesses, and that building and the age of it, but what we've got in Dr Inkster's statement is-- she makes a substantive point, which is that:

> "My point was that Yorkhill was a very old building. I knew the water quality at Yorkhill was very poor because we had really high Legionella counts. They had not looked for gram-negatives, but it was the Legionella counts that suggested the water was a problem."

If it's the case that the water quality in Yorkhill was poor, would that in any way reduce the utility or affect the way you understood, in comparison, as people do with your graphs, of what to think about the left-hand end? Does that affect the way you should think about it?

A Yes. I think it adds to context. I don't think it necessarily changes utility, and I think it comes back to the question on what is the minimum we're trying to achieve, and it may well be the legitimate point that what we could achieve in the old Yorkhill is higher than the legitimate aim that we want to achieve----

Q So it's sort of less good, as it were?

A Yes, yes.

Q So, therefore, if Yorkhill was old and had its problems, you ought to try better in a new building?

A Yes.

Q Right. Now, the final

thing is really to give you a free opportunity to say, at this point-- to tell me the things that were said in the IMT of 2019 about your report that you think it shouldn't be useful. In a sense, what shouldn't we use your report to do?

A I think that the key one is the one I've already said; you shouldn't use the report to say a definitive answer of, "There is no issue," or, "There is definitely an issue." It should be used alongside other pieces of information. So, other things I think would have been helpful for the IMT-- so, there's a mention in one of the email trails about up-to-date case data and epi curves available from ICNet I don't think were ever presented to the IMT. They would be useful things.

I think further descriptive epidemiology-- So, we talked this morning, and I might expand on something I said, about "When can you do the time, place, person, descriptive epidemiology," and that that is easier when you're dealing with a single organism.

Q Yes.

A Now, you can still do it with multiple organisms based on your case definition within the IMT, and I think there is actually a good example of that in the Case Note Review

chapter on descriptive epidemiology. I think it might be chapter 4 of the Case Note Review, you (inaudible), actually, quite a nice piece, a detailed and quite nuanced piece, about the descriptive epidemiology. So, obviously, they have the benefit of doing that after the reactive processes have finished, but certainly it's the sort of thing that you could do during an incident management process. You wouldn't want to or need to or have the resource to update it every time you have IMT, but it's something that you could keep regularly reviewed.

Q The only thing I want to do now before I ask you some questions about whole genome sequencing is just that I had forgotten that the heavily redacted section from the HPS report is available elsewhere. So if we go to bundle 7, page 232. So I'm assuming you've seen this table before?

A Yes.

Q So what is it trying to show us?

A So this table, or the one over the page, which I think is the gram-negative-specific----

Q Yes, let's go to the gram-negatives.

A So this is a-- it's similar to the box-and-dot diagram in the

previous report, but I think this is a better graphical presentation of that kind of data, and we have three columns: one representing the time in the old Yorkhill, one representing the 2A/2B, and the one on the right representing the time during the decant. It's important when looking at this to remember that those three columns represent different lengths of time.

Q Yes, of course.

A So it's two years, I think, for the first column, three years for the middle column, and one year for the right-hand column, but you see can quite neatly there the way-- Because these are-- although there are individual incident numbers written on the chart, it's actually percentages, and it adds up to 100 per cent.

You can see the way the mix of organisms changes over time and in the different locations, and you can see, for example, the way Klebsiella has increased a lot disproportionately to the difference in time period and then decreased a lot disproportionately to time period. But then the top half of the charts have the ones which are much rarer organisms, ones where there might only have been one in that time period.

Effectively, what you can see is that 2A/2B period where there is a kind of almost rainbow effect with far fewer colours in both the old Yorkhill and the 6A/4B time period, demonstrating a reduction in the diversity and a reduction in the number of those very unusual organisms. So I think it's quite-- I highlight it just as I think it's quite a helpful graphical representation of that complexity.

Q Are you wanting us to notice that, in a sense, the rainbow of complexity has gone? Is that the point you're drawing?

A Yes.

Q Right. To what extent would you consider the mix of organisms in the 6A/4B environment to be similar to the Yorkhill environment or different from? I mean, how would you describe the difference?

A There are some similarities for most of them. About 80 per cent, 85 per cent of those columns, they're the same organisms, and it's just those last few where there is difference. There are some organisms that were seen in the old Yorkhill not seen in 6A/4B and vice versa.

Q Because it occurred to me that, if you are-- and again, this is the words of, I think, the clinicians, not, I suspect, Professor Leanord, but he's giving evidence next week and he can

say-- that part of the reassurance about the decision to reopen the ward's services is, because that situation is-- I don't think anyone used the words, "No worse than," but certainly similar to or comparable with the experience in Yorkhill-- is if you're going to end up with the same water standards as Yorkhill, you're back to the problem we just discussed of it being an old system and maybe that's not the standard we should be aiming for. Would you agree with that or disagree?

A I would agree.

Q All right. The final thing I want to turn to is whole genome sequencing. So, we can get take this off the screen, and I'm going to really do this, I think, with a reference to a short section within your statement, page 137 of the statement bundle.

So, in paragraph 61, it's the first time you touch on whole genome sequencing, the bottom half of it, and you see, just after the reference to Suzanne Lee in the middle, and I want focus in on a sentence which I'd like to understand why you think it. So this is six lines from the bottom. It's the line that begins "common ancestor," but it's the following sentence:

"I would think that if there were multiple strains in the biofilm, they may well demonstrate a common ancestry."

I wondered why you think that. Is there an evidential source that you're relying on?

A So, it's a logical thought process, I'd say, rather than a specific evidence base. So, when we get to the use of whole genome sequencing rather than lab typing, you have a much greater granularity. So, we've talked briefly about the typing, so the Steno cases described are all typed as unique, which is a descriptor, but not necessarily a helpful one.

I'm much more familiar, for example, with typing of things like E. coli, where we'll get, you know, O157:H7 or something like that, or we'll get some other sequence of letters and numbers that gives us quite a lot of detail. But then, if you then go to the whole genome sequencing level, there are other organisms, other outbreaks where the whole genome sequencing demonstrates, actually, quite a close link, even though the biochemical or microbiology lab typing says they're different, because you're looking at more detail about the organism.

When you look at whole genome

sequencing results, you often have them presented as trees or presented as diagrams where it's effectively interconnected circles, and the more cases you have or the more isolates you have that match the sequencing, the bigger the circle, and then the longer or shorter the lines between the circles demonstrates how different they are.

The phrase used-- the term is SNIP, or SNIPs, and I'm sure Professor Leanord will be able to talk a lot about this, but single nucleotide polymorphisms, so one change in one part of the genetic code, and the whole genome sequencing will-- may as well be able to tell us how many of those changes there are, and you have to set criteria as to how many SNIP differences represent the relatedness such that you would still count the organism as being linked or being part of your outbreak. We tend to start with five. If there's less than five SNIPs' difference, they're effectively close enough to being identical that we count them as being the same. Some outbreaks, we've gone out to 25, or we've done more detailed consideration about that interrelatedness.

I would anticipate, if there were multiple strains, and here I think we're talking about five different isolates at this point, and there were more later on through 2018 and 2019 that are all typed as unique, it's-- The mycological process there is, is it more likely that there have been a dozen different strains of Stenotrophomonas seeded into the pipework or the taps and then joining the biofilm, or is it more likely that there are a smaller number that, over time, have-- as they replicate, mutate and the sequences change, so you'd be able to trace them back on that tree.

Q So, just to sort of narrow this down, are you effectively saying that one of the options is that you have a bunch of related bacteria, and the measure-- and effectively the assumption is are they all related and how close they are either related, or you've got multiple different sources which have no relationship to each other, other than they're just of the same species and that's the comparison you're just drawing to there?

A Yes.

Q The reason I focused in on this sentence is because we've heard evidence that the hospital's water system was filled for 12 months and assessed as high risk for Legionella and wasn't particularly

actively managed – or at least people are critical of the level of management – for some years until there starts to be work by the authorised engineer in 2017. I wonder why you think that, in a system that big, all the Stenotrophomonas in all the biofilm would have a common ancestry. Because that seems to be what you might be saying, or am I actually just putting words in your mouth?

A Well, as I say, it's not necessarily that they all come from a single genitor organism, but that it would be, to my mind, more likely that there were a small number that, over time, have mutated and changed and drifted apart, rather than being so many separate unique strains all being introduced at the same time.

Q Do you have any evidence for that, other than logic?

A No.

Q No?

A And I would turn to, I would say, Prof Leonard, who already talked about this because, in terms of the science of full genome sequencing, there is-- it's where-- we understand-- the bioinformaticians who do the work understand that certain bacteria will mutate at certain rates. So you can take into account the time frame that it would have-- well, for this bug, it would have taken two years to change that much, but actually for another one it might have taken three months.

Q Right.

A So you can get in-- I'm raising that specifically in answer to the point about if the water system had been filled for 12 months or 24 is however long----

Q Well, we'll ask him----

A -- to be able to work out how much change would you expect over that time period for something that's measured.

Q We'll ask him (inaudible). So let's turn to page 178, your paragraph 199. Again, I think you're now discussing the usefulness of typing results. We asked you about that. And in the third sentence:

> "I agree with the principle stated by others that, in a scenario where there are multiple strains in an environment, a lack of typing match does not rule out a connection. However, it makes the probability of connectedness less likely. Similarly, the opposite is true. Matching itself doesn't prove connectedness but greatly increases the probability of the two samples connected."

Now, I think no one is

disagreeing that matching influences the probability of connectedness. It's the other half of that, the first half of that, that's interesting. Again, what's your source for this sentence, the two sentences beginning with "I agree" and ends in "less likely" in there? Where are you getting that, those four lines from? Because you're not the microbiologist yourself, so that's what you need to find out.

A No, it's from experience of responding to public health incidents-- is about-- What I'm trying to see here is I agree, as you know – I think everyone agrees from the declarative perspective – that if there is a connection, although I actually disagree with it later on in the paragraph, that matched typing suggests connectedness. But one thing I suppose to generally challenge is the view that unmatched typing is still useful information.

Because the more-- and particularly in the context of this instance where there are hundreds and easily in the water tens of thousands of samples, the probability of getting a match sample or a related sample increases. So all I would say is it's not a black and white binary, 'Yes/No.' It's still something to think about.

Q Because Professor Dancer gave evidence yesterday of, albeit not in the context of whole genome sequencing but in flagella testing – I can't remember the exact word – for counting the nucleotides on the flagellum of bacteria. She explained that her view is that when you have a suspicion that there is an environmental source to the problem you've got and you're testing and you've got a method of connecting the two, you don't just test it once and find there's no connection. You keep going, you keep looking, and I think you used those words in a slightly similar context earlier on this afternoon. So would you agree with her that, if you're faced with a possible environmental connection and you don't find a whole genome sequencing connection, that's not a reason to stop, it's a reason to keep looking?

A Yes, and I think there are-- these will be questions for the microbiologists about exactly what typing did you use. Was it species-specific typing or did you look at things like antibiograms? What's the antibiotic resistance profile of these organisms, which are also an indicator of potential relatedness, even if other

typing doesn't match, for example?

Q The final thing I wanted to ask you about was-- Before the lunchtime break, I'd asked you about what it is, what had happened, what's been the causal-- or why is it that end up with the low infections that you say we don't have?

A Yes.

Q Is that low infections now or low infections then in 2023? When would you say, because I didn't put a date on that? Would you put a date on it?

A No, I didn't put a date on it, and I wouldn't without looking at the data.

Q But now, approximately?

A Yes.

Q Right, okay. What was your understanding of how it is we got to a position where now, approximately, there are a low number of infections in the Schiehallion cohort? What's your explanation for that?

A So I think it's the same as my answer before----

Q Well, I didn't quite understand it.

A OK, yes.

Q That's why I wanted to press you again because it didn't quite make sense to me and rather than going through in detail, make another go of seeing if you can get it and make us understand.

A Probably a combination of different activities, so I think the change of environment is beneficial. I think the ongoing work in terms of the collaborative work and related work is beneficial. There's ensuring you have the best environment and then ensuring that your ongoing practices are as best as they can be as well, and it's this point of continued vigilance over both systems and processes that keep the rate low.

Q Well, I think I've asked all the questions I'm planning to ask, but I suspect that some of my colleagues may have things they would like me to press on, so wondering whether we might have our 10-minute break.

THE CHAIR: Dr Kennedy, what I need to do is find out if there's any more questions in the room. So, if I can ask you to go back to this room, and I would hope that we'll reconvene in about 10 minutes.

THE WITNESS: Thank you.

(<u>Short break</u>)

THE CHAIR: Mr Mackintosh?

MR MACKINTOSH: There's no

more questions, but one thing to remind the witness about, that's all.

THE CHAIR: No more questions, Dr Kennedy, and that means you're free to go, but before you do go, I think Mr Mackintosh has got one thing to raise with you, but since I've begun talking, can I just use the opportunity to say thank you for your attendance and for the work that'll have gone into the preparation of your statement. Both the statement and this morning's evidence is your contribution to the Inquiry and I'm grateful for that, so thank you. Mr Mackintosh.

MR MACKINTOSH: It was simply – thank you, my Lord – to ask you to dig out, if you can, the PowerPoint presentation that you and Ms Rodgers produced to the IMT on 20 September 2019 and pass it to the Board's lawyers and we will attempt to recover it from them, so we have at least the final set of numbers that you were talking about in that minute.

THE WITNESS: Yes. Thank you.

THE CHAIR: Thank you. Mr Mackintosh, I think our plan is to again sit at ten o'clock tomorrow with Mr Hoffman.

MR MACKINTOSH: Yes, it's Mr Connal and Mr Hoffman's by video link.

THE CHAIR: By video link, right.

MR MACKINTOSH: Which, of course, means it's slightly harder to display documents and therefore makes the task a lot more difficult.

THE CHAIR: Well, we'll see how we get on from ten o'clock tomorrow, and I wish you a good afternoon. We'll see each other then.

(<u>Session ends</u>)

16:27