SCOTTISH HOSPITALS INQUIRY

Bundle of documents for Oral hearings commencing from 19 August 2024 in relation to the Queen Elizabeth University Hospital and the Royal Hospital for Children, Glasgow

Bundle 27 - Miscellaneous Documents

Volume 9

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SCOTTISH HOSPITALS INQUIRY

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Healthcare Improvement Scotland | Inspections and reviews
To drive improvement

Unannounced Inspection Report – Safety and Cleanliness of Hospitals

Queen Elizabeth University Hospital (including Institute of Neurological Sciences and Royal Hospital for Children)

19–21 November 2019

This report is embargoed until 10.00am on Thursday 20 February 2020

NHS SCOTLAND

A50125560

We inspect acute and community hospitals across NHSScotland. You can contact us to find out more about our inspections or to raise any concerns you have about cleanliness, hygiene or infection prevention and control in an acute or community hospital or NHS board by letter, telephone or email.

Our contact details are:

Healthcare Improvement Scotland
Gyle Square
1 South Gyle Crescent
Edinburgh
EH12 9EB

Telephone: 0131 623 4300

Email: [redacted]

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www.healthcareimprovementscotland.org

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Summary of inspection

About the hospital we inspected

Queen Elizabeth University Hospital, Glasgow opened in April 2015. This acute hospital has 1,677 beds with a full range of healthcare specialties, including a major emergency department. In addition to the 14-floor hospital building, the hospital site retains a number of other services in adjacent facilities. This includes maternity services, the Royal Hospital for Children, Institute of Neurological Sciences, and the Langlands Unit for medicine of the elderly and rehabilitation.

About our inspection

In January 2019, at the request of the Cabinet Secretary for Health and Sport, we carried out an unannounced inspection to Queen Elizabeth University Hospital, the Institute of Neurological Sciences and the Royal Hospital for Children. That inspection resulted in 14 requirements and one recommendation. The inspection report is available on the Healthcare Improvement Scotland website www.healthcareimprovementscotland.org

We carried out an unannounced inspection to the Queen Elizabeth University Hospital, the Institute of Neurological Sciences and the Royal Hospital for Children, NHS Greater Glasgow and Clyde, from Tuesday 19 to Thursday 21 November 2019.

The inspection team was made up of seven inspectors, with support from a project officer. A senior inspector led the team and was responsible for guiding them and ensuring the team members agreed about the findings reached. Although we try hard to involve members of the public as public partners on our inspections, none were available for this inspection.

Inspection focus

We focused on:

- Standard 1: Leadership in the prevention and control of infection
- Standard 6: Infection prevention and control policies, procedures and guidance, and
- Standard 8: Decontamination.

In **Queen Elizabeth University Hospital**, we inspected the following areas:

- emergency department

- initial assessment unit
- ward 5D (general surgery)
- ward 7D (respiratory)
- ward 8A (medicine of the elderly), and
- ward 10D (orthopaedic trauma).

We also inspected ward 6A (paediatrics) to inspect the environment, the fabric of the building and patient equipment.

In the **Institute of Neurological Sciences**, we inspected the following areas:

- ward 60 (high dependency unit)
- ward 61 (intensive therapy unit)
- ward 64 (neurosurgery), and
- ward 67 (neurology).

We also visited all the remaining wards in the Institute of Neurological Sciences to inspect the environment and the fabric of the building.

In the **Royal Hospital for Children**, we inspected the following areas:

- ward 1E (paediatric cardiology)
- ward 3C (orthopaedics), and
- ward 3C (renal).

We also visited the neonatal intensive care unit and paediatric intensive care unit.

In the **maternity unit**, we inspected the following areas:

- labour ward, and
- ward 47 (postnatal).

We also visited two medicine for the elderly wards in the Langlands building.

We distributed patient questionnaires to the majority of areas inspected and 13 completed patient questionnaires were returned.

What NHS Greater Glasgow and Clyde did well

- Since our previous inspection, the standard of environmental cleaning has improved in the emergency department and initial assessment unit.
- Since our previous inspection, a number of domestic staff have been recruited including additional staff to ensure flexibility of domestic cover. An ongoing programme of recruitment is in place.
- Good staff compliance with standard infection control precautions.

What NHS Greater Glasgow and Clyde could do better

- The NHS board should ensure that access to audit information is not person-dependent to ensure the continuity of the audit programme.
- Within the Institute of Neurological Sciences, the fabric of the building must be maintained to allow for effective cleaning.

Detailed findings from our inspection can be found on page 8.

What action we expect NHS Greater Glasgow and Clyde to take after our inspection

NHS Greater Glasgow and Clyde has made progress to meet the requirements made in our previous inspection report. However, one recommendation has not been met and still remains. During this inspection, we found that issues in the Institute for Neurosciences remain an area of concern. Therefore, this inspection has resulted in two requirements and one recommendation.

The requirements are linked to compliance with the Healthcare Improvement Scotland HAI standards. A full list of the requirements and recommendations can be found in Appendix 1.

An improvement action plan has been developed by the NHS board and is available on the Healthcare Improvement Scotland website www.healthcareimprovementscotland.org

We expect NHS Greater Glasgow and Clyde to carry out the actions described in its improvement action plan to address the issues we raised during this inspection. These actions should be completed within the time frames given in Appendix 1.

We would like to thank NHS Greater Glasgow and Clyde and, in particular, all staff and patients at Queen Elizabeth University Hospital, the Institute of Neurological Sciences and the Royal Hospital for Children for their assistance during the inspection.

More information about our safety and cleanliness inspections, methodology and inspection tools can be found at www.healthcareimprovementscotland.org

Key findings

Standard 1: Leadership in the prevention and control of infection

What NHS Greater Glasgow and Clyde did well

During the inspection, we were provided with a copy of NHS Greater Glasgow and Clyde's infection prevention and control assurance and accountability framework. This is currently in draft form and needs to be approved by the Board infection control committee. The framework outlines the strategic aims and objectives of the infection prevention and control team, the risk management process, surveillance reporting and the overall governance process in place for reporting to NHS Greater Glasgow and Clyde Board members. This framework included the steps taken to:

- strengthen the governance within the infection prevention and control and estates and facilities teams
- improve communication, and
- provide a joint approach across all teams on the management of the built environment.

We were provided with the terms of reference and minutes of the infection prevention and control in the built environment group. The overarching remit of the group is to ensure that NHS Greater Glasgow and Clyde complies with current legislation, government policy, mandatory guidance and best industry practice for the management of the built environment. We are encouraged to see that these meetings are taking place regularly and are attended by representatives from infection prevention and control, estates and facilities teams and senior charge nurses.

During our discussion session, we were told about the steps taken to review the management structure within the facilities and estates teams. The teams have been restructured and operational management support has been put in place for outlying buildings, including the maternity unit and Institute of Neurological Sciences. Senior staff from the estates and domestic teams now attend the daily huddle meeting. This is to provide face-to-face interaction for all staff groups where immediate issues are raised.

Senior management told us that recruitment is continuing within estates and facilities teams to provide more supervisory support for staff. Training is being conducted to ensure the NHSScotland *National Cleaning Services Specification* (2016) is delivered as well as supporting staff in roles to complete accurate and realistic monitoring of the environment.

Standard 6: Infection prevention and control policies, procedures and guidance

What NHS Greater Glasgow and Clyde did well

Health Protection Scotland's *National Infection Prevention and Control manual* describes standard infection control precautions and transmission-based precautions. These are the minimum precautions that healthcare staff should take when caring for patients to help prevent cross-transmission of infections. There are 10 standard infection control precautions, including hand hygiene, the use of personal protective equipment (such as aprons and gloves), how to care for patients with an infection, and the management of linen, waste and sharps.

In the majority of wards inspected, staff told us they would access NHS Greater Glasgow and Clyde's infection prevention and control policies online through the staff intranet. Staff described a good relationship with the infection prevention and control team and told us they can access advice and support, including out of hours and at weekends. Ward staff told us the infection prevention and control team regularly visits the wards.

NHS boards are required to measure staff compliance with standard infection control precautions. The frequency of this compliance monitoring is determined by individual NHS boards.

All wards carried out audits of standard infection control precautions ranging from monthly to twice a year. Some wards told us hand hygiene audits and staff compliance with personal protective equipment would be audited monthly. The results of these audits are shared with the lead nurses.

The infection prevention and control team carries out ward audits using NHS Greater Glasgow and Clyde's infection prevention and control audit tool (IPCAT). This is completed at least once a year.

The NHS board introduced a new Care Assurance Improvement Resource (CAIR) dashboard audit in August 2019. We were told that this dashboard will display audit results and will help focus improvements where compliance with individual elements of standard infection control precautions is low. This new process for auditing standard infection control precautions by ward level staff will take place twice a year. Staff will have access to this system and be able to view all audit results. This system has not yet reached all areas of the hospital and we will follow the progress of the implementation of the new system across the site.

The ward-based and infection prevention and control team audit results were displayed at the ward entrance for information for staff, patients and visitors.

However, some information displayed was not dated, therefore it was unclear if the information was up to date.

During our inspection, we saw good compliance with standard infection control precautions such as linen, waste and sharps management, and the use of personal protective equipment. For example, we observed good practice in the safe management of sharps with all sharps bins being dated, signed and closed over when not in use. Linen was seen to be stored in covered trolleys keeping them free form dust and used and contaminated linen management appropriately.

Staff we observed were performing hand hygiene processes at appropriate times. Hand hygiene posters were displayed at clinical wash hand basins for staff, patients and visitors and we saw appropriately located alcohol-based hand rub dispensers. Of the 13 people who responded to our survey during our inspection, the majority of patients stated that ward staff always wash their hands. The remaining respondents were not sure.

Staff showed good knowledge of standard infection control precautions, including the management of blood and body fluid spills. Staff could also describe the additional transmission-based precautions for patients in isolation rooms for infection prevention and control purposes.

Patients seen to be in isolation for infection control reasons had the correct isolation precautions in place. This included a sign on the door, equipment required was kept in the room, yellow aprons at the door and a care plan in the patients' health records. We saw that involvement by the infection prevention and control team was recorded in the majority of patient notes.

In the intensive therapy unit, located in the Institute of Neurological Sciences, we saw staff had adopted a process of using colour-coded personal protective equipment and each patient bay is identified by a colour. This avoids staff crossing over into each other's patient area, and minimises the risk of cross-contamination. This is an area of good practice.

At our previous inspection in January 2019, we were told there were no functioning negative pressure isolation rooms in the hospital. These rooms are required for some infectious diseases. During our inspection, we saw that the negative pressure rooms have now been installed and are operational and training had been provided to staff. We saw that the pressures within the rooms were routinely recorded and that if any deviance outside the correct pressure range had been identified, appropriate measures had been taken. If staff were unable to correct the pressure range locally, we saw that this would be reported to the estates team. Staff told us the estates team would respond quickly.

NHS boards are required to monitor water safety to reduce the risks associated with waterborne infections such as Legionella. To reduce the risk of Legionella, there should be regular flushing of unused or less frequently used water outlets.

At our previous inspection in January 2019, NHS Greater Glasgow and Clyde were required to ensure all staff involved in the running of water are clearly informed of their roles and responsibilities in this and a clear and accurate record is kept to allow early identification of any water outlets that are not being run. During this inspection, all staff we spoke with were aware that domestic staff are responsible for carrying out water flushing on the unused or less frequently used water outlets at least once a week. We saw that wards and units had completed records to evidence that this is being carried out.

During our previous inspection in January 2019, we saw bladeless fans were being used in high-risk areas to keep the air cool. During this inspection, we saw no bladeless fans in use. However, staff told us a policy is now in place for the use of cooling fans that includes instructions to carry out a risk assessment before use.

At our previous inspection in January 2019, NHS Greater Glasgow and Clyde were required to ensure that information on the expressed breast milk recording charts is in line with national guidance. This will ensure that the storage of expressed breast milk is managed in a way that reduces the risk to patients. The temperature recording charts should be specific for expressed breast milk, describe the correct temperature range and allow staff to record the actions taken if the temperature falls outside this range. During this inspection, the majority of wards visited where breast milk was stored, used the appropriate charts to record storage temperatures. One ward did not have an expressed breast milk freezer chart that specified the correct and safe temperature storage range. However, all recordings seen were within the accepted temperature range. This issue was raised at the time of inspection.

What NHS Greater Glasgow and Clyde could do better

During this inspection, in the absence of the person responsible for undertaking the audits, we found audit information was unavailable and was a person-dependent system. This was a recommendation at our previous inspection in January 2019.

- **Recommendation a:** NHS Greater Glasgow and Clyde should ensure that access to audit information is not person dependent to ensure the continuity of the audit programme.

In the Institute of Neurological Sciences, the current system in place for both ward level and infection prevention and control audits demonstrate that there are issues

with the environment, due to the age and fabric of the building. These audits look at several elements of standard infection control precautions. The audits carried out by ward staff show one of these elements is scoring 30-40% for the condition of the ward environment for all the wards in the Institute. As the overall score is a combined score of all elements, this is generating an overall good score. We were concerned false assurance would be taken from the overall high score, without recognising the low scores within the separate sections. These audit results are overseen by lead nurses but are not currently being shared beyond this management level. We raised this at the time of our inspection.

We acknowledge the new Care Assurance Improvement Resource (CAIR) dashboard, which will address this issue, has not been introduced into the Institute of Neurological Sciences.

Standard 8: Decontamination

Due to the issues specifically relevant to the Institute of Neurological Sciences, we have reported our findings for that area separately to the other areas of Queen Elizabeth University Hospital under 'What NHS Greater Glasgow and Clyde could do better' section below.

What NHS Greater Glasgow and Clyde did well

The standard of environmental cleaning was generally good across the majority of wards inspected.

Staff in all areas described a good relationship with the domestic services team. Senior charge nurses complete a daily sign-off sheet to confirm that domestic cleaning of the environment has been carried out to a satisfactory standard. We were told of the escalation process to raise any issues to domestic services management, if necessary. In the majority of areas, ward staff told us there was sufficient domestic resource both dedicated and responsive, if required.

Since our previous inspection in January 2019, we saw a noticeable improvement in the standard of environmental cleaning in the emergency department and initial assessment unit. The domestic resource in the department has been increased throughout the day and also to provide 24-hour cover.

Staff in the initial assessment unit told us that the domestic service is now more receptive to the departments needs and systems are now in place to ensure that the domestic staff can access all areas that require cleaning.

We were told that since our previous inspection, NHS Greater Glasgow and Clyde has recruited a number of domestic staff. They have also looked at patterns of activity

and how to meet demand. As a result, extra staff have been recruited to ensure additional flexibility of domestic cover. There is an ongoing programme of recruitment.

There is support from domestic discharge teams who provide a reactive service by cleaning rooms in ward areas after a patient has been discharged or following a patient testing negative after a recent infection. The aim of this team is to allow ward domestic staff to complete their usual duties fully without the pressure of additional work.

All domestic staff we spoke with were aware of their roles and responsibilities. They told us they had enough equipment, including mop heads. Some domestic staff told us that if more mops are required, a supply of disposable mop heads was available as an emergency measure.

During our previous inspection in January 2019, not all domestic staff were aware of the correct method or cleaning product for cleaning hand wash basins. During our inspection, all domestic staff we spoke with were able to explain the correct process and product for cleaning hand wash basins.

The majority of domestic staff told us they had enough hours to complete their duties and they were aware of the process to escalate outstanding cleaning duties at the end of a shift.

During our inspection, we reviewed the minutes from the NHS Greater Glasgow and Clyde Board meeting in October 2019. We noted that cleaning compliance for the Langlands Building was reported as being 77.7% in August 2019. Domestic cleaning services is provided by an external provider for this site only. NHS Greater Glasgow and Clyde have worked with this provider to address this issue. We visited the Langlands Building and met with domestic services management and lead nurses. They told us that domestic staffing levels had been reviewed and a programme of training in now place. The nurses in charge of the Langlands Building told us they were satisfied with the current level of domestic cleaning.

In the majority of areas inspected, storage areas and domestic services rooms were clean, uncluttered, well organised and equipment was stored appropriately to allow effective cleaning of the environment.

We inspected a variety of patient equipment including drip stands, patient moving and handling equipment, patient monitoring equipment and commodes. We found the majority was clean and any exceptions raised with the nursing staff at the time of the inspection.

Throughout the inspection, we saw cleaning schedules for patient rooms and the equipment found within these rooms. These should be completed weekly or on discharge of the patient. We saw completed cleaning schedules that provided senior charge nurses with the assurance that near patient equipment was being cleaned.

Of the 13 patients who responded to our survey during our inspection:

- the majority of patients stated they thought the standard of cleanliness on their wards was good, and
- the majority of patients stated the equipment used by staff for their care was clean.

Some patients who responded to our survey said:

- 'Ward cleaned every day and bed changed daily.'
- 'All areas appear very clean and staff visibly involved in their roles.'

Repair and maintenance jobs for the fabric of the building are reported by ward staff on the estates reporting computer system. We were told that since our last inspection, communication between ward staff and the estates team has now improved. We were told the majority of estates jobs are completed in a reasonable timeframe. Outstanding jobs could be discussed at the daily hospital huddle that are attended by ward and estates staff. We acknowledge that the revised process is reflected in the improvement seen in the fabric of the building.

During our inspection, we were told that there are now estates managers who have dedicated responsibility for certain areas within the hospital. They attend weekly meetings where any outstanding issues are discussed. An escalation plan is in place for staff to raise issues regarding work not complete the required timeframe.

At our previous inspection in January 2019, we saw significant levels of dust in ventilation panels in some of the areas inspected. During this inspection, we saw that the vents were dust free and are now cleaned as part of a planned programme of works.

What NHS Greater Glasgow and Clyde could do better

Facilities monitoring is a national framework for monitoring cleaning in healthcare premises. Data from the facilities monitoring tool audit is used for local and national reporting purposes. Information should be available to local staff following an audit, as well as management. Some nurses and midwives in charge were unaware of facilities monitoring audits being carried out on their wards. Those who could tell us

that facilities monitoring audits were taking place, were unable to access the system at the time of our inspection for us to view the results.

Institute of Neurological Sciences

During our inspection, staff within the Institute of Neurological Sciences told us that since our last inspection many repairs identified were still outstanding. Some significant repairs within the domestic services rooms had taken place, however the fabric of the building remains in a poor state. This makes it difficult to effectively clean.

On the first day of our inspection, we found issues with environmental and patient equipment cleaning in one ward. We found:

- portable monitoring equipment with sticky residue
- significant dust on movable patient equipment
- dust and grime on floors
- mould on shower trays, plug holes and shower curtains, and
- store cupboards with multiple pieces of equipment, patient clothing and staff belongings.

We escalated these concerns to senior management and requested immediate actions be taken. We returned to this ward the following day and saw an improvement in the standard of cleanliness and that shower curtains had been replaced.

- **Requirement 1**: NHS Greater Glasgow and Clyde must ensure the patient environment and patient equipment in the Institute of Neurological Sciences is clean and ready for use to reduce the risk of cross infection.

We spoke with a senior charge nurse in this ward, who raised concerns about the level of domestic staff available in this ward and others within the Institute. Nursing staff explained that all domestic staff work extremely hard to maintain the standard of cleanliness, however they are overwhelmed with the volume of work.

We raised this with senior staff during our discussion session and have been told that domestic resource will be reviewed to provide extra domestic staff.

- **Requirement 2**: NHS Greater Glasgow and Clyde must ensure that within the Institute of Neurological Sciences domestic resource meets the demands to enable effective cleaning and ensure infection prevention and control can be maintained.

Throughout our inspection of the Institute of Neurological Sciences, we saw multiple estates issues. We found the following.

- Extensive damage to shower trays.
- Broken PVC sealant on showers, sinks and toilets.
- Extensive damage to walls.
- Exposed damaged wooden panelling.
- Damage to panels at sinks.
- Damage to floors, with tape in place.
- Water ingress on ceiling tiles, that was widespread throughout the institute.
- Damage to a staff changing area, including exposed pipes, broken ceiling tiles and damage at sinks.

All of these issues make it difficult to effectively clean the environment.

During our inspection, we reviewed both the estates reporting system and the facilities monitoring audit scoring tool for the Institute of Neurological Sciences. We saw many outstanding jobs on the estates system with multiple reporting of similar issues. Staff told us that they did not feel that jobs were being completed in a reasonable timeframe, they described having to re-report jobs, and this was leading to confusion and delays.

During our review of the facilities monitoring audit scores, we saw that areas with multiple estates issues were scoring well and these scores are not reflective of the current fabric of the building. Therefore this system is generating false assurance.

We raised these issues during our discussion with senior estates management. We have been told there will be immediate work to address the failures within the estate reporting and facility monitoring systems.

Senior estates mangers told us that planned and ongoing work is taking place within the Institute of Neurological Sciences. We saw that remedial replacement and repair work was ongoing in one ward with work planned in each ward area in the near future. We met with senior estates mangers who explained patients may need to be moved out of areas whilst work is ongoing. We appreciate that clinical decisions regarding moving patients will take priority to maintain patient safety. We were provided with timescales for completion of this work, and the refurbishment plan for all wards in the Institute of Neurological Sciences. We were provided with evidence of the immediate plans in place to reduce existing risks associated with the built environment following our inspection and the immediate address of longstanding

issues. Senior staff acknowledged the ongoing challenges with the reporting processes for estates issues and are taking steps with recruitment and supervisory support to address these. We will review this at future inspections.

Appendix 1: Requirements and recommendations

The actions Healthcare Improvement Scotland expects the NHS board to take are called requirements and recommendations.

- **Requirement:** A requirement sets out what action is required from an NHS board to comply with the standards published by Healthcare Improvement Scotland, or its predecessors. These are the standards which every patient has the right to expect. A requirement means the hospital or service has not met the standards and we are concerned about the impact this has on patients using the hospital or service. We expect that all requirements are addressed and the necessary improvements are made.
- **Recommendation:** A recommendation relates to national guidance and best practice which we consider a hospital or service should follow to improve standards of care.

Standard 6: Infection prevention and control policies, procedures and guidance	
Recommendation	
a	NHS Greater Glasgow and Clyde should ensure that access to audit information is not person-dependent to ensure the continuity of the audit programme (see page 10).

Standard 8: Decontamination		
Requirements		HAI standard criterion
1	NHS Greater Glasgow and Clyde must ensure the patient environment and patient equipment in the Institute of Neurological Sciences is clean and ready for use to reduce the risk of cross infection (see page 15).	**8.1**
2	NHS Greater Glasgow and Clyde must ensure that within the Institute of Neurological Sciences,	**8.1**

domestic resource meets the demands to enable effective cleaning and ensure infection prevention and control can be maintained (see page 15).	

Appendix 2: Inspection process flow chart

We follow a number of stages in our inspection process.

Before inspection

We review a range of information, including a report provided by our data measurement and business intelligence team. The report includes data publically available such as NHS National Scotland Services Scotland publications and reporting platforms and Inpatient Experience Survey.

We review previous inspection reports and action plans.

Before

During inspection

We arrive at the hospital or service and undertake a physical inspection.

We use inspection tools to help us assess the physical environment and compliance with standard infection control precautions.

We have discussions with senior staff and/or operational staff, people who use the hospital or service and their family or carers.

We give feedback to the hospital or service senior staff.

We carry out further inspection of hospitals or services if we identify significant concerns.

During

After inspection

We publish reports for patients and the public based on what we find during inspections. NHS Staff can use our reports to find out what other hospitals or services do well and use this information to help make improvements. Our reports are available on our website at **www.healthcareimprovementscotland.org**

We require NHS boards to develop and then update an improvement action plan to address the requirements and recommendations we make. We check progress against the improvement action plan.

After

More information about our inspections, methodology and inspection tools can be found at

You can read and download this document from our website.
We are happy to consider requests for other languages or formats.
Please contact our Equality and Diversity Advisor on 0141 225 6999
or email [redacted]

Healthcare Improvement Scotland

Edinburgh Office
Gyle Square
1 South Gyle Crescent
Edinburgh
EH12 9EB

0131 623 4300

Glasgow Office
Delta House
50 West Nile Street
Glasgow
G1 2NP

0141 225 6999

www.healthcareimprovementscotland.org

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Healthcare Improvement Scotland

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Ensuring your hospital is safe and clean

Unannounced Inspection Report

Queen Elizabeth University Hospital
NHS Greater Glasgow and Clyde

12–15 December 2016 and 16–17 January 2017

[This report is embargoed until 10.00am on Wednesday 29 March 2017]

The Healthcare Environment Inspectorate was established in April 2009 and is part of Healthcare Improvement Scotland. We inspect acute and community hospitals across NHSScotland.

You can contact us to find out more about our inspections or to raise any concerns you have about cleanliness, hygiene or infection prevention and control in an acute or community hospital or NHS board by letter, telephone or email.

Our contact details are:

Healthcare Environment Inspectorate
Gyle Square
1 South Gyle Crescent
Edinburgh
EH12 9EB

Telephone: 0131 623 4300

Email: [redacted]

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1 About this report

This report sets out the findings from our unannounced inspection to Queen Elizabeth University Hospital, NHS Greater Glasgow and Clyde, from Monday 12 to Thursday 15 December 2016, and an unannounced follow-up inspection on Monday 16 and Tuesday 17 January 2017.

This report summarises our inspection findings on page 5 and detailed findings from our inspections can be found on page 7. A full list of the requirements and recommendations can be found in Appendix 1 on page 19.

The inspection team was made up of five inspectors and two public partners, with support from a project officer. A key part of the role of the public partner is to talk with patients about their experience of staying in hospital and listen to what is important to them. The unannounced follow-up inspection involved two inspectors and a project officer.

The flow chart in Appendix 2 summarises our inspection process. More information about the Healthcare Environment Inspectorate, our inspections, methodology and inspection tools can be found at www.healthcareimprovementscotland.org/HEI.aspx

2 Summary of inspection

About the hospital we inspected

Queen Elizabeth University Hospital, Glasgow, is a newly built 1,109 bed acute hospital with a full range of healthcare specialties, including a major emergency department. The hospital opened in April 2015. In addition to the 14-floor hospital building, the hospital site retains a number of other services in adjacent facilities. This includes maternity services, neurosciences and the Langlands Unit for medicine of the elderly and rehabilitation.

About our inspection

We carried out an unannounced inspection to Queen Elizabeth University Hospital from Monday 12 to Thursday 15 December 2016. This was the first inspection to this site.

We had significant concerns in the emergency department, immediate assessment unit and clinical decisions unit about the cleanliness of the environment and the systems to support this. As a result, we formally escalated these concerns to NHS Greater Glasgow and Clyde's senior management team at the time of our inspection. We asked NHS Greater Glasgow and Clyde to submit an action plan to us detailing how the NHS board would respond to our concerns. We were satisfied that the action plan, when implemented, should address our concerns.

We carried out an unannounced follow-up inspection to these three areas on Monday 16 and Tuesday 17 January 2017. During our follow-up inspection, we found that a number of improvements had been made to address our concerns about the standard of environmental cleanliness and the systems to support this. This included significant improvements in the standard of environmental cleanliness in the immediate assessment unit.

Inspection focus

This was the first inspection of the hospital against the Healthcare Improvement Scotland *Healthcare Associated Infection (HAI) Standards* (February 2015). Before carrying out this inspection, we reviewed a self-assessment submitted by NHS Greater Glasgow and Clyde.

This informed our decision about which standards to focus on during this inspection.

- Standard 3: Communication between organisations and with the patient or their representative
- Standard 6: Infection prevention and control policies, procedures and guidance, and
- Standard 8: Decontamination.

We inspected the following areas:

- acute receiving units 1, 3 and 5
- clinical decisions unit
- emergency department
- immediate assessment unit
- physically disabled rehabilitation unit
- ward 5C (communicable diseases)

- ward 6A (rheumatology)
- ward 8D (gastroenterology)
- wards 51 and 53 (medicine for the elderly, Langlands building), and
- ward 61 (neurological intensive therapy unit [ITU]), Institute for Neurological Sciences).

We carried out 39 patient interviews and received 62 completed patient questionnaires.

What NHS Greater Glasgow and Clyde did well

- The standard of environmental cleanliness in the majority of wards inspected was generally good.
- Staff knowledge of standard infection control precautions was generally good.

What NHS Greater Glasgow and Clyde could do better

- In the emergency department:
  - the standard of environmental cleanliness, and the systems to support this, must be improved
  - the standard of patient equipment cleanliness must be improved, and
  - findings from assurance systems must be acted on to drive improvement in environmental cleanliness.
- Domestic service provision must continue to be reviewed to provide a safe and clean environment. This should include domestic staff access to areas to clean and the availability of the equipment required to allow cleaning to take place.

During our follow-up inspection, we found improvements had been made to address a number of our concerns about the cleanliness of patient equipment and the environment. Notably, the standard of environmental cleanliness had significantly improved in the immediate assessment unit. As a consequence, the number of requirements in this report has been reduced to reflect the findings from the follow-up inspection. A further follow-up inspection will be carried out to ensure that improvements have been sustained.

What action we expect NHS Greater Glasgow and Clyde to take after our inspection

These inspections resulted in 10 requirements and three recommendations. The requirements are linked to compliance with the Healthcare Improvement Scotland HAI standards. A full list of the requirements and recommendations can be found in Appendix 1.

An improvement action plan has been developed by the NHS board and is available on the Healthcare Improvement Scotland website www.healthcareimprovementscotland.org/HEI.aspx

We would like to thank NHS Greater Glasgow and Clyde and, in particular, all staff and patients at Queen Elizabeth University Hospital for their assistance during the inspections.

3 Key findings

Standard 3: Communication between organisations and with the patient or their representative

Staff told us that infection prevention and control information is provided verbally and a range of patient information leaflets appropriate to patient's conditions are also available. We saw patient information leaflets about infection prevention and control available for patients and visitors at the entrance to wards and departments.

Staff had good knowledge of how and what information to provide to patients with a specific infection-related risks. Most of this was done verbally. The majority of patients we spoke with told us they had received information (verbal or written) about HAI or infection control. Of those people who responded to our survey during our inspection, 74% stated they had received information about HAI or infection control.

Staff told us that an interpreter service was available where the patient's first language was not English. This service was provided both on the telephone and in person. Staff confirmed that assistance was normally provided quickly. We were told that information leaflets can also be accessed from the NHS board's staff intranet site in languages other than English. However, some staff were less familiar with which languages were available, and where and how they could access the leaflets in other languages. In the physically disabled rehabilitation unit, a nurse had developed 'flash cards' in Cantonese to help communicate with a patient.

Standard 6: Infection prevention and control policies, procedures and guidance

NHS Greater Glasgow and Clyde's infection prevention and control manual and guidance describes standard infection control precautions and transmission-based precautions. These are the minimum precautions that healthcare staff should take when caring for patients to help prevent cross-transmission of infections. There are 10 standard infection control precautions, including hand hygiene and the use of personal protective equipment (such as aprons and gloves). Three transmission-based precautions describe how to care for patients with known or suspected infections.

Staff told us they could access this information on the NHS board's staff intranet site. They told us they would be notified of any updates to infection prevention and control policies and procedures through email, staff huddles and ward safety briefs.

Staff displayed a good level of knowledge and understanding of the various standard infection control precautions. They felt confident to challenge any staff members who were not complying with standard infection control precautions.

In the majority of wards inspected, we saw generally good compliance with standard infection control precautions. This included hand hygiene, management of sharps, linen, and domestic and clinical waste. We also saw personal protective equipment was readily available and was used appropriately.

Patients we spoke with told us they saw staff washing their hands or using the alcohol-based hand rubs before entering wards and between caring for patients. Of those people who responded to our survey during our inspection, 92% stated that ward staff always wash their

hands. Some patients told us that staff had spoken with them about the importance of hand hygiene when they were admitted to hospital. Most patients commented on seeing visitors using the alcohol-based hand rubs on entering and leaving the wards.

We spoke with staff about managing patients with a known or suspected infection and patients who are at risk of an infection. Across the wards and departments inspected, staff described the correct assessment and isolation procedures for managing these patients. We found that the majority of staff had a good level of knowledge about how they would safely manage a blood or body fluid spillage. Guidance was displayed on the wards describing the use of chlorine-releasing disinfectant and detergent for both general cleaning and for the management of blood and body fluid spillages.

NHS boards are required to measure staff compliance with standard infection control precautions. The frequency of this compliance monitoring is determined by individual NHS boards. We saw evidence of standard infection control precautions audits carried out by ward staff in the majority of wards and departments inspected and action plans being produced. Audit results are recorded on the NHS board's electronic data recording and management system. The infection prevention and control team accesses this system to gain an overview of ward and departmental performance.

We saw evidence of audits carried out by the infection prevention and control team. Each ward and department is audited at least once every year, but done more frequently if the overall compliance score falls below 80%. The results are scored red (less than 65% compliance), amber (65–79% compliance) and green (80% compliance and above). Areas with red audit results are re-audited within 3 months, amber within 6 months and green within 12 months.

Where non-compliance is identified during these audits, an action plan is automatically generated. The senior charge nurse is responsible for resolving any issues identified and returns the completed and signed-off action plan to the infection prevention and control team within 30 days of the audit. We saw examples of these audits and corresponding action plans in the majority of wards and departments inspected. We were told that audit results are shared with ward staff by email, staff huddles, meetings and ward safety briefs. Lead nurses prepare monthly reports to discuss with senior managers. These reports are submitted to the relevant NHS board directorate or sector governance committees.

We saw audit and surveillance information displayed for patients, staff and visitors in the wards and departments inspected. This was presented in a clear and informative way. We found that some of this information was not dated and included:

- infection prevention and control audit results
- hand hygiene compliance audit results
- the number of 'days since' infections such as *Clostridium difficile* infection (C *diff* infection) and meticillin resistant *Staphylococcus aureus* (MRSA), and
- peripheral vascular catheter compliance.

Ward staff told us how and when they would contact the infection prevention and control team for advice and support. A consultant microbiologist is also available for infection control guidance and patient-specific advice.

A hospital-wide safety huddle takes place every day. This is attended by senior charge nurses and senior managers. Any changes to policy, significant events and patient safety issues are discussed at these meetings. We attended a hospital-wide safety huddle during our inspection.

Safety briefs also take place each day at ward level to share information with ward staff. A safety brief is used as a communication tool to focus on patient safety issues. This includes infection prevention and control information such as identifying patients with a known or suspected infection. We saw evidence of infection prevention and control issues being discussed at ward safety briefs.

Areas for improvement

We found that adherence to standard infection control precautions was variable in the emergency department, immediate assessment unit and clinical decisions unit. Due to the high level of activity in these areas during our inspection, it was not possible to talk with many staff about their knowledge of standard infection control precautions.

In the emergency department, immediate assessment unit and clinical decisions unit, we saw that compliance with hand hygiene decreased as these areas became busier. Outwith emergency situations, we also saw some occasions where emergency department staff did not remove their personal protective equipment before leaving the patient bed space. We highlighted our concerns about the adherence to standard infection control precautions to the relevant senior charge nurses and lead nurses at the time of our inspection.

The clinical decisions unit is staffed by nurse practitioners. We identified a lack of HAI-related leadership and activity taking place in the unit. For example, we were told that these staff were not carrying out audits of standard infection control precautions. The infection prevention and control team was also not carrying out audits in the unit. The nurse practitioners were unaware of any domestic monitoring of the environment being carried out. We discussed these issues with the lead nurse for the unit who confirmed that no-one had been allocated responsibility for these tasks. We escalated these concerns to the NHS board's senior management team at the time of our inspection.

In the immediate assessment unit, we saw evidence of 6-monthly standard infection control audits carried out in June 2016. All of these audits scored 100%. The senior change nurse told us these audits are carried out at the weekend when the unit is partially closed and is quieter. Although the audits are carried out when workload allows, doing so at the weekend during quieter periods may not reflect staff practices when the unit is busier. For example, we noted that compliance with hand hygiene decreased in this area as the unit became busier.

- **Recommendation a:** NHS Greater Glasgow and Clyde should consider the timing of standard infection control precautions audits in the immediate assessment unit to ensure the results of audits are representative of staff practices during busy periods.

Staff in the clinical decisions unit could correctly describe how to manage blood and body fluid spillages. However, they did not have access to the chlorine-releasing disinfectant and detergent needed to do this on the unit. The nurse practitioners told us they had to leave the unit to obtain this product from a neighbouring ward. As this unit was very busy, we were concerned there was a risk that staff may not use the correct product to manage blood

spillages, if it is not readily available. We raised our concerns about this with staff and senior managers at the time of our inspection for them to action.

In the immediate assessment unit, staff knowledge about the safe management of blood and body fluid spillages varied. Due to the activity level on the unit, we were only able to speak with four members of staff at the time of our inspection. These staff could not describe the correct method for cleaning a blood spillage. We also saw one staff member using detergent wipes to clean a significant blood spillage we had found on a patient trolley. Blood spillages should be cleaned using chlorine-releasing disinfectant and detergent. We raised this with staff at the time of our inspection who said they would address this.

- **Requirement 1:** NHS Greater Glasgow and Clyde must ensure that staff in the immediate assessment unit are aware of, and practice, the safe management of blood and body fluid spillages in line with Health Protection Scotland's *National Infection Prevention and Control Manual*.

In the immediate assessment unit, we saw three bed spaces where intravenous fluids had been disconnected from patients' peripheral venous catheters. These patients had left the unit for further investigations in another area of the hospital. The fluid bags and attached tubing had been left to be re-attached when the patients returned to the unit. Best practice is for partially-used bags of intravenous fluids to be discarded when detached from a patient to minimise the risk of infection. We informed the senior charge nurse about this at the time of the inspection for them to rectify. We will follow this up at future inspections.

During our inspection, we found some partially-used single patient use toiletries, for example skin cleansing foam, had not been disposed of following use in the emergency department, the immediate assessment unit, and in wards 51 and 53. Single patient use toiletries should be allocated to one patient or be disposed of when no longer required by that patient to prevent the risk of cross-infection. They should not be used for multiple patients. We raised this with staff in the affected wards and departments at the time of our inspection and were told they would be removed.

Clinical waste from the neurological intensive therapy unit awaiting uplift by portering staff is stored in large, lockable waste hold bins. These waste hold bins are located outside the unit in a public area. We found that the bins were not locked at the time of our inspection. We discussed this with the senior charge nurse for the unit at the time of the inspection. We were told that refurbishment work was planned to make a 'waste room' for the safe storage of all waste. This room will have a keypad entry system to make sure waste is kept locked away from public access. In the meantime, waste should be managed in line with national policy.

- **Requirement 2:** NHS Greater Glasgow and Clyde must ensure that all clinical waste is stored in line with Health Facilities Scotland's *Scottish Health Technical Note 3 NHSScotland waste management guidance Part A* (2015).

Follow-up inspection findings

During the follow-up inspection, we observed good compliance by medical, nursing and domestic staff with hand hygiene and the use of personal protective equipment in the immediate assessment unit and clinical decisions unit. However, in the emergency department, we saw some staff not removing their personal protective equipment at appropriate times and missing opportunities for carrying out hand hygiene.

- **Requirement 3:** NHS Greater Glasgow and Clyde must ensure staff in the emergency department comply with hand hygiene and the use of personal protective equipment guidance in line with Health Protection Scotland's *National Infection Prevention and Control Manual.*

The action plan submitted by NHS Greater Glasgow and Clyde following our December 2016 inspection states that a senior nurse will be identified in each area to complete audits of standard infection control precautions. Weekly assurance checks of the cleanliness of patient equipment and the environment to monitor and identify any possible risks to patients and staff will also be carried out by a senior nurse.

We found improvements had been made in the clinical decisions unit since our December 2016 inspection. One of the nurse practitioners had taken on the role of co-ordinating audit activity and completing assurance checks in the unit. We saw evidence of completed hand hygiene audits and a recent audit carried out by the infection prevention and control team. Staff spoke positively about the changes that had been implemented and felt these had led to the necessary improvements being made.

We found five partially-used canisters of skin cleansing foam had not been disposed of in the major injury and resuscitation areas of the emergency department. One canister was contaminated with faecal matter.

- **Recommendation b:** NHS Greater Glasgow and Clyde should ensure that single patient use toiletries are only available for single patient use and are discarded when no longer required by the patient.

Standard 8: Decontamination

We found the standard of environmental cleaning carried out by domestic staff in the majority of wards inspected was generally good. We discussed any exceptions we found with staff at the time of our inspection.

In most wards inspected, we saw evidence of completed domestic cleaning schedules. These are completed by the domestic, then signed off by the domestic, domestic supervisor and senior charge nurse.

Ward staff described a good working relationship with the domestic team. The majority of staff told us they were happy with the system for raising any concerns about the standard of cleanliness and the resulting response times from the domestic team. Domestic staff told us that ward staff would make them aware of any patients being cared for in isolation for infection prevention and control reasons.

Patients we spoke with were generally positive about the standard of cleanliness across the hospital. This included toilets, showers, bed spaces and ward areas. They could describe the daily cleaning routines they had observed. Patients told us that any spillages were dealt with promptly. Most patients felt that equipment and furniture was clean and generally in good repair. Of those people who responded to our survey during our inspection:

- 97% stated that they thought the standard of cleanliness on their wards was good, and
- 97% stated that the equipment used by staff for their care was clean.

Some patients we spoke with or who responded to our survey said:

- ‘The cleaners do a wonderful job, first rate.’
- ‘Staff clean room every day and they are all friendly.’
- ‘Cleaners are in at a regular basis throughout day and night.’
- ‘They do their best to keep it clean, given all the work they have to do.’

NHS Greater Glasgow and Clyde uses Health Facilities Scotland’s facilities management tool to monitor the cleanliness and condition of estates. This audit tool is completed by domestic staff. Any issues with the fabric and cleanliness of the building are identified by this audit tool which randomly selects the areas in wards and departments to be audited each month. The facilities management tool audit results for the emergency department, immediate assessment unit and clinical decisions unit all showed positive recent results (above 90% compliance). These audit results are often displayed at the entrances to wards and departments.

Domestic supervisors also have a role in the monitoring of environmental cleanliness. They sign off domestic cleaning schedules to confirm that cleaning has taken place to an acceptable standard.

We looked at a variety of patient equipment throughout the wards inspected. This included equipment trolleys, patient monitoring equipment, commodes, drip stands and hoists. We found the majority of this equipment on the wards was clean and ready for use.

NHS Greater Glasgow and Clyde has an online estates reporting system for staff to report any repair and maintenance issues. Ward staff spoke positively about communication with the estates department, the service provided and response times. Staff told us that any outstanding jobs would be discussed at the daily hospital-wide safety huddle. Generally, we found the wards and departments inspected appeared to be in a good state of repair and, therefore, could be effectively decontaminated.

Areas for improvement

During the course of our inspection, we had significant concerns about the standard of environmental cleanliness in the emergency department and immediate assessment unit, and the systems in place for domestic cleaning in the clinical decision unit. We found the standard of domestic cleanliness varied significantly from those reported through the facilities management tool. As a result, we were not confident in the accuracy and effectiveness of the domestic monitoring systems.

We spoke with frontline domestic and facilities management staff to better understand the factors affecting the ability to deliver a clean environment. We found a difference of opinion and understanding between frontline domestic and facilities management staff about:

- domestic roles and responsibilities in the immediate assessment unit
- the time and staffing to complete duties in a number of wards and departments, and
- the availability of equipment to achieve a good standard of environmental cleanliness.

We escalated these concerns to the NHS board's senior management team for them to action. This included submitting an action plan to us detailing how the NHS board would respond to our concerns.

Clinical decisions unit

The clinical decisions unit is a day unit with four clinical rooms used to assess and medically review patients.

We found that the floors in the clinical decisions unit were dusty and gritty.

We were able to examine two patient trolleys. We saw that one mattress base and mattress were heavily contaminated with blood. Staff told us they were unaware that the mattress could be detached from the base of the trolley. Therefore, they were not routinely cleaning this area of the patient trolley or mattress. We found that the other patient trolley was dirty and dusty at the base. We also saw that the bases of patient monitoring equipment stands were dirty and dusty.

We saw a patient equipment cleaning schedule which staff in the unit had developed. Although this schedule was generally completed and up to date, it did not reflect our findings in terms of the cleanliness of patient equipment and the general environment. NHS Greater Glasgow and Clyde's self-assessment states that senior charge nurses will complete a weekly assurance check of the cleanliness of patient equipment and the environment to monitor and identify any possible risks to patients and staff. This checklist had not been implemented in this unit.

One of the nurse practitioners told us that domestic services support was provided in the unit for 2 hours each morning. We were unable to speak with a domestic in the unit or view any domestic cleaning schedules during the inspection.

Follow-up inspection findings

During our follow-up inspection, we found improvements had been made and that the standard of environmental cleanliness in the clinical decisions unit was good.

We saw a patient equipment cleaning schedule and weekly equipment assurance checklists had been introduced in the clinical decisions unit since our December 2016 inspection. These were completed and up to date. We found that the standard of patient equipment cleanliness was good.

Immediate assessment unit

Patients are referred to this 28-bedded unit by GPs for assessment. The cubicle bed spaces are curtained areas with no en-suite facilities.

During our inspection, we saw staff decontaminating patient equipment between uses. We found that most of this equipment was clean. However, we found that two patient trolleys in cubicles ready for the next patient were heavily contaminated with blood and faeces. We were told that these trolleys had been brought in from the corridor outside the unit that morning. Nursing staff had assumed the trolleys had been cleaned before being left on the corridor ready for use. We discussed this with the senior charge nurse who informed us that patient trolleys from the corridor would now be inspected for cleanliness before use.

The senior charge nurse told us that if any issues with the standard of environmental cleanliness are identified, the domestic supervisor or duty manager is contacted to request additional domestic cleaning. We were told staff in this unit regularly request additional domestic cleaning. For example, one senior change nurse told us they had identified concerns with the standard of cleanliness of the floors and patient bed tables the previous day. These concerns were reported to the domestic response team. The senior charge nurse was told that domestic staff would be available to clean the floors but would not have enough time to clean the patient bed tables. As a result, the senior charge nurse cleaned the patient bed tables. There did not appear to be a mechanism to review domestic provision in this unit to address the concerns raised by unit staff. Facilities management staff do not keep records of the requests for additional cleaning. This means that the number of times domestic cleaning is not satisfactory or extra cleaning is required cannot be quantified.

The standard of environmental cleanliness varied in the unit. The majority of surfaces were dust free and the floors were clean and grit free. Of the patient cubicles we were able to inspect, we found the majority of bed spaces were clean. However, we found that two of the seven communal patient toilets in the unit were heavily contaminated with faeces on the walls, mirrors and hand wash basins. We were told that these toilets were available for the 102 patients that had been seen in the unit on the day of our inspection. We spoke with facilities managers about toilet cleaning on the unit. They told us the patient toilets in this area were cleaned once every day and were spot checked each shift. The frequency of cleaning of these toilets was not resulting in a clean environment. Facilities managers told us that, given the high volume of patients attending this unit, the domestic team would reconsider the number of times the toilets in the immediate assessment unit are cleaned each day.

Domestic staff told us there were no dedicated staff to clean the immediate assessment unit. Environmental cleaning responsibilities for this unit are shared between two domestics who are based in other clinical areas. The domestic supervisor confirmed this to be the case. There was no domestic cleaning schedule for the unit for the domestic to sign off completed tasks and highlight outstanding tasks. This meant that domestics and the domestic supervisor responsible for the unit were not being made aware of outstanding cleaning tasks needing to be completed by staff on the next shift. The senior charge nurse was not informed of cleaning responsibilities of domestic staff working in the unit, outstanding cleaning tasks and had nowhere to document whether cleaning had taken place on the unit.

We found different opinions and understanding between the domestic supervisor and facilities managers about the role of domestic staff on the immediate assessment unit. This included information about the number of hours and tasks the nightshift domestic carried out on the unit. The senior charge nurse we spoke with was unaware of any nightshift domestic working on the unit.

Follow-up inspection findings

During our follow-up inspection, we found that the standard of environmental cleanliness had significantly improved in the immediate assessment unit. As a result of our inspection, the unit now had dedicated domestic staff. A new domestic cleaning schedule had been put in place specifically for this area. The domestic records completed tasks and highlights any outstanding tasks on the cleaning schedule. We saw that this schedule had been signed off each day in the previous week by the domestic and that any outstanding tasks had been completed. The senior charge nurse then signs off the schedule to provide assurance that cleaning has taken place.

Both staff on the unit and the new domestic spoke positively about the improvements put in place. The domestic told us they were included in the unit's safety brief and this helped them to plan their work for their shift. They were also informed of any infection control issues at this time. The domestic told us they felt supported by the domestic supervisor.

We were told that the patient toilets in the immediate assessment unit were cleaned at the start of the shift, checked and cleaned as required throughout the shift, and cleaned again at the end of the shift. We found that all toilets in the unit were clean.

We found that patient equipment was clean. This included bed frames, mattresses, patient tables, patient monitoring equipment and toilet hand rails. We saw staff cleaning equipment between patients.

Emergency department

Domestic staff told us that they were unable to access patient bays if they were occupied by a patient. We were told that all cleaning needed to take place when the bays were empty. The emergency department was very busy on the day of our inspection. Most patient bays were occupied by patients for the majority of our time in the department. It is essential that domestic staff are given the opportunity to clean all areas to provide a safe and clean environment.

We saw a variable standard of environmental cleanliness throughout the emergency department. We found significant levels of dust on high and low surfaces in the resuscitation area. This included pendant arms, cupboard tops, curtain rails, floor corners and edges, and beneath trolleys. We also found significant dust contamination on higher surfaces in the major and minor injury treatment areas. Some storage areas had thick dust on higher surfaces, including cupboard tops and shelving.

We spoke with the domestic and domestic supervisor for the emergency department. Both highlighted a need for more allocated time for domestic cleaning in the department and a need to access occupied patient bays.

Staff carry out standard infection control precautions audits in the emergency department. For 5 out of the previous 6 months, staff had identified issues with the standard of environmental cleanliness. All five audits had scored 67% compliance in this area. No action plans were completed following these audits.

Further assurance should be provided by the audits carried out by the infection prevention and control team in the emergency department. The two most recent audits produced amber results (65–79% compliance) with both highlighting issues with environmental dust. We saw the completed action plan following the first audit.

We were shown records of the facilities management tool audits for the previous 6 months. There was no evidence that this assurance system had highlighted any problems with environmental cleanliness in the emergency department. This was in contrast to the results from audits carried out by the infection prevention and control team and department staff and our own findings which had highlighted problems with environmental cleanliness in the department.

We were told that all audit results are discussed between the lead nurse and clinical services manager at their regular meetings. We were confident that standard infection control precautions and infection prevention and control team audits were highlighting non-

compliances with environmental cleanliness. However, they were not leading to sustained improvement or addressing the repeated poor standard of environmental cleaning.

We found a variety of patient equipment was contaminated with dust, debris or body fluids. This included:

- patient trolleys in 'clean' resuscitation bays
- a mattress in a 'clean' resuscitation procedure room
- equipment, dressing and procedure trolleys
- pendant lamps, and
- a blood gas analyser.

We found the patient equipment cleaning schedules completed by nursing staff in the emergency department were signed off and up to date. Some of these cleaning schedules related to equipment we had found contaminated with thick dust and/or body fluids. We also saw evidence of completed and up-to-date weekly assurance checks of the cleanliness of equipment and the environment carried out by the senior charge nurse. This suggests limited assurance can be taken from the signed cleaning schedules that patient equipment is clean and ready for use.

In the emergency department resuscitation area, we found the management of sterile instrument trays and individual supplementary instrument packs was not in line with Health Facilities Scotland's *Management of reusable surgical instruments during transportation, storage and after clinical use*. This would mean the contents could no longer be considered sterile. For example, we found numerous items were out of date, with dates ranging from February 2013 to November 2016. We were told that emergency department staff did not check the sterile instrument trays and individual supplementary instrument packs to ensure they were in date and that packaging was intact.

We inspected patient trolleys and transport chairs stored in the corridors of the hospital ready for use by the emergency department and immediate assessment unit. We found the majority of these to be dirty, and some were contaminated with blood and body fluids.

Follow-up inspection findings

During the follow-up inspection, we found there had been improvement in the standard of environmental cleanliness. However, the number of patient bays we were able to access was limited. The domestic we spoke with described continuing difficulty in accessing patient bays to clean.

Domestic staff told us that, as a result of our inspection, there had been an increase in domestic staff provision in the emergency department from one to two full-time staff covering Monday to Friday day shifts.

We found a significant amount of patient equipment was contaminated with body fluids and dust.

Four out of eight patient trolley mattresses we inspected were damaged. These trolleys were in the emergency department and ready for use.

All sterile instrument trays were in date, with packaging intact and free from damage. Senior staff told us that theatre staff were now responsible for checking the sterile instrument trays in the resuscitation area. A stock rotation system had been put in place by theatre staff to ensure the instrument trays in the emergency department were in date. We will follow this up at future inspections.

We looked at 10 patient trolleys stored in corridors and the immediate assessment unit. All were generally clean. We also looked at six patient transport chairs and found that these were clean and intact.

The action plan submitted by NHS Greater Glasgow and Clyde following our December 2016 inspection states that portering staff are responsible for cleaning patient trolleys unless they are contaminated with body fluids. During our follow-up inspection, we found that most porters we spoke with were still unaware that they were responsible for cleaning patient trolleys. We will follow this up at future inspections.

- **Requirement 4:** NHS Greater Glasgow and Clyde must ensure that patient equipment in the emergency department is clean and ready for use.

- **Requirement 5:** NHS Greater Glasgow and Clyde must ensure that the environment in the emergency department is safe and clean.

- **Requirement 6:** NHS Greater Glasgow and Clyde must ensure that:

  a) accurate records are kept of domestic cleaning, and
  b) staff are aware of their responsibilities for environmental cleanliness.

- **Requirement 7:** NHS Greater Glasgow and Clyde must ensure that:

  a) domestic monitoring assurance systems identify where environmental cleanliness in the emergency department is below the accepted standard, and
  b) remedial actions are taken to ensure the environment is safe and clean.

- **Requirement 8:** NHS Greater Glasgow and Clyde must ensure that where audit data identifies deficiencies in the emergency department, remedial actions are taken to reduce risk, prevent recurrence, and promote improvement and compliance with infection prevention and control policies.

- **Requirement 9:** NHS Greater Glasgow and Clyde must ensure that patient equipment cleaning schedules in the emergency department are accurately completed.

- **Requirement 10:** NHS Greater Glasgow and Clyde must ensure that mattresses and mattress covers are consistently checked for their integrity and cleanliness, and actions are taken to ensure they are fit for purpose.

- **Recommendation c:** NHS Greater Glasgow and Clyde should review domestic staff access to patient areas in the emergency department allowing them to deliver a safe and clean environment.

Other wards and departments inspected

We found domestic staff and facilities managers had different opinions and understanding about equipment needed and how it was supplied for ward and departmental cleaning. Domestic staff told us there were not enough mop heads for them to clean wards and departments. Facilities management told us there were sufficient mop heads in the system, but these would be delivered to the wards and departments throughout the domestics' shifts.

Over the course of our inspection, we looked at public toilets in the emergency department, main hospital atrium and at the entrances to wards and departments. In the atrium, mezzanine level 1 and the emergency department waiting area, we found that the majority of the toilets were contaminated with blood, faeces, urine or vomit. These toilets have more frequent use as they are in general public areas. We also found the baby changing facilities were contaminated with faeces. No records are kept when any of these areas are cleaned. In the emergency department, the domestic told us the public toilets in this area are cleaned once every day and spot checked on each shift. However, domestic managers told us the toilets in this area are cleaned three times each day.

Follow-up inspection findings

During the follow-up inspection, we looked at public toilets in the atrium and reception area of the emergency department. We found these to be generally clean. We also found that the baby changing facilities were clean.

Appendix 1 – Requirements and recommendations

The actions the HEI expects the NHS board to take are called requirements and recommendations.

- **Requirement:** A requirement sets out what action is required from an NHS board to comply with the standards published by Healthcare Improvement Scotland, or its predecessors. These are the standards which every patient has the right to expect. A requirement means the hospital or service has not met the standards and the HEI is concerned about the impact this has on patients using the hospital or service. The HEI expects that all requirements are addressed and the necessary improvements are made within the stated timescales.

- **Recommendation:** A recommendation relates to national guidance and best practice which the HEI considers a hospital or service should follow to improve standards of care.

Prioritisation of requirements

All requirements are priority rated (see table below). Compliance is expected within the highlighted timescale, unless an extension has been agreed in writing with the lead inspector.

Priority	Indicative timescale
1	Within 1 week of report publication date
2	Within 1 month of report publication date
3	Within 3 months of report publication date
4	Within 6 months of report publication date

Standard 6: Infection prevention and control policies, procedures and guidance

Requirements		HAI standard criterion	Priority
1	NHS Greater Glasgow and Clyde must ensure that staff in the immediate assessment unit are aware of, and practice, the safe management of blood and body fluid spillages in line with Health Protection Scotland's *National Infection Prevention and Control Manual* (see page 10).	**6.11**	**1**
2	NHS Greater Glasgow and Clyde must ensure that all clinical waste is stored in line with Health Facilities Scotland's *Scottish Health Technical Note 3 NHSScotland waste management guidance Part A* (2015) (see page 10).	**6.11**	**1**

Standard 6: Infection prevention and control policies, procedures and guidance (continued)

Requirements		HAI standard criterion	Priority
3	NHS Greater Glasgow and Clyde must ensure staff in the emergency department comply with hand hygiene and the use of personal protective equipment guidance in line with Health Protection Scotland's *National Infection Prevention and Control Manual* (see page 11).	**6.11**	**1**
Recommendations			
a	NHS Greater Glasgow and Clyde should consider the timing of standard infection control precautions audits in the immediate assessment unit to ensure the results of audits are representative of staff practices during busy periods (see page 9).		
b	NHS Greater Glasgow and Clyde should ensure that single patient use toiletries are only available for single patient use and are discarded when no longer required by the patient (see page 11).		

Standard 8: Decontamination

Requirements		HAI standard criterion	Priority
4	NHS Greater Glasgow and Clyde must ensure that patient equipment in the emergency department is clean and ready for use (see page 17).	**8.1**	**1**
5	NHS Greater Glasgow and Clyde must ensure that the environment in the emergency department is safe and clean (see page 17).	**8.1**	**2**
6	NHS Greater Glasgow and Clyde must ensure that: a) accurate records are kept of domestic cleaning, and b) staff are aware of their responsibilities for environmental cleanliness (see page 17).	**8.2**	**1**
7	NHS Greater Glasgow and Clyde must ensure that: a) domestic monitoring assurance systems identify where environmental cleanliness in the emergency department is below the accepted standard, and b) remedial actions are taken to ensure the environment is safe and clean (see page 17).	**8.3**	**2**

Standard 8: Decontamination (continued)

Requirements		HAI standard criterion	Priority
8	NHS Greater Glasgow and Clyde must ensure that where audit data identifies deficiencies in the emergency department, remedial actions are taken to reduce risk, prevent recurrence, and promote improvement and compliance with infection prevention and control policies (see page 17).	**1.9**	**1**
9	NHS Greater Glasgow and Clyde must ensure that patient equipment cleaning schedules in the emergency department are accurately completed (see page 17).	**8.3**	**1**
10	NHS Greater Glasgow and Clyde must ensure that mattresses and mattress covers are consistently checked for their integrity and cleanliness, and actions are taken to ensure they are fit for purpose (see page 17).	**8.1**	**1**
Recommendation			
c	NHS Greater Glasgow and Clyde should review domestic staff access to patient areas in the emergency department allowing them to deliver a safe and clean environment (see page 17).		

Appendix 2 – Inspection process flow chart

We follow a number of stages in our inspection process.

More information about the Healthcare Environment Inspectorate, our inspections, methodology and inspection tools can be found at www.healthcareimprovementscotland.org/HEI.aspx

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Low *Cryptococcus* Antigen Titers as Determined by Lateral Flow Assay Should Be Interpreted Cautiously in Patients without Prior Diagnosis of Cryptococcal Infection

Marie Dubbels, Dane Granger, Elitza S. Theel

Division of Clinical Microbiology, Department of Laboratory Medicine and Pathology, Mayo Clinic, Rochester, Minnesota, USA

ABSTRACT Detection of *Cryptococcus* antigen (CrAg) is invaluable for establishing cryptococcal disease. Multiple different methods for CrAg detection are available, including a lateral flow assay (LFA). Despite excellent performance of the CrAg LFA, we have observed multiple cases of low-titer (≤1:5) positive CrAg LFA results in patients for whom cryptococcosis was ultimately excluded. To investigate the accuracy of low-titer positive CrAg LFA results, we performed chart reviews for all patients with positive CrAg LFA results between June 2014 and December 2016. During this period, serum and/or cerebrospinal fluid (CSF) samples from 3,969 patients were tested with the CrAg LFA, and 55 patients (1.5%) tested positive. Thirty-eight of those patients lacked a history of cryptococcal disease and were the focus of this study. Fungal culture or histopathology confirmed *Cryptococcus* infection for 20 patients (52.6%), and CrAg LFA titers in serum and CSF samples ranged from 1:5 to ≥1:2,560. For the 18 patients (47.4%) without culture or histopathological confirmation, the CrAg LFA results were considered true-positive results for 5 patients (titer range, 1:10 to ≥1:2,560), due to clinical improvement with targeted therapy and decreasing CrAg LFA titers. The remaining 13 patients had CrAg LFA titers of 1:2 (n = 11) or 1:5 (n = 2) and were ultimately diagnosed with an alternative condition (n = 11) or began therapy for possible cryptococcosis without improvement (n = 2), leading to an overall CrAg LFA false-positive rate of 34%. We recommend careful clinical correlation prior to establishing a diagnosis of cryptococcal infection for patients with first-time positive CrAg LFA titers of 1:2.

KEYWORDS *Cryptococcus*, antigen, lateral flow assay

Cryptococcus species are encountered worldwide and are most often associated with causing opportunistic invasive fungal disease in immunosuppressed individuals, particularly patients with HIV/AIDS. While the global burden of cryptococcal meningitis in this patient population remains high, with nearly 1 million cases annually, the use of highly active antiretroviral therapy (HAART) has reduced the incidence of cryptococcal meningitis in the United States to less than 1.3 cases per 100,000 individuals (1, 2). Cryptococcal infections can also lead to significant morbidity and death among patients with defective cellular immunity, solid organ transplant recipients, and individuals receiving prolonged high-dose corticosteroid therapy (3). Certain species of *Cryptococcus* have also been associated with significant disease in otherwise healthy individuals without underlying comorbidities (4). Prompt identification of cryptococcal disease and initiation of targeted antifungal therapy are essential for patient survival,

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Address correspondence to Elitza S. Theel, [redacted]

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although the mortality rate for acute cryptococcal meningoencephalitis remains approximately 20% in HIV/AIDS patients (5).

Members of the *Cryptococcus* genus have recently undergone taxonomic revision, with the multiple *Cryptococcus neoformans* and *Cryptococcus gattii* serotypes and molecular types now classified as seven unique species (6). While fungal culture remains the reference method for detection of these encapsulated yeast, isolation from clinical specimens requires several days of incubation, which may delay the diagnosis. Identification of *Cryptococcus* yeast by histopathology is also an important diagnostic approach. However, the invasive procedures necessary to collect preferred specimens (e.g., lung tissue) for histopathology are often contraindicated for severely ill patients (7). Direct microscopy, particularly of cerebrospinal fluid (CSF), is also routinely performed but is hampered by low sensitivity, primarily for patients with low fungal burdens (8). Due to these limitations, detection of *Cryptococcus* antigen (CrAg) in serum and CSF samples has emerged as an invaluable tool for the diagnosis of cryptococcal disease.

Multiple assays have been developed and FDA approved for detection of the capsular glucoronoxymannan polysaccharide of *Cryptococcus* species, including a CrAg latex agglutination system (CALAS) (Meridian Bioscience, Cincinnati, OH) and a CrAg lateral flow assay (LFA) (IMMY, Norman, OK). The CrAg LFA offers a number of advantages over the CALAS, including enhanced sensitivity for detection of CrAg and a rapid turnaround time of approximately 15 min; in addition, the assay does not require pronase pretreatment of serum samples (9–11). Although both assays provide endpoint CrAg titers, these semiquantitative results are not directly comparable between the tests, due to the different methodologies used.

The CrAg LFA was implemented in our laboratory in 2014, replacing the CALAS for detection of CrAg in both serum and CSF samples. Since transitioning to the CrAg LFA, we have observed a number of patients with low CrAg titers ($\leq$1:5) for whom the results did not correlate with the clinical presentation or final diagnosis. In an effort to investigate the accuracy of these low-titer positive CrAg LFA results, we performed chart reviews for all patients with positive CrAg LFA results between June 2014 and December 2016.

RESULTS

Study population. Between 1 June 2014 and 31 December 2016, the CrAg LFA was performed with 4,627 serum or CSF samples collected from 3,969 patients. Among those patients, 3,914 (98.6%) were negative for CrAg in all specimens and were excluded from this study (Fig. 1). Based on chart reviews, 17 (30.9%) of the 55 patients with positive CrAg LFA results in serum and/or CSF samples had been previously diagnosed with cryptococcal infections and testing had been ordered to monitor responses to treatment; therefore, those patients were also excluded from the study. The remaining 38 patients (69.1%) with positive CrAg LFA results lacked a history of cryptococcal infection, and CrAg testing had been ordered for initial diagnostic purposes. Those 38 patients were the focus of this study, and in-depth chart reviews were performed by one of the authors (E.S.T.).

Among the 38 patients, *Cryptococcus neoformans* was isolated in culture or identified by histopathology (to the genus level) for 20 patients (52.6%), confirming the positive CrAg LFA results (Fig. 1). Of the 18 patients (47.4%) without culture or histopathological evidence of *Cryptococcus* infection, 5 were diagnosed with probable cryptococcal infections and showed improvement with targeted antifungal treatment. Two of the remaining 13 patients were diagnosed with possible cryptococcal infections but did not show improvement with antifungal treatment, and an alternative diagnosis was established for the remaining 11 patients (Fig. 1).

CrAg LFA titers for patients with confirmed *Cryptococcus* infections. A definitive diagnosis of cryptococcal infection, based on isolation of *C. neoformans* in culture and/or identification by histopathology, was established for 20 of the 38 patients tested with the CrAg LFA for initial diagnostic purposes (Table 1). Those patients ranged in age

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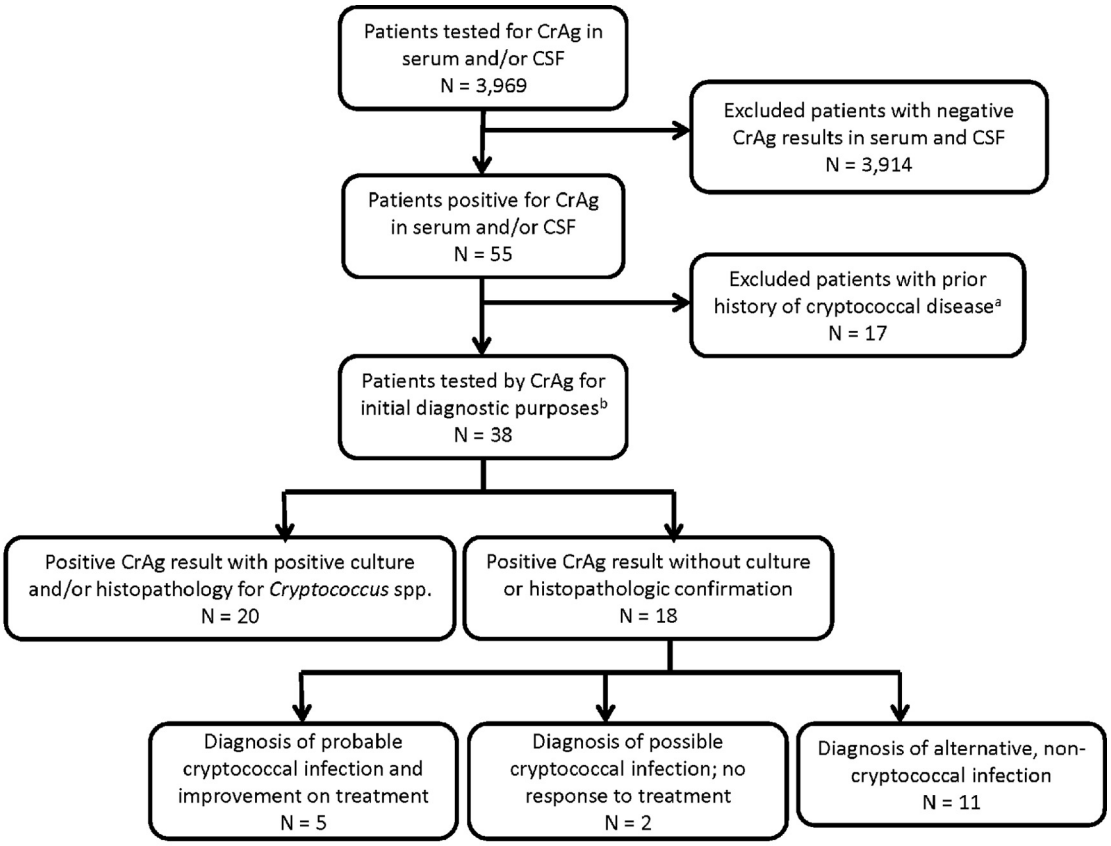

[a] CrAg ordered to monitor treatment response and disease progression.
[b] No prior history of cryptococcal disease

FIG 1 Summary of patients for whom serum and/or CSF samples were tested with the CrAg LFA between 1 June 2014 and 31 December 2016.

from 30 to 88 years (median, 58 years) and were predominantly male ($n = 17$). *C. neoformans* was recovered most frequently from CSF ($n = 10$), followed by respiratory fluid ($n = 4$), blood ($n = 2$), tissue ($n = 3$), and urine ($n = 1$), and was identified by histopathology in a single case. The median time to culture positivity was 2 days (range, 1 to 7 days). Among the 10 patients with confirmed cryptococcal meningitis, the CrAg LFA titers for CSF samples ranged from 1:20 to ≥1:2,560 (median, 1:1,280). Eight of those patients also had a paired serum sample drawn near the time of CSF sample collection (typically within 24 h), and CrAg LFA titers for the paired serum samples ranged from 1:2 to ≥1:2,560 (median, 1:160). Among the 10 patients for whom *C. neoformans* was detected from sources other than CSF, serum CrAg LFA titers ranged from 1:5 to ≥1:2,560 (median, 1:40). Sufficient specimen volume was available to perform CALAS testing for 18 patients and, with the exception of a single case, the CALAS results were positive for all specimens that had corresponding CrAg LFA titers of ≥1:20. Notably, the CALAS results were negative for all specimens collected from 2 patients with culture-confirmed cryptococcal infections (Table 1, patients 1 and 3).

CrAg LFA titers for patients without confirmed cryptococcal infections. *Cryptococcus* spp. were not recovered in culture or identified by histopathology for 18 (47.4%) of the 38 patients with positive CrAg LFA results who were tested for initial diagnostic purposes (Table 2). Those patients ranged in age from 33 to 88 years (median, 61 years) and were predominantly male ($n = 11$). Among those 18 patients, the CrAg LFA result was considered to be a true-positive result for 5 patients (27.8%) (patients 1 to 5), based on (i) clinical and radiological features consistent with cryptococcal infection, (ii) observed decreases in serial CrAg LFA titers, and (iii) documented clinical improvement with anticryptococcal therapy. Four (80%) of those 5 patients were diagnosed with

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TABLE 1 CrAg LFA and CALAS titers for patients with first-time diagnoses of cryptococcal disease confirmed by culture or histopathology ($n = 20$)

Patient no.	Age (yr)/sex	Source for fungal culture	Time to growth (days)	Source for CrAg assay[a]	CrAg LFA titer	CALAS titer
1	88/M	CSF	4	CSF	1:20	Negative
				Serum	ND	ND
2	70/M	CSF	2	CSF	≥1:2,560	≥1:4,096
				Serum	1:160	1:32
3	67/M	Bronchial wash	7	Serum	1:5	Negative
4	78/F	Bronchial wash	1	Serum	1:40	1:16
5	73/M	Blood	2	Serum	≥1:2,560	≥1:4,096
6	78/M	Blood	2	Serum	≥1:2,560	ND
7	76/M	CSF	2	CSF	≥1:2,560	1:2,048
				Serum	≥1:2,560	1:1,024
8	57/M	CSF	2	CSF	≥1:2,560	1:128
				Serum	1:160	1:32
9	50/M	BAL fluid	3	Serum	1:20	1:4
10	72/M	CSF	2	CSF	≥1:2,560	1:512
				Serum	1:640	1:64
11	71/M	CSF	7	CSF	≥1:2,560	1:1,024
				Serum	ND	ND
12	61/M	CSF	2	CSF	1:20	1:1
				Serum	1:20	1:4
13	63/M	Urine	7	Serum	1:40	1:8
14	39/M	CSF	2	CSF	1:640	1:64
				Serum	1:2	Negative
15	48/F	Calf tissue	5	Serum	≥1:2,560	1:1,024
16	58/F	CSF	3	CSF	1:160	1:16
				Serum	1:160	1:64
17	43/M	CSF	2	CSF	1:320	1:128
				Serum	≥1:2,560	1:128
18	58/M	Lung tissue	2	Serum	1:20	1:16
19	52/M	Lung tissue[b]	NA	Serum	1:10	1:2
20	30/M	Sputum	2	Serum	≥1:2,560	ND

[a]CrAg, *Cryptococcus* antigen; ND, not done; NA, not applicable; BAL, bronchoalveolar lavage; LFA, lateral flow assay.
[b]Organisms consistent with *Cryptococcus* spp. were observed in the histopathological assessment of a lung biopsy specimen, using both Gomori methenamine silver (GMS) and mucicarmine stains.

probable cryptococcal pulmonary infections and had CrAg LFA titers ranging from 1:10 to 1:1,280. Interestingly, the CALAS results were negative for 2 of those 4 patients. The fifth patient was found to be HIV positive at the time of presentation ($CD4^+$ cell count, 48 cells/mm^3) and was diagnosed with cryptococcal meningitis, with a CrAg LFA titer of ≥1:2,560 in CSF.

Two of the 18 patients were diagnosed with possible *Cryptococcus* infections (Table 2, patients 6 and 7). The first patient was status post liver transplant in 2004 and presented with fever, rigors, and anorexia. This patient was diagnosed with possible cryptococcal granulomatous hepatitis, based on liver biopsy findings showing granulomas with central necrosis (negative for fungal organisms) and a CrAg LFA serum titer of 1:2. CALAS results for this specimen and repeat CrAg LFA results for a separate serum specimen (collected 2 days later) were both negative. The second patient presented with fever and tremors, and imaging studies revealed a few punctate lung nodules; the CrAg LFA titer was 1:5 in serum, and the CALAS results were negative. Both patients began fluconazole therapy without clinical improvement, and an alternative diagnosis was not established for either patient.

For the remaining 11 patients who were positive by the CrAg LFA but were negative for *Cryptococcus* spp. by culture and/or histopathology, cryptococcal disease was excluded and an alternative diagnosis (either infectious or noninfectious) was ultimately established (Table 2). For 10 of those 11 patients, the CrAg LFA endpoint titer was 1:2; the 11th patient showed a titer of 1:5 in CSF. CALAS testing was performed in 10 of those cases, and the results were negative in each of them. Serial CrAg LFA testing was performed for 7 of the 11 patients, and results either were negative ($n = 5$), remained unchanged at a titer of 1:2 ($n = 1$), or were repeated at a titer of 1:2 and

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TABLE 2 Review of data for patients tested by the CrAg LFA without culture or histopathological confirmation of cryptococcal disease ($n = 18$)[a]

Patient no.	Age (yr)/ sex	Presenting symptom(s)	Comorbidity/ immunosuppression	Radiological findings	Culture source	CrAg LFA titer (source)	CALAS titer (source)	Final diagnosis	Antifungal treatment initiated/response?	Repeat CrAg LFA titer (days between tests)[b]
1	33/M	Chronic dry cough	S/p kidney Tx (2006); tacrolimus and mycophenolate	Bilateral innumerable small lung nodules	Blood, CSF	1:10 (S)	Neg. (S)	Probable cryptococcal pulmonary infection	Fluconazole/yes	1:10 (3)
2	80/F	Dyspnea, weight loss, fatigue	Idiopathic pulmonary fibrosis	Ground glass lung opacities	Blood, CSF	1:10 (S)	Neg. (S)	Probable cryptococcal pulmonary infection	Fluconazole/yes	1:2 (96), 1:2 (111)
3	60/F	SOB, fever, HA, chronic cough	S/p kidney Tx (2010), DM2; tacrolimus	Bilateral nodular lung opacities	Blood	1:1,280 (S)	1:256 (S)	Probable cryptococcal pneumonia	Fluconazole and flucytosine/yes	1:640 (13), 1:80 (153)
4	74/M	Cough, weight loss, fatigue, fever	Autoimmune hemolytic anemia; high-dose prednisone	Cavitary lesion in right upper lobe	Blood	1:40 (S)	ND	Probable cryptococcal pulmonary infection	Fluconazole/yes	1:40 (30), 1:20 (123), neg. (10 mo)
5	53/M	Severe HA, neck pain, fever, photophobia	Newly diagnosed with HIV (48 $CD4^+$ cells/mm^3)	None	CSF	≥1:2,560 (CSF)[c]	≥1:4,096 (CSF)	Cryptococcal meningitis	Amphotericin B and flucytosine/yes	≥1:2,560 (CSF, 34)
6	68/M	Fever, rigors, anorexia	S/p liver Tx (2004), IBD; tacrolimus	None	Blood, CSF	1:2 (S)	Neg. (S)	Possible cryptococcal granulomatous hepatitis	Fluconazole/no	Neg. (2)
7	73/M	Tremors, fever	Monoclonal gammopathy, microscopic anemia	Few punctate lung nodules	Blood	1:5 (S)	Neg. (S)	Possible subacute cryptococcal infection, Waldenström's macroglobulinemia	Fluconazole/no	ND
8	85/M	Hematuria, back pain	S/p aortic valve replacement	None	Blood, CSF, spinal tissue, urine	1:2 (S)	Neg. (S)	*Pseudomonas aeruginosa* UTI, *Streptococcus bovis* spinal infection	No/NA	1:2 (1)
9	51/F	Fever, abdominal pain	S/p liver Tx (2004); azathioprine and tacrolimus	None	Blood, urine	1:2 (S)	Neg. (S)	Large diffuse B-cell lymphoma	Fluconazole/no	1:2 (2), neg. (75)
10	42/F	Weight loss, fatigue, ARDS at admission	Congenital urinary/ lower GI abnormalities	None	Blood	1:2 (S)	Neg. (S)	ARDS secondary to adrenal insufficiency	No/NA	Neg. (2)
11	61/F	Foot ulcer, hemodynamic instability	Rheumatoid arthritis, DM2, ESRD with hemodialysis; etanercept	None	Blood, hip tissue	1:2 (S)	Neg. (S)	Cellulitis and contiguous osteomyelitis due to *Staphylococcus aureus* and *Streptococcus pyogenes*	No/NA	ND
12	46/M	Fever, hip pain	Total hip arthroplasty	Bilateral lung nodules/opacities	Blood	1:2 (S)	Neg. (S)	*Candida albicans* bloodstream infection	Caspofungin for *C. albicans* infection/yes	ND
13	88/F	Gait disturbance, difficulty swallowing	None	Enlargement of left lateral pons	CSF	1:2 (CSF)[c]	Neg. (CSF)	Glioma	No/NA	ND
14	61/M	SOB, cough	S/p allogeneic PBSC Tx (2015)	Bilateral lung consolidation and septal thickening	Blood, BAL fluid, CSF	1:2 (S)	Neg. (S)	Pulmonary GVHD	Amphotericin B, switched to fluconazole/no	Neg. (3)
15	43/F	Right upper extremity weakness	None	Frontal lobe brain atrophy	CSF	1:5 (CSF), neg. (S)	Neg. (CSF), ND (S)	Corticobasal degeneration	No/NA	Neg. (S, 1)
16	88/M	Progressive neurological symptoms	Coronary artery disease, lumbar fusion	None	Blood, CSF	1:2 (S)	Neg. (S)	Cauda equina nerve root enhancement	No/NA	ND
17	75/M	Fever	Gout, hypothyroidism	Bilateral small lung nodules	Blood	1:2 (S)	ND	Resolution with empiric levofloxacin	No/NA	Neg. (5)
18	60/M	SOB, chronic cough, fatigue, fever	Adenocarcinoma s/p chemoradiation (2016), HCV s/p ledipasvir (2016)	Cavitary lung lesion, ground glass opacities	Blood	1:2 (S)	Neg. (S)	Pneumonia due to *Aspergillus fumigatus* and *Acinetobacter baumannii*/ *Acinetobacter calcoaceticus*	Fluconazole (discontinued)/no	Neg. (22)

[a]S/p, status post; S, serum; UTI, urinary tract infection; BAL, bronchoalveolar lavage; NA, not applicable; ND, not done; neg., negative; Tx, transplant; ARDS, acute respiratory distress syndrome; GI, gastrointestinal; IBD, irritable bowel syndrome; PBSC, peripheral stem cell; GVHD, graft-versus-host disease; HA, headache; SOB, shortness of breath; DM2, diabetes mellitus type 2; ESRD, end-stage renal disease; HCV, hepatitis C virus.
[b]Indicates the time between the initial CrAg LFA result and the repeat test(s) ordered as part of clinical care.
[c]Serum samples were not evaluated for CrAg.

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subsequently became negative ($n = 1$). Targeted anticryptococcal therapy was initiated for 3 of the 11 patients without noted clinical improvement. The 8 patients for whom antifungal treatment was not initiated did not show laboratory or clinical evidence of cryptococcal disease at the time of chart review, performed 5 to 33 months following the initial positive CrAg LFA result. Overall, 13 patients were considered to have false-positive CrAg LFA results, leading to an overall false-positive rate among patients tested for initial diagnostic purposes of 34% (13/38 patients).

DISCUSSION

The aim of this retrospective study was to evaluate the accuracy of low-titer (≤1:5) positive CrAg LFA results for patients without a history of cryptococcal disease. Our review revealed that, for patients with culture- or histopathology-confirmed *Cryptococcus* infections, the first-time positive CrAg LFA titers in CSF or serum ranged from 1:5 to ≥1:2,560. Notably, the lowest CrAg LFA titer observed in CSF from patients with culture-confirmed cryptococcal meningitis was 1:20. In all but one case of confirmed cryptococcal disease outside the central nervous system, the CrAg LFA titers were ≥1:10. We also identified 5 patients without confirmed cryptococcal disease who were diagnosed with probable cryptococcosis based on clinical presentations consistent with cryptococcal pneumonia or meningitis and who responded to antifungal therapy, with concomitant decreases in serial CrAg LFA levels. The initial CrAg LFA titers for those 5 patients ranged from 1:10 to ≥1:2,560, similar to the range observed for patients with confirmed cryptococcal infections. In contrast, all 11 patients with initial CrAg LFA titers of 1:2 and 2 of the 3 patients with first-time titers of 1:5 either had an alternative diagnosis established ($n = 11$) or did not respond to anticryptococcal treatment ($n = 2$). Importantly, none of those 13 patients had developed cryptococcal disease at the time of chart review. Based on these results, we recommend that patients without a history of cryptococcosis who have first-time CrAg LFA titers of 1:2 be evaluated by repeat testing of a new specimen and the results correlated with other clinical and laboratory findings prior to establishing a diagnosis of cryptococcal infection.

Our data support those from previously published studies documenting the enhanced sensitivity of the CrAg LFA over the CALAS (11, 12). Four patients in our cohort with either culture-confirmed *C. neoformans* infections ($n = 2$) or probable cryptococcal pulmonary disease ($n = 2$) were positive by the CrAg LFA (titer range, 1:5 to 1:20) but negative by the CALAS. However, for patients with initial CrAg LFA titers of 1:2, and potentially for patients with first-time CrAg LFA titers of 1:5, results should be evaluated and interpreted with caution. Inaccurate diagnosis of cryptococcal disease based on such low-titer positive CrAg LFA results may lead to missed diagnosis of an alternative condition that is possibly treatable or unnecessary initiation of antifungal therapy. In this study, 5 patients with initial CrAg LFA titers of 1:2 or 1:5 began either fluconazole or amphotericin B therapy without clinical improvement, and alternative diagnoses were ultimately established for 3 of those patients.

Prior studies reported that false-positive CrAg results by the CALAS or other latex agglutination assays may occur for patients with *Capnocytophaga canimorsus* (previously referred to as CDC group DF-2), *Stomatococcus mucilaginosus*, or *Trichosporon* infections, for patients with systemic lupus erythematosus, or for samples transported in anaerobic vials (13–18). Importantly, reports of false-positive results by the CrAg LFA are rare, with only a single study documenting false-positive CrAg LFA results for 2 patients with disseminated *Trichosporon asahii* fungemia (19). None of the 13 patients in our study with suspicious CrAg LFA titers of 1:2 or 1:5 had a *Trichosporon* infection. Interestingly, near the end of this study, the manufacturer issued a recall of three CrAg LFA kit lots due to reduced assay specificity; however, none of those lots was used in our laboratory during the study period. Finally, test accuracy is significantly influenced by the pretest probability of disease, with false-positive results being more likely to occur in low-incidence settings. In this study, we report an overall CrAg positivity rate of 1.4% (55/3,969 patients), with a prevalence of new-onset cryptococcal disease of approximately 0.6% (25/3,956 patients) over the 2.5-year study period. To maintain high

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assay specificity, testing with the CrAg LFA should be reserved for patients who are at risk for and present with symptoms consistent with cryptococcal infection.

This study has a number of limitations that should be discussed. First, despite the inclusion of all Mayo Clinic patients who tested positive by the CrAg LFA during a 2.5-year period, only 38 patients met our inclusion criteria; therefore, the conclusions that can be drawn are limited. Second, despite in-depth chart reviews for the 13 patients with low-titer positive CrAg LFA results, a common explanation for the inaccurate CrAg LFA results was not identified. It is important to note, however, the manual and subjective nature of this assay, including both performance and visual assessment for the presence or absence of reactivity with the LFA. In an effort to minimize this, our laboratory routinely repeats samples with initial CrAg LFA endpoint titers of 1:2, in order to confirm the results, before the report is released. Ultimately, additional studies are needed to clarify the cause of low-titer positive CrAg LFA results and to better assess the impact of these results on patient care.

In conclusion, we report that, among patients tested with the CrAg LFA for initial diagnostic purposes, 34% (13/38 cases) of all positive results were considered falsely positive, with semiquantitative titers ranging between 1:2 and 1:5. We show that, with the exception of a single case, all patients with confirmed cryptococcal meningitis or disseminated disease in our study had CrAg LFA titers of $\geq$1:10. For patients with first-time positive CrAg LFA endpoint titers of 1:2, we recommend consideration of repeat CrAg LFA testing with a new specimen and we continue to urge caution in interpretation of low-titer positive results. Correlation of the results with clinical findings and other laboratory data prior to establishing a diagnosis of cryptococcal infection will very likely be required.

MATERIALS AND METHODS

Study design. All patients who were tested with the IMMY CrAg LFA at the Mayo Clinic (Rochester, MN) between June 2014 and December 2016 were identified through query of the laboratory information system. During this time period, all specimens that were positive by the CrAg LFA were frozen and tested with the CALAS (Meridian Bioscience, Inc., Cincinnati, OH) within 1 week after original sample collection. Chart reviews were performed retrospectively for all patients reported as positive by the CrAg LFA, using the European Organization for Research and Treatment of Cancer (EORTC)/Mycoses Study Group (MSG) criteria for invasive fungal infections as guidance (7). Specifically, patient charts were assessed to determine patient demographic characteristics, presentation at the time of testing, reason for CrAg testing (i.e., initial diagnostic purposes versus monitoring of the response to anticryptococcal therapy), immune status, comorbidities, radiological findings, other microbiological laboratory data (e.g., culture, PCR, and/or serological results), final diagnosis, and antifungal treatment. For the purposes of this study, a positive CrAg LFA result was considered true if one of the following criteria was met: (i) a *Cryptococcus* species was recovered in culture from any specimen source, (ii) a *Cryptococcus* species was histopathologically identified in any specimen, or (iii) the patient responded to targeted antifungal therapy with concomitant decreases in serial CrAg LFA titers. This study was approved by the Mayo Clinic Institutional Review Board.

IMMY CrAg LFA. The IMMY CrAg LFA is FDA cleared for use with serum and CSF specimens, and samples were collected, stored, and tested according to the manufacturer's instructions. Briefly, serum and CSF specimens were first screened for the presence of CrAg by preparing a 1:2 dilution of the specimen in specimen diluent. CrAg LFA strips were added to the diluted sample, incubated for 10 min, and visually evaluated for the presence of a test band and a control band. The presence of both bands indicates a positive result; the presence of a single control band indicates a negative result. A semiquantitative procedure was performed for all samples that tested positive at the initial 1:2 screening dilution. Briefly, specimens were diluted to a 1:5 dilution in specimen diluent, followed by serial 2-fold dilutions up to 1:2,560, and were tested as indicated above. The highest dilution that yielded a positive result was reported as the endpoint titer. If the 1:5 dilution tested negative, then the endpoint titer was reported as 1:2.

Meridian CALAS. The Meridian Bioscience CALAS is FDA cleared for use with serum and CSF specimens, and testing was performed according to the manufacturer's instructions. Briefly, serum was treated with pronase, incubated at 56°C for 15 min, and boiled for 5 min. CSF was inactivated by boiling for 5 min. Specimens were cooled prior to use and were screened by the CALAS at a 1:2 dilution for serum or undiluted for CSF. Serum or CSF samples with agglutination reactions of 2+ or stronger were serially diluted, using 2-fold dilutions up to 1:4,096, to determine an endpoint titer.

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NICE National Institute for Health and Care Excellence

NICE guideline

Haematological cancers: improving outcomes

NICE guideline

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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

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This guideline replaces CSG3.

This guideline is the basis of QS150.

Overview

This guideline covers integrated diagnostic reporting for diagnosing haematological cancer in adults, young people and children. It also covers staffing, facilities (levels of care) and multidisciplinary teams needed for adults and young people. It aims to improve care for people with suspected or diagnosed cancer by promoting best practice on the organisation of haematological cancer services.

Who is it for?

- All healthcare professionals that provide diagnostic and treatment services to adults, young people and children with suspected or diagnosed haematological cancer, including clinical and scientific staff in secondary care.
- All healthcare professionals and scientific staff in haematology wards, units, and specialist integrated haematological malignancy diagnostic services (SIHMDS).
- Commissioners of diagnostic and treatment services for haematological cancer.
- People with suspected or diagnosed haematological cancers, their families and carers.

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Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

1.1 Integrated diagnostic reporting

The recommendations in this section apply to services for adults (over 24 years), young people (16 to 24 years) and children (under 16 years).

1.1.1 Take into account that recommendations 1.1.2 to 1.1.4 are most likely to be achieved if the component parts of the specialist integrated haematological malignancy diagnostic services (SIHMDS) are located at a single site. **[new 2016]**

1.1.2 All SIHMDS should:

- have clearly defined organisational structures
- have a formally appointed SIHMDS director who is responsible for the operation of the service, including the design of the diagnostic pathway, resource use and reporting standards
- have a single quality management system
- be formally accredited as a SIHMDS by a recognised independent organisation
- be managed by a single trust/organisation
- assess the clinical benefit and the financial and resource impact of new diagnostic and therapeutic technologies before introducing them
- have a central reception point for all specimens

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- have a full range of age-appropriate specialist haematology and haematopathology input for diagnosis and the authorisation of integrated reports
- have a full range of protocols covering specimen handling, diagnostic pathways and compilation of integrated reports
- ensure that their location, organisation, infrastructure and culture allow effective day to day and ad hoc communication for rapid resolution of diagnostic uncertainty and accurate diagnosis
- have clear and reliable systems for communicating with relevant healthcare professionals outside the SIHMDS
- produce integrated reports that include all information needed for disease management, and share these with the relevant multidisciplinary team.
- report diagnoses sub-typed by the current World Health Organization (WHO) classification. **[new 2016]**

1.1.3 All SIHMDS should have a predefined diagnostic pathway that is followed for each specimen type or clinical problem. The pathway should ensure that:

- the most appropriate diagnostic platforms are selected for a particular clinical situation to avoid unnecessary duplication
- tests for each specimen are used to provide maximum levels of internal cross-validation, using the current WHO principle of multi-parameter disease definitions
- there is a robust process for report validation, including double reporting. **[new 2016]**

1.1.4 All SIHMDS should have an IT system that allows:

- specimen booking and registration at source
- input and update of clinical information
- integrated reporting
- two-way communication between SIHMDS and healthcare professionals using the SIHMDS. **[new 2016]**

1.1.5 The SIHMDS director should be responsible for the overall quality management system, including:

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- laboratory processes and the quality of diagnostic reporting
- ongoing assessment of staff competencies
- training provision
- communication within the SIHMDS and with relevant healthcare professionals
- audit and quality assurance
- research and development. **[new 2016]**

1.1.6 If an urgent treatment decision is not needed, local diagnostic laboratories should send all specimens (including lymph node and other tissue material) directly to a SIHMDS without any local diagnostic workup:

- as soon as a haematological malignancy is suspected
- during active investigation of a suspected haematological malignancy
- if patients with an established or previous malignancy have suspected relapse or disease progression. **[new 2016]**

1.1.7 If an urgent treatment decision is needed and local diagnostic workup will not reduce the speed or quality of the SIHMDS assessment and integrated reporting, local diagnostic laboratories should process and report on blood film, bone marrow aspirate and cerebrospinal fluid cytology specimens. **[new 2016]**

1.1.8 SIHMDS should release individual laboratory reports before the integrated report is produced, if there is an urgent clinical need. **[new 2016]**

1.1.9 SIHMDS should be responsible for specimens that are sent to external labs and should integrate the results into the relevant report (unless there are exceptional arrangements in place for clinical trials). **[new 2016]**

Disease monitoring

1.1.10 When flow cytometry, molecular diagnostics or cytogenetics are needed for disease monitoring, local diagnostic laboratories should send all relevant specimens directly to a SIHMDS without any local diagnostic workup. **[new 2016]**

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1.2 Staffing and facilities (levels of care) for adults and young people who are having high-intensity non-transplant chemotherapy

In this guideline, ambulatory care is a planned care system in which adults and young people at risk of prolonged neutropenia are based at home or other specified accommodation. There should be specific safeguards to minimise the risk from potentially life-threatening complications of chemotherapy.

The recommendations in this section apply to young people (16–24 years) and adults (over 24 years) with haematological malignancies:

- who are receiving high-intensity (non-transplant) chemotherapy for induction or re-induction of remission or consolidation, and are at risk of more than 7 days of neutropenia of 0.5×10^9/litre or lower (see levels of care) **or**
- who are receiving low- or intermediate-intensity chemotherapy but have comorbidities or frailty, or are at increased risk of other organ toxicities.

This includes young people and adults having treatment for:

- acute myeloid leukaemia (including acute promyelocytic leukaemia)
- acute lymphoblastic leukaemia/lymphoblastic lymphoma
- high-risk/hypoplastic myelodysplastic syndrome
- Burkitt lymphoma
- bone marrow failure caused by other haematological malignancy, such as plasma cell leukaemia or other lymphoproliferative disorders.

These recommendations do not apply to adults and young people with relapsed or refractory lymphoma who are having salvage chemotherapy regimens likely to result in fewer than 7 days of neutropenia of 0.5×10^9/litre or lower, unless they have comorbidities or frailty, or are at increased risk of other organ toxicities.

1.2.1 For guidance on staffing and facilities for children with cancer see the NICE cancer service guidance on improving outcomes in children and young people with cancer.

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Centre size

1.2.2 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should provide high-intensity (non-transplant) chemotherapy for induction or re-induction of remission to a minimum of 10 patients per year who have new or relapsed haematological malignancies and who are at risk of more than 7 days of neutropenia of 0.5×10^9/litre or lower. **[new 2016]**

Facilities

Isolation facilities

1.2.3 Inpatient isolation facilities for adults and young people who have haematological malignancies and are at risk of more than 7 days of neutropenia of 0.5×10^9/litre or lower should consist of a single-occupancy room with its own bathroom. **[new 2016]**

1.2.4 Consider installing clean-air systems into isolation facilities for adults and young people who have haematological malignancies and are at risk of more than 7 days of neutropenia of 0.5×10^9/litre or lower. **[new 2016]**

Other facilities

1.2.5 Ensure that there is provision for direct admission to the haematology ward or other facilities equipped to rapidly assess and manage potentially life-threatening complications of chemotherapy (such as neutropenic sepsis or bleeding) in adults and young people, according to agreed local protocols. **[2016]**

1.2.6 Ensure that there are specific beds available in a single dedicated ward within the hospital with the capacity to treat the planned volumes of patients. **[2016]**

1.2.7 Ensure that there is a designated area for outpatient care that reasonably protects the patient from transmission of infectious agents, and provides, as necessary, for patient isolation, long duration intravenous infusions, multiple medications, and/or blood component transfusions. **[2016]**

1.2.8 Ensure that there is rapid availability of blood counts and blood components for

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transfusion. [2016]

1.2.9 Ensure that there are on-site facilities for emergency cross-sectional imaging. [2016]

1.2.10 Ensure that cytotoxic drug reconstitution is centralised or organised at the pharmacy. [2016]

1.2.11 Central venous catheter insertion should be performed by an experienced specialist. [2016]

1.2.12 Ensure that there is on-site access to bronchoscopy, intensive care and support for adults and young people with renal failure. [2016]

Ambulatory care

1.2.13 Consider ambulatory care for adults and young people who have haematological malignancies that are in remission and who are at risk of more than 7 days of neutropenia of 0.5×10^{9}/litre or lower. [new 2016]

1.2.14 Standard operating procedures for all aspects of an ambulatory care programme should be clearly defined and include the following:

- local protocols for patient eligibility, selection and consent
- procedures for patient monitoring
- access to a dedicated 24-hour advice line staffed by specifically trained haematology practitioners
- clear pathways for rapid hospital assessment in the event of neutropenic sepsis or other chemotherapy-related complications or toxicities
- clear pathways for re-admission to haematology units that care for adults and young people who are receiving high-intensity chemotherapy
- written and oral information for adults and young people and their family members or carers
- communication with primary care about the care the adult or young person is receiving, and their need for direct re-admission

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- audit and evaluation of outcomes. **[new 2016]**

1.2.15 Take into account the following when assessing adults and young people to see if ambulatory care is suitable:

- patient preference
- comorbidities
- distance and travel times to treatment in case of neutropenic sepsis and other toxicities (see the NICE guideline on neutropenic sepsis)
- the patient's or carer's understanding of the safety requirements of ambulatory care and their individual treatment plan
- access to and mode of transport
- accommodation and communication facilities
- carer support. **[new 2016]**

1.2.16 For more guidance on providing information to patients and discussing their preferences with them, see the NICE guideline on patient experience in adult NHS services. **[new 2016]**

Clinical policies and audit

1.2.17 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should have written policies for:

- all clinical procedures **and**
- communication with the person's GP and other teams involved in treatment. **[new 2016]**

1.2.18 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should ensure that there is participation in audit of process and outcome. **[2016]**

Staffing

1.2.19 Haematology units that care for adults and young people who are receiving

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high-intensity chemotherapy should have consultant-level specialist medical staff available 24 hours a day. This level of service demands the equivalent of at least 3 whole-time consultants, all full members of a single haematology multidisciplinary team (MDT) and providing inpatient care at a single site. [2016]

1.2.20 Cover in haematology units that care for adults and young people who are receiving high-intensity chemotherapy should be provided by specialty trainees and specialty doctors who are:

- haematologists or oncologists
- involved in providing care to the patients being looked after by the centre
- familiar with and formally instructed in the unit protocols. [2016]

1.2.21 In haematology units that provide care for adults and young people who are receiving high-intensity chemotherapy:

- there should be adequate nursing staff to provide safe and effective care [new 2016]
- the 2003 NICE cancer service guidance on improving outcomes in haematological cancers recommended that 'The level of staffing required for neutropenic patients is equivalent to that in a high dependency unit'. [2003]

1.2.22 Nursing staff in haematology units that care for adults and young people who are receiving high-intensity chemotherapy should be competent to care for people with a severe and unpredictable clinical status. The nursing staff should be able to deal with indwelling venous catheters, recognise early symptoms of infection, and respond to potential crisis situations at all times. [new 2016]

1.2.23 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should have access to consultant-level microbiological advice at all times. There should be access to specialist laboratory facilities for diagnosing fungal or other opportunistic pathogens. [2016]

1.2.24 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should have access to a consultant clinical oncologist for consultation, although radiotherapy facilities do not need to be on

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site. [2016]

1.2.25 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should have access to on-site advice from a specialist haematology pharmacist. [2016]

1.2.26 Haematology units that care for adults and young people who are receiving high-intensity chemotherapy should have dedicated clinical and administrative staff to support patient entry into local and nationally approved clinical trials and other prospective studies. [2016]

1.3 Multidisciplinary teams

The following recommendations were published in chapter 4 of the original improving outcomes in haematological cancers guidance (2003). The evidence for these recommendations has not been reviewed as part of this update, but they have been included in this section as they are still relevant to staffing and facilities (levels of care) for adults (over 24 years) and young people (16–24 years) with haematological cancer.

1.3.1 Clinical services for patients with haematological cancers should be delivered by multidisciplinary haemato-oncology teams. [2003]

1.3.2 Haemato-oncology MDTs should serve a population of at least 500,000 people. [2003]

1.3.3 Every patient with any form of haematological cancer (as defined by current World Health Organization [WHO] criteria) should be cared for by a haemato-oncology MDT. [2003, amended 2016]

1.3.4 All patients should have their care discussed in formal MDT meetings attended by members involved in the diagnosis, treatment, or care of that particular patient, and all the clinicians in the MDT should regularly treat patients with the particular forms of haematological cancer with which that MDT deals. [2003, amended 2016]

1.3.5 These MDTs should be responsible not only for initial recommendations about what treatment should be offered, but also for delivery of treatment and long-term support for patients. [2003, amended 2016]

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1.3.6 Individual clinicians should be responsible for discussing the MDT's recommendations with their patients, who should have the opportunity to be informed of the outcome of MDT meetings. **[2003]**

1.3.7 Clinicians who are not members of the MDTs should refer any patient with suspected or previously diagnosed haematological cancer to an appropriate haemato-oncology MDT. **[2003, amended 2016]**

1.3.8 Written referral policies should be disseminated both within hospitals (particularly to departments such as gastroenterology, dermatology, rheumatology and medicine for the elderly) and to primary care teams, to promote prompt and appropriate referral. **[2003]**

Core members

1.3.9 Each haemato-oncology MDT should include sufficient core members for the following people to be present in person or remotely (for example via video conferencing) at every meeting:

- Haemato-oncologists (either haematologists or some medical oncologists): at least two who specialise in each tumour type being discussed at that meeting (e.g. leukaemia or lymphoma). At least one from each hospital site contributing to the MDT.
- Haematopathologist: at least one haematopathologist from the SIHMDS should be present; to provide the diagnostic information.
- Nurses: at least one clinical nurse specialist, also ward sisters from hospitals which provide high-intensity chemotherapy.
- Palliative care specialist: at least one palliative care specialist (doctor or nurse) who liaises with specialists from other sites. If, because of staff shortages, a palliative care specialist cannot regularly attend MDT meetings, the MDT should be able to demonstrate that it reviews patients regularly with such a specialist.
- Support staff: staff to organise team meetings and provide secretarial support. **[2003, amended 2016]**

1.3.10 Teams established to manage patients with lymphoma should include the following additional core members, who should be fully and regularly involved in MDT discussions:

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- Clinical oncologist: at least one.
- Radiologist: at least one, who liaises with radiologists at other sites. **[2003]**

1.3.11 Teams responsible for managing patients with myeloma should include at least one radiologist who liaises with radiologists at other sites and is fully and regularly involved in MDT discussions. Teams that care for patients with myeloma should have rapid access to oncologists for palliative radiotherapy, although it is not necessary for clinical oncologists to regularly attend team meetings. **[2003, amended 2016]**

Extended MDT members

1.3.12 The MDT should include the following extended team members. They do not have to be present at every MDT meeting:

- clinical member of the transplant team to which patients could be referred
- microbiologist (especially for patients with leukaemia)
- pharmacist
- vascular access specialist
- registered dietitian
- orthopaedic surgeon (myeloma MDT)
- clinical oncologist (myeloma MDT and leukaemia MDT; provision of cranial radiotherapy for patients with acute lymphoblastic leukaemia (ALL) is an important role for a clinical oncologist). **[2003, amended 2016]**

Other specialists

1.3.13 MDTs should have access to the following specialists:

- dermatologist
- gastroenterologist
- ear, nose and throat (ENT) surgeon
- interventional radiologist

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- renal physician. **[2003, amended 2016]**

1.3.14 All haemato-oncology MDTs should have access to support staff, including:

- allied health professionals including rehabilitation specialists
- liaison psychiatrist and/or clinical psychologist
- social worker
- bereavement counsellor
- support for patients and carers. **[2003, amended 2016]**

1.3.15 A clinical nurse specialist should be the initial point of contact for patients who feel they need help in coping with their disease, its treatment or consequences. This nurse should be able to arrange re-admission, clinical review, or meetings between patients and support staff such as those listed above. Networking between nurses with different types of expertise should be encouraged. **[2003]**

Responsibilities of haemato-oncology MDTs

1.3.16 Haemato-oncology MDTs should meet weekly, during normal working hours. All core members should have a special interest in haematological cancer and attend MDT meetings as part of their regular work. They should attend at least two-thirds[1] of meetings. **[2003, amended 2016]**

1.3.17 At each meeting, the MDT should:

- Ensure that all new diagnoses have had SIHMDS review and integrated reporting.
- Establish, record and review diagnoses for all patients with the forms of cancer that fit the team's definition criteria.
- Assess the extent of each patient's disease and discuss its probable course.
- Work out treatment plans for all new patients and those with newly-diagnosed relapses.

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- Review decisions about treatment, particularly those made in the interval between MDT meetings. This review should cover not only the clinical appropriateness of the treatment but also the way patients' views were elicited and incorporated in the decision-making process.
- Discuss the response to treatment, both during therapy and when the course of treatment is complete.
- Think about the appropriateness of radiotherapy in the light of the response to chemotherapy.
- Think about the patients' other requirements such as palliative care or referral to other services. MDTs should be able to demonstrate effective systems for collaboration with hospital and community palliative care services.
- Discuss discontinuing treatment. Each MDT should develop a specific process for considering discontinuation of treatment when its effectiveness has become so limited that adverse effects might outweigh potential benefits.
- Agree dates for reviewing patients' progress.
- Discuss clinical trials and audit results. **[2003, amended 2016]**

1.3.18 The MDT should:

- review all SIHMDS reports of borderline conditions such as aplastic anaemia and other non-malignant bone marrow failure syndromes (which overlap with hypoplastic myelodysplastic syndrome), and lymphocyte and plasma cell proliferation of uncertain significance (which overlap with lymphoma and myeloma)
- identify requirements for staff and facilities for any form of treatment it provides
- liaise with primary care teams, palliative care teams, services for the elderly and voluntary organisations such as hospices
- ensure that adequate information, advice and support is provided for patients and their carers throughout the course of the illness
- ensure that GPs are given prompt and full information about the nature of their patients' illness or treatment, any changes in management, and the names of individual MDT members who are primarily responsible for their patients' management

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- record, in conjunction with the cancer registry, the required minimum dataset for all cases of haematological cancer within its specified catchment area, including those cared for by clinicians who are not haemato-oncology MDT members
- identify the training needs of MDT members and make sure these needs are met
- be involved in clinical trials and other research studies
- collaborate in planning, and collecting data for audit. [2003, amended 2016]

1.3.19 One member of each team, usually the lead clinician, should act as the administrative head of the team, taking overall responsibility for the service it delivers. [2003]

1.3.20 Lead clinicians from all haemato-oncology teams in each MDT should collaborate to develop and document evidence-based clinical and referral policies which should be consistently applied across the MDT as a whole. They should agree process and outcome measures for regular audit. All teams should be involved in audit and clinical trials. [2003, amended 2016]

1.3.21 There should be an operational policy meeting at least once a year at which each MDT discusses its policies and reviews the way it functions. [2003]

Maximising the effectiveness of MDT meetings

1.3.22 Suitable facilities should be provided to support effective and efficient team working. In addition to basic physical facilities such as adequate room and table space, there should be appropriate equipment, for example to allow the group to review pathology slides and imaging results. [2003]

1.3.23 Every MDT meeting should have a designated chairperson. Whilst this may be the lead clinician, teams should consider rotating the role of chairperson between members. Teams should aim for an egalitarian mode of interaction, to facilitate open discussion to which all members feel able to contribute. [2003]

1.3.24 Each MDT should have named support staff who take the roles of team secretary and coordinator. Since these roles overlap, one person may be able to cover both functions in smaller teams. If a team decides that a clinical nurse specialist should be responsible for coordinating meetings, secretarial and administrative support should be provided for this nurse. [2003, amended 2016]

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1.3.25 The team coordinator should arrange meetings, inform all those who are expected to attend, and ensure that all information necessary for effective team functioning and clinical decision-making is available at each meeting. This will include a list of patients to be discussed and the relevant clinical information, along with diagnostic, staging, and pathology information. [2003]

1.3.26 The secretary should take minutes at all meetings, and record and circulate decisions made by the team within the case notes and both to MDT members and to those others identified as appropriate for routine circulation by the MDT, such as GPs, who may require this information. Confidentiality dictates that these records go to relevant clinicians only. [2003]

1.3.27 A designated member of the team's support staff, working with the administrative head of the team, should be responsible for communication with primary care, palliative care, and other site-specific MDTs. [2003, amended 2016]

Local services

1.3.28 Local services should be developed around MDTs which include at least three haematologists whose sole or main specialist interest is in haemato-oncology. [2003]

1.3.29 Teams should specify which patients they can treat locally and make specific arrangements for the delivery of clinical services which they do not provide. [2003]

1.3.30 All inpatients undergoing intensive forms of treatment such as complex chemotherapy under the care of this team should be treated either at one hospital, or, where there is a locally agreed case for providing this service at more than one hospital, in hospitals which then each must independently meet the full criteria for the safe delivery of these treatments. [2003]

1.3.31 Each haemato-oncology MDT which provides high-intensity chemotherapy should have facilities as specified in section 1.2, and should be able to demonstrate adequate arrangements for 24-hour cover by specialist medical and nursing staff. These arrangements should be sufficiently robust to allow cover for holidays and other absences of team members. [2003, amended 2016]

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1.3.32 All hospitals which give high-intensity (non-transplant) chemotherapy for induction or re-induction of remission, or consolidation, or which are likely to admit patients undergoing chemotherapy as medical emergencies, should have documented clinical policies, agreed with haematology and oncology staff, which clearly specify arrangements for the care of such patients. **[2003, amended 2016]**

1.4 Recommendations from the 2003 cancer service guidance

1.4.1 For guidance on access to care, patient-centred care, continuing management, palliative care, and clinical trials and the use of protocols, see the NICE cancer service guidance on improving outcomes in haematological cancers.

Terms used in this guideline

Ambulatory care

In this guideline, ambulatory care is a planned care system in which adults and young people at risk of prolonged neutropenia are based at home or in other specified accommodation. There should be specific safeguards to minimise the risk from potentially life-threatening complications of chemotherapy.

Levels of care

The Guideline Committee redefined levels 2b and 3 from the British Committee for Standards in Haematology (BCSH) guidelines on levels of care, and level 2 care from the original NICE cancer service guidance on improving outcomes in haematological cancers. The new definitions are based only on the depth and duration of expected severe neutropenia.

Low- to intermediate-intensity chemotherapy	All other chemotherapy not included in the definitions below.

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High-intensity chemotherapy	Chemotherapy that is anticipated to result in severe neutropenia (0.5×10^9/litre or lower) for 7 or more days. Other potential organ toxicities, comorbidities and frailty should also be considered. The relevant chemotherapy regimens are usually but not exclusively those used for curative treatment of: • acute myeloid leukaemia • high-risk myelodysplastic syndrome • acute lymphoblastic leukaemia • Burkitt lymphoma (and other rare aggressive lymphomas treated on Burkitt-lymphoma-like protocols) • lymphoblastic lymphoma. Salvage treatments for other types of lymphoma would not usually be included in this definition.
Autologous and allogeneic haematopoietic stem cell transplantation (HSCT)	Previously referred to as high-dose therapy in the original 2003 NICE guidance on improving outcomes in haematological cancers. Commissioned centrally through specialised commissioning, and centres should meet FACT-JACIE accreditation standards.

[1] Cancer Quality Improvement Network System (2013) Manual for Cancer Services: haemato-oncology cancer measures – Haemato-oncology MDT Measure 13-2H-104

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Context

Haematological malignancies are a diverse group of cancers that affect the blood, bone marrow, and lymphatic systems. Some forms are highly aggressive, and others are so benign that they are often only discovered by chance. Symptoms may include:

- lumps caused by enlarged lymph nodes, which are characteristic of lymphomas
- bone fractures and kidney problems, which are characteristic of myeloma
- fatigue and vulnerability to infection and bleeding, which can be caused by most types of haematological cancer but are particularly severe in acute leukaemia.

The main categories of haematological cancer are lymphoma, myeloma, leukaemia, myelodysplastic syndromes and myeloproliferative neoplasms. These categories vary in prevalence, incidence and survival rates. In addition, there are subtypes of lymphoma and leukaemia, as well as rarer haematological cancers that have their own categories.

There are also borderline conditions such as aplastic anaemia and other non-malignant bone marrow failure syndromes (which overlap with hypoplastic myelodysplastic syndrome), and suspected cutaneous lymphomas that need specialised facilities for diagnosis and treatment.

Different levels of service are needed to manage haematological cancers, depending on the particular cancer in question. Because of the increased complexity of care and changes in the levels of care from those specified in the 2003 NICE cancer service guidance on improving outcomes in haematological cancers, an update was needed.

There has been progressive and variable adoption of specialist integrated haematological malignancy diagnostic services (SIHMDS), aimed at improving diagnostic accuracy and expertise. Integrated diagnostic reports are well established in some centres but not everywhere. In addition, new diagnostic techniques have been developed since 2003. Because of all this, an update to the diagnostic and evaluation sections in the 2003 guidance was needed.

More information

To find out what NICE has said on topics related to this guideline, see our web page on blood and bone marrow cancers.

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Putting this guideline into practice

NICE has produced tools and resources to help you put this guideline into practice.

Putting a guideline fully into practice can take months to years. This depends on how much change in practice or services is needed. Implementing change is most effective when aligned with local priorities.

Changes recommended for clinical practice that can be done quickly – like changes in prescribing practice – should be shared quickly. This is because healthcare professionals should use guidelines to guide their work – as is required by professional regulating bodies such as the General Medical and Nursing and Midwifery Councils.

Here are some pointers to help put NICE guidelines into practice:

1. Raise awareness through routine communication channels, such as email or newsletters, regular meetings, internal staff briefings and other communications with all relevant partner organisations.

2. Identify a lead with an interest in the topic to champion the guideline and motivate others to support its use and make service changes, and to find out any significant issues locally.

3. Carry out a baseline assessment against the recommendations to find out if there are gaps in current service provision. Think about what data you need to measure improvement and plan how you will collect it. You may need to work with other health and social care organisations and specialist groups to compare current practice with the recommendations. This may also help identify local issues that will slow or prevent implementation.

4. Develop an action plan with the steps needed to put the guideline into practice. Recognise that it may take several years. Include milestones and the business case, which will set out additional costs, savings and possible areas for disinvestment. A small project group should develop the action plan. The group should include the guideline champion, a senior organisational sponsor, staff involved in the associated services, finance and information professionals.

5. Implement the action plan with oversight from the lead and the project group with project management support.

6. Review and monitor how well the guideline is being implemented through the project group.

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Share progress with those involved in making improvements, a well as relevant boards and local partners.

NICE provides a comprehensive programme of support and resources to maximise uptake and use of evidence and guidance. See our into practice pages for more information.

Also see Leng G, Moore V, Abraham S, editors (2014) Achieving high quality care – practical experience from NICE. Chichester: Wiley.

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Update information

This guideline is an update of NICE cancer service guidance on improving outcomes in haematological cancers (published October 2003).

New recommendations have been added for the role of integrated diagnostic reporting and the staffing and levels of care needed to treat haematological cancer.

These are marked as:

- **[new 2016]** if the evidence has been reviewed and the recommendation has been added or updated
- **[2016]** if the evidence has been reviewed but no change has been made to the recommended action.

The NICE cancer service guidance on improving outcomes in haematological cancers (2003) was developed using very different methods to the current NICE guideline development process. The 2003 guidance presented recommendations in a paragraph format. The Guideline Committee highlighted some sections of the original guidance as still relevant to clinical practice, and other sections as out of date. Recommendations that are no longer relevant have been deleted. Recommendations that are still relevant to clinical practice have been transferred as individual recommendations labelled **[2003]**, and the evidence for these has not been reviewed. Any amendments that change the meaning of recommendations labelled **[2003, amended 2016]** are explained in Amended recommendation wording (change to meaning). This is an exception to NICE's standard guideline development process and has been done so that relevant recommendations in the chapter not being updated could be carried across into this update.

Amended recommendation wording (change to meaning)

Recommendation in 2003 guideline	Recommendation in current guideline	Reason for change

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Every patient with any form of haematological cancer (including myelodysplasias and chronic myeloproliferative disorders) should be managed by a haemato-oncology MDT.	1.3.3 Every patient with any form of haematological cancer (as defined by current World Health Organization [WHO] criteria) should be cared for by a haemato-oncology MDT.	This reference has been added to confirm how all haematological cancers are defined.

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Each haemato-oncology MDT must include sufficient core members for the following people to be present at every meeting: • Haemato-oncologists (principally haematologists, some medical oncologists) — At least two who specialise in each tumour type being discussed at that meeting(e.g. leukaemia or lymphoma). At least one from each hospital site contributing to the MDT • Haemato-pathologist — At least one specialist in haematopathology who liaises with pathologists from other hospital sites; • Nurses — At least one clinical nurse specialist, also ward sisters from hospitals which provide services at BCSH Level 2 or above.	1.3.9 Each haemato-oncology MDT should include sufficient core members for the following people to be present in person or remotely (for example via video conferencing) at every meeting: • Haemato-oncologists (either haematologists or some medical oncologists): at least two who specialise in each tumour type being discussed at that meeting (e.g. leukaemia or lymphoma). At least one from each hospital site contributing to the MDT. • Haematopathologist: at least one haematopathologist from the SIHMDS should be present; to provide the diagnostic information. • Nurses: at least one clinical nurse specialist, also ward sisters from hospitals which provide high-intensity chemotherapy. • Palliative care specialist: at least one palliative care specialist (doctor or nurse) who liaises with specialists from other sites. If, because of staff shortages, a palliative care specialist cannot regularly attend MDT meetings, the MDT should be able to demonstrate that it reviews patients regularly with such a specialist.	The opening paragraph has been amended to show that MDT members can be present at meetings remotely. The first bullet point has been amended to avoid showing a preference for haematologists as this was unnecessary. The second bullet has been amended to reference the SIHMDS recommended in this update. The BCSH Levels of Care have been replaced, as they are no longer applicable.

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• Palliative care specialist — At least one palliative care specialist(doctor or nurse) who liaises with specialists from other sites. If, because of staff shortages, a palliative care specialist cannot regularly attend MDT meetings, the MDT must be able to demonstrate that it reviews patients regularly with such a specialist • Support staff — Staff to organise team meetings and provide secretarial support.	• Support staff: staff to organise team meetings and provide secretarial support.	
Teams responsible for managing patients with myeloma should include at least one radiologist who liaises with radiologists at other sites and is fully and regularly involved in MDT discussions. It is not necessary for clinical oncologists to regularly attend team meetings for discussion of myeloma patients, although teams which manage these patients need rapid access to oncologists for palliative radiotherapy.	1.3.11 Teams responsible for managing patients with myeloma should include at least one radiologist who liaises with radiologists at other sites and is fully and regularly involved in MDT discussions. Teams that care for patients with myeloma should have rapid access to oncologists for palliative radiotherapy, although it is not necessary for clinical oncologists to regularly attend team meetings.	The second sentence of this recommendation has been amended to give it a clear action.

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MDT meetings have the following functions: • To establish, record and review diagnoses for all patients with the forms of cancer that fit the team's definition criteria; • To assess the extent of each patient's disease and discuss its probable course; • To work out treatment plans for all new patients and those with newly-diagnosed relapses; • To review decisions about treatment, particularly those made in the interval between MDT meetings. This review should cover not only the clinical appropriateness of the treatment but also the way patients' views were elicited and incorporated in the decision-making process; • To discuss patients' responses to treatment, both during therapy and when the course of treatment is complete Lymphoma MDTs should review each patient's progress after three cycles of chemotherapy and again at the end of the prescribed course. The appropriateness of radiotherapy should be considered in the light of the response to chemotherapy;	1.3.17 At each meeting, the MDT should: • ensure that all new diagnoses have had SIHMDS review and integrated reporting • establish, record and review diagnoses for all patients with the forms of cancer that fit the team's definition criteria • assess the extent of each patient's disease and discuss its probable course • work out treatment plans for all new patients and those with newly-diagnosed relapses • review decisions about treatment, particularly those made in the interval between MDT meetings. This review should cover not only the clinical appropriateness of the treatment but also the way patients' views were elicited and incorporated in the decision-making process • discuss the response to treatment, both during therapy and when the course of treatment is complete • think about the appropriateness of radiotherapy in the light of the response to chemotherapy	This recommendation has been changed to give it a clear action. In addition, a reference to SIHMDS review has been added to match the recommendation on diagnostic reporting in this update. Reference to lymphoma MDTs has been removed because the recommendations will be superseded by the NICE guideline on non-Hodgkin's lymphoma (publication expected July 2016). 'consider' has been changed to 'think about' to avoid confusion with current NICE style for actions in recommendations. 'must' has been changed to 'should' to match current NICE style

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• To consider patients' other requirements such as palliative care or referral to other services. MDTs must be able demonstrate effective systems for collaboration with hospital and community palliative care services; • To discuss discontinuing treatment. Each MDT should develop a specific process for considering discontinuation of treatment when its effectiveness has become so limited that adverse effects might outweigh potential benefits; • To agree dates for reviewing patients' progress; • To discuss clinical trials and audit results.	• think about the patients' other requirements such as palliative care or referral to other services. MDTs should be able to demonstrate effective systems for collaboration with hospital and community palliative care services • discuss discontinuing treatment. Each MDT should develop a specific process for considering discontinuation of treatment when its effectiveness has become so limited that adverse effects might outweigh potential benefits • agree dates for reviewing patients' progress • discuss clinical trials and audit results.	for actions in recommendations.

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The MDT is also responsible for: • Identifying requirements for staff and facilities for any form of treatment it provides (see Topic 5, Treatment, excluding high dose therapy, and Topic 6, High dose therapy). • Liaison with primary care teams, palliative care teams, services for the elderly and voluntary organisations such as hospices; • Ensuring that adequate information, advice and support is provided for patients and their carers throughout the course of the illness; • Ensuring that GPs are given prompt and full information about the nature of their patients' illness or treatment, any changes in management, and the names of individual MDT members who are primarily responsible for their patients' management; • Recording, in conjunction with the cancer registry, the required minimum dataset for all cases of haematological cancer within its specified catchment area, including those cared for by clinicians who are not haematological cancer MDT members;	1.3.18 The MDT should: • review all SIHMDS reports of borderline conditions such as aplastic anaemia and other non-malignant bone marrow failure syndromes (which overlap with hypoplastic myelodysplastic syndrome), and lymphocyte and plasma cell proliferation of uncertain significance (which overlap with lymphoma and myeloma) • identify requirements for staff and facilities for any form of treatment it provides • liaise with primary care teams, palliative care teams, services for the elderly and voluntary organisations such as hospices • ensure that adequate information, advice and support is provided for patients and their carers throughout the course of the illness • ensure that GPs are given prompt and full information about the nature of their patients' illness or treatment, any changes in management, and the names of individual MDT members who are primarily responsible for their patients' management	This has been updated to reflect the recommendations made in section 1.1. The reference to Topics 5 and 6 has been removed because these chapters have been deleted.

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• Identifying training needs of MDT members and making sure these needs are met; • Involvement in clinical trials and other research studies; • Collaboration in planning, and collecting data for, network-wide audit.	• record, in conjunction with the cancer registry, the required minimum dataset for all cases of haematological cancer within its specified catchment area, including those cared for by clinicians who are not haemato-oncology MDT members • identify the training needs of MDT members and make sure these needs are met; • be involved in clinical trials and other research studies • collaborate in planning, and collecting data for audit.	
A designated member of the team's support staff, working with the administrative head of the team, should be responsible for communication with primary care, palliative care, and other MDTs in the network	1.3.27 A designated member of the team's support staff, working with the administrative head of the team, should be responsible for communication with primary care, palliative care, and other site-specific MDTs.	The reference to networks has been amended, as these no longer exist.

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Each haemato-oncology MDT which provides treatment at BCSH Level 2 or above must have facilities as specified by BCSH and must be able to demonstrate adequate arrangements for 24-hour cover by specialist medical and nursing staff. These arrangements must be sufficiently robust to allow cover for holidays and other absences of team members.	1.3.31 Each haemato-oncology MDT which provides high-intensity chemotherapy should have facilities as specified in section 1.2, and should be able to demonstrate adequate arrangements for 24-hour cover by specialist medical and nursing staff. These arrangements should be sufficiently robust to allow cover for holidays and other absences of team members.	The BCSH Levels of Care have been replaced, as they are no longer applicable. In addition, 'must' has been changed to 'should' to match current NICE style for actions in recommendations.
All hospitals which give chemotherapy, or which are likely to admit patients undergoing chemotherapy as medical emergencies, should have documented clinical policies, agreed with haematology and oncology staff, which clearly specify arrangements for the care of such patients.	1.3.32 All hospitals which give high-intensity (non-transplant) chemotherapy for induction or re-induction of remission, or consolidation, or which are likely to admit patients undergoing chemotherapy as medical emergencies, should have documented clinical policies, agreed with haematology and oncology staff, which clearly specify arrangements for the care of such patients.	The reference to chemotherapy has been amended to match the levels of care defined in this update.

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Accreditation

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From: Powrie, Ian
Sent: 12 July 2018 08:42
To: Hirst, Allyson
Subject: FW: [BlockedURL][ExternaltoGGC]Additional Information in respect of Chlorine dioxide used on water systems within Renal Environments.
Attachments: Activated carbon and chlorine dioxide and by-product removal copy.pdf

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From: Tim Wafer [redacted]
Sent: 11 July 2018 10:56
To: Powrie, Ian
Cc: Wafer Tim
Subject: [BlockedURL][ExternaltoGGC]Additional Information in respect of Chlorine dioxide used on water systems within Renal Environments.

Hi

Following our recent conversation i can confirm that Constant dosing of Chlorine dioxide is widely used within the treatment of Cold water Supplies within the Healthcare environment.

Renal treatments area are always subject to review and covered under a stand-alone risk assessment which is normally completed by ourselves.

Within many of our client sites that utilise Chlorine dioxide they ensure compliance with renal requirements by employing both PRE renal plant and POST treatment monitoring. There are tight set-points with a set of operating parameters based on the monitor outputs. Indeed, some have insulated a warning beacon to alert the Renal Unit in the event of a deviance from normal control parameters.

Examples of such sites are: -

The Leeds Teaching Hospitals NHS Trust
City Hospitals Sunderland NHS Foundation Trust
United Lincolnshire Hospitals NHS Trust
Mid Yorkshire Hospitals NHS Trust
Sheffield Teaching Hospitals NHS Trust
Leicester Hospitals NHS Trust

As part of this project we will be liaising with the Renal team to discuss specific criteria and bring together the necessary risk assessment and standard operational procedures documentation.

Regards

T Wafer FRSPH; MIHEEM
Technical & Compliance Director
Authorising Engineer - Water & Chlorine dioxide

The Water Solutions Group
5 Arena Park
Scarcroft
Leeds
LS17 9BF

Tel: [redacted]

Email: [redacted]

Web: BLOCKEDwatersolutionsgroup[.]org[.]ukBLOCKED

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Action plan – Chlorine dioxide plant installation; Operational issues meeting 23/8/18

Action	Responsible person	Estimated completion date
Email Karen Connolly for clarification around this query and a response is awaited.	Jamie Redfern	Completed 23/8/18 Response awaited.
Contact relevant persons in adult haemodialysis service to discuss a contingency plan for paeds to move into adults should the water supply be switched off all together.	Jennifer Rodgers	07/09/18
Contact Karen Connelly (General manager, facilities) to query if there will be increased waste uplifts should the water be switched off.	Susie Dodd	Completed 24/08/18. Response awaited.
Contact Michael Bradnam (Head of Imaging) to query uplift of chemo waste should patient be unable to flush toilets on 2A.	Melanie Hutton.	Completed 24/08/18 Response awaited.
Contact Karen Connelly to seek assurance that daily and twice daily cleaning will be maintained should the water supply be switched off.	Susie Dodd	Completed 24/08/18 Response awaited.
Establish provision of toilet facilities for public use including disabled access.	Ian Powrie	01/10/18
Establish how many portable sinks are required and the locations of these. Numbers will be provided to IP for costing and provision.	Susie Dodd	01/10/18
Liaise with facilities to review portable sinks available for use in the event of the water being switched off completely.	Susie Dodd & Teresa Inkster	01/10/18 Facilities GM contacted 24/8/18.
Continue to liaise with catering services as the project develops to ensure contingencies are in place should supply of water be lost.	Ian Powrie	Ongoing
Quantify the volume of bottled water needed for each areas should it be required.	Ian Powrie	01/10/18
Produce a written guide note for staff referring to patient hygiene and staff hand hygiene should the water be switched off.	Susie Dodd & Teresa Inkster	01/10/18

Water Review Meeting (Technical)
Friday 24th May 2019 at 1pm
QEUH – CMB – Facilities Meeting Room and via Teleconference

Present and on call:

Ian Powrie (IP)	Deputy General Manager – Estates
Colin Purdon (CP)	Interim Sector Estates Manager, South Sector
Teresa Inkster (TI)	Consultant Microbiology
Mary Anne Kane (MAK)	Associate Director of Estates & Facilities (Chair)
Dennis Kelly (DK)	Authorising Engineer
John Mallon (JM)	Technical Services Manager – GRI

Apologies:

Tom Steele (TS)	Director of Estates & Facilities
John Hood (JH)	Consultant Microbiologist - GRI
Alan Gallacher (AG)	General Manager – Estates
Eddie McLaughlin (EMcL)	Principal Engineer - HFS
Iain Kennedy (IK) (on call)	Consultant in Public Health Medicine
Tim Wafer (TW)	Consultant (Water Solutions Group)
Mark Riddell (MR)	Sector Estates Manager

In Attendance :

Allyson Hirst (AH)	Admin – Estates and Facilities for Notes

1. Apologies — **Action**

As noted above -

2. Minute of Previous Meeting 26th April 2019
The minute was agreed as an accurate record.

3. Chlorine Dioxide Snagging
90% complete. The conclusion of the snagging will see the installation or the probes and dosing rates adjusted
IP noted that DHW return CLO2 sensors are outstanding due to supply issues from Germany but should be delivered in next week. Four boosted lines treatment systems are off line due drainage pump failure. Chlorine dioxide levels remain good

4. Test Results
OOS Results March – monthly reporting good except chloroforms but not specific to any one system. Actions in place to determine work practices or other causes of these returned results. Same areas resampled last Friday and verbal confirmation that these have returned clear.
TI/TW had requested a third set to be taken and results from this were awaited. It was agreed to type test the positive results(what strain of organism)
TI noted that BGibson reported steno bacteraemia in 6A within the lines of patients and it was agreed to reprogrammed the schedule of testing to check the day care area of 6A including sentinels as well as rooms either side or the day room. TI agreed to check actual rooms used and report back to IP – IP will carry out the testing on Tuesday next week. Agreed that further definitive testing will be carried out to determine what the microbacteria was, to determine if this was potentially related to water borne – agreed that this will require a slightly different testing regimen

Tracker Review – on 15th May all points in ward 2a (RHC) were sampled due to concerns about repeating positives and found that this repeated through the ward. Due to the

findings it was decided to complete an engineering check of the ward including a recheck of deadlegs etc and all was confirmed as being removed and as reported. It was established that the taps had been sanitised using showerhead plus and the dip of these carried out for 2 minutes per tap was deemed to be insufficient to be effective and is thought to be part of the process causing issues of repeating negative results but also coming in from the manufacturer not sufficiently sanitised. IP has instructed DMA to remove the taps and sanitises at a 2ppm high level CD for 7 days to eradicate anything from the system. DMA have indicated to IP that they should be using an ethanol based sanitiser product but this request a license to use which they do not have. An alternative sanitant is being tested by Ideal Standards but this will take around 2 months to conclude the testing process. IP reported that he has contact HFS re the standard of brass and RAS approval level required as being insufficient and requested that HFS intervene to reduce the leeching and PCV being other threshold acceptable levels. A detailed response was received from Ideal Standard and this has been forwarded to HFS for their information and also to IK as part of Public Health. IP was asked to arrange the conference call with all relevant parties. MAK noted that the quality of the water coming into the hospital was not considered to be of the best standard and to the quality that is being reported to us and asked what we can do about it.

CD Manual Monitoring – good levels of residual in all cold water outlets with good penetration found. Hot water – not as effective in proportional dosing due to lack of demand but even during the day the distribution system is not getting the levels required. It was expected that the planned implementation of DHW return CLO2 algorithms and monitoring probes would address the proportional dosing efficacy.

5. Water Meters

Water Meters – Corrosion Assessment Plan – The condition of the meters and the ineffectiveness of the coating could mean similarly cast iron components, in the system with graphite leach weakening of the cast iron bodies and therefore providing unwanted nutrients to the water system and creating pockets of nutrients within the system could have an adverse affect on various areas. It is suggested that these areas are checked to check the potential for multiple seeding sources of the system from these and if anything found determine what actions need to be taken to remove this risk. It was recommended by Delta Flowtech (meter manufacturer) that we remove meters prior to the commissioning and at first chemical treatment and then replace these thereafter but for us this means that the meter would not be chemically treated. IP suggested that instead of mechanical meters we use PTFE lined ultrasonic Meter, where there is no water contact with the metal parts but noted that these were around 5 times the price of mechanical. There was no criticism of the installation or the commissioning but of the WRAS approval being inadequate for use in hospital systems. We need to establish if these components are responsible for reseeding the system thereby making the CD work harder to try to clean the water. MAK asked IP what would be a solution to this – IP reported that removal and replacement of all these components if affected with similar derogations.

This has been escalated to HFS to alert others that this could be a national issue and to request engagement with WRAS on assessment procedures for product compatibility with biocides routinely adopted for use in wholesome water systems, but it appears that this has not been taken forward by HFS at this time. IP agreed to follow this up with HFS as this issue needs to be clarified so that we can proceed to resolve our issues with HFS endorsement. A programme of replacement will be required depending upon the outcome of the inspection\analysis of the randomly selected components. – it was thought that the maximum water shutdown for each inspection would be around 1 hour and it was agreed that work with the clinical teams was required to ensure that little or no impact to patient care during this time.

Deadleg Removal Programme – CP reported that one cooler was remaining to be removed but noted that there were 7 deadlegs that required removal within the neonatal block but this was proving difficult to gain access as these were located in patient room and clinical demand did not allow for access

6. **TMT**

TMT Future Replacement – Tap selection and mobilisation of the replacement tap is required specifically in high risk areas. It was agreed that a capital application and Business Case will require to be pulled together - It was agreed that MR will take this forward. This will be taken forward on the basis of installation of Marwick taps at this time and it was noted that there is limitations on choice within the market. It should be noted that if industry standards change and improvements made this may expand the choices available. Consideration needs to be given to the installation of these and a plan will be required to ensure that this does not impact on patient care. IPS changes will be required at the same time as well as basin changes to improve splash control and drain outflow issues. IP recommended that we adopt the fixed spout option to prevent unintended off set issue with the demountable option — MR

ED OPD Drinking Water – BWSG determined that the update to SUP05 was awaited and direction from HFS and guidance is awaited

7. **Drinking Water Dispensers**

Drinking Water Assessment Tool – IP had included a proforma we could use for this and adapt to our needs. The group are asked to feedback their comments to IP and AH who will then update this and submit to the Board Water Safety Group for their ratification — All

8. **Date of Next Meeting**

The next meeting will take place on 24th June at 1pm in the CMB Meeting Room. MR will chair this meeting in IPs absence — **MR**

NHS Greater Glasgow & Clyde

Clinical & Care Governance Committee

Dr Teresa Inkster

Paper No: 18/??

Report on water contamination incident at QEUH/RHC

Purpose of Paper:-

To describe the water contamination incident at QEUH/RHC including current and future infection control measures.

Recommendations:-

The committee are asked to note the concerns raised in relation to the QEUH and RHC water supply and review the current status and actions being progressed.

Short Summary of Key Issues:-

Following the detection of an unusual bacterial infection on a patient in ward 2A RHC, water sampling was undertaken and water tests were positive. Immediate infection control measures were implemented. Despite chemical dosing, water testing results from outlets on the ward remained positive. Further testing revealed evidence of a more widespread problem in RHC and QEUH. NHSGGC are in the process of implementing long term preventative methods in conjunction with UK water experts.

Author – Dr Teresa Inkster
Tel No – [redacted]
Date – 22/5/18

Incident Management Team meeting
Gram Negative Isolates (GN) – Ward 1D PICU
Tuesday 10th December 2019, 13:00
Hot Desk Room PICU RHC

Present: Professor A Leanord, P Joannidis, G Bowskill, Dr A Turner, J Redfern, E Milligan, S Johnstone, C Cook.

Apologies: J Rogers

Actions

Welcome, Apologies, Introductions

Prof Leanord welcomed everyone to the meeting, introductions were made and everyone was reminded of the confidentiality surrounding IMTs.

Update on situation

Professor Leanord advised the IMT that on advice of the Scottish Government that all 3 recent incidents relating to Gram Negative isolates are investigated together retrospectively and prospectively using the HPS case definition previously used in relation to the Haemato oncology Gram Negative incident. Case definition below:

1) A positive blood culture of a single organism that has not been previously isolated from the patient's blood within the same 14 day period (i.e. 14 days from date last Positive sample obtained).

2) A positive blood culture for any organism defined as environmental bacteria group (detailed above) that has not been previously isolated with same or other environmental bacteria group organism in the patient's blood within the same 14 day period.

3) A positive blood culture for an environmental including enteric bacteria group (detailed above) that has not been previously isolated with same or other environmental including enteric bacteria group organism in the patient's blood within the same 14 day period.

4) A positive blood culture where Gram-negative bacteria has been isolated in 14 day period that has not been previously isolated with same or other Gram-negative organism within the same 14 day period.

5) A positive blood culture where Gram-positive bacteria has been isolated in 14 day period that has not been previously isolated with same or other Gram-positive organism within the same 14 day period.

Professor Leanord advised that by case definition we have 2 cases that meet the definition and 1 Haemophilus case which is not part of this incident.

Professor Leanord recommended to the IMT that the group look at each previously assessed incident in turn starting with the Acinetobacter incident October 2019 which was given a HIIAT score of Green on 05.11.19.

Acinetobacter

The IMT members discussed the cases of Acinetobacter and determined a hypothesis that cross transmission occurred between case 1 and 3 linked to either beds 2 and 3 or beds 14 and 15 as they had identical typing. The IMT also discussed case 4 who isolated Acinetobacter in August who also

had a typing match with case 1 and 3. Case 1 and 4 were nursed in the same bed bay (13-16) for a period of time.

The IMT agreed that the appropriate controls were put in place i.e. Hand hygiene audits, Infection Control Audits. Further controls have been put in place since including: wipeable keyboards and agreed at today's IMT weekly Safe Patient Environment audits will be carried out weekly by the IPCT.

Pseudomonas

IMT 19.11.19 HIIAT Green.

Professor Leanord advised the IMT that the Scottish Government were under the misunderstanding the Case 1 (Pseudomonas Sepsis cited on death certificate) had a Pseudomonas bacteraemia. This patient had positive isolates form a sternal wound and a blind BAL and in fact had 5 negative blood cultures. Dr Turner (clinician) was asked by Professor Leanord what his opinion was around the description of Pseudomonas sepsis for case 1 as there were no positive blood cultures. Dr Turner advised that presumption was sepsis although there was no evidence of Pseudomonas in the blood. The IMT agreed that Case 1 was not a bacteraemia.

The timeline for case 2 was also discussed and although due to the clinical picture and the time spent in PICU this case was not truly an HAI which could be attributed to PICU the IMT agreed to add this case as an HAI. Dr Turner advised the IMT that case 2 (deceased, Pseudomonas not cited on death certificate) died of surgical complication due to massive surgical haemorrhage and that this was a terminal event.

Case 3 discussed, unlike case 1 & 2 there is no association with Theatre 8. Professor Leanord advised that he will look at the antibiograms for all 3 and include a further 4th case which was not an HAI. Professor Leanord advised the group that the hypothesis for the Pseudomonas incident was that Theatre 8 was implicated in the transmission in both cases 1 & 2 separated by 41 days. Water sampling from Theatre 8 and NICU were negative for any of the organisms discussed by the IMT. **AL**

Serratia

IMT 27.11.19 HIIAT Amber

1 case of Serratia isolate obtained 24.11.19 from blood cultures. Case has been referred to the Procurator Fiscal therefore unable to ascertain if the cause of death is associated with the Serratia isolate. No further cases since 24.11.19.

Professor Leanord advised the IMT that the hypothesis for this incident is possible water transmission.

Actions

Actions from previous IMTs continue.

New actions from IMT:

- Weekly Safe Patient Environment audits. **IPCT**
- Routine weekly swabbing of POUF's, drains and CHWB's over a 4 week period commenced this week. **IPCT**
- Routine weekly water sampling will be carried out over a 4 week period checking for all Gram negatives. Monthly water sampling will check for any Mycobacterium. **DMA**
- All drains will continue to have weekly Hysan dosing. **Facilities**
- P Joannidis will share the PPVL room document to the IMT. **PJ**
- The IC Data team have produced a SPC chart for all Gram negatives in PICU, details **JR**

of occupied bed days to be supplied.

Actions – Cont/d

- Trigger will be 2 Gram negative isolates in a 30 day period or 2 HAI in a 2 week period. **IPCT**
- RCA will be completed for any new blood cultures. **IPCT**
- As requested by the Scottish Government there will be a retrospective look back for a period of 6 months and RCA completed for the 2 cases in the time period. **PJ**

Water Reports

Water sampling reports from PICU, Theatre 8 and NICU are negative for the organisms discussed at this IMT.

Environmental Reports

Environmental sampling was negative.

Other Reports

Hand Hygiene audit results:

08/11/19 - Opportunities Taken score was 100%. Combined Compliance score was 80%.

Four failures with technique; One Medical, after contact with patient surroundings, not bare below the elbows, wristwatch. One Domestic, after contact with patient surroundings, not bare below the elbows, Fit bit. One Medical, after contact with patient surroundings, not bare below the elbows, wristwatch. One Radiographer, after contact with patient surroundings, duration eight seconds.

20/11/19 - Opportunities Taken score was 100%. Combined Compliance score was 90%.

Two failures with technique; One Physiotherapist, after contact with patient surroundings, duration eight seconds. One Trained Nurse, after contact with patient surroundings, duration eight seconds.

IPCAT Results:

Audit carried out 06.11.19 – overall score was 86% Green. SPE section 62% Red.

Repeat SPE Audit Result:

Repeat SPE carried out 04.12.19 – Score 80% Green.

HIIAT

Severity of illness – Minor
Services – Minor
Risk of transmission – Minor
Public anxiety – Moderate (anticipated) **GB/PJ/ AL**

The group agreed on an HIIAT score of **Green**

HIIORT will be agreed and sent to HPS. **JR/AT**

Communications – Patients/Parents

Communication will be made with parents of children discussed as part of this IMT. **CC**

Press

No recent media enquiries. Holding press statement is in place.

AOCB

AT

Clinical team will check what parents have already been spoken to and what parents require to be contacted.

JR

The requirement for a SCI will be investigated.

The next IMT is on Tuesday 17th December, Hot Desk Room, PICU RHC @ 10am.

Greater Glasgow and Clyde Outbreak and Incident Management Plan

Version 4 Final

February 2020

NHS Greater Glasgow and Clyde

East Dunbartonshire Council

East Renfrewshire Council

Glasgow City Council

Inverclyde Council

Renfrewshire Council

West Dunbartonshire Council

Approvals

This version was approved by NHS GGC Corporate Management Team on 5th March 2020

Abbreviations

APHA	Animal and Plant Health Agency, formed by merger of Animal Health and Veterinary Laboratories Agency (formerly known as the State Veterinary Service) with parts of the Food and Environment Research Agency (Fera) responsible for plant and bee health
CBRN	Chemical, biological, radiological and nuclear (usually refers to deliberate releases)
CMO	Chief Medical Officer
CPHM (CD/EH)	Consultant in Public Health Medicine (Communicable Diseases and Environmental Health)
DPH	Director of Public Health
DWQR	Drinking Water Quality Regulator for Scotland
EDC	East Dunbartonshire Council
EHO	Environmental Health Officer
EPO	Emergency Planning Officer
ERC	East Renfrewshire Council
FSS	Food Standards Scotland (formerly Food Standards Agency (Scotland))
GCC	Glasgow City Council
HPS*	Health Protection Scotland
HSE	Health and Safety Executive
IMT	Incident Management Team
IMTSG	Administrative Incident Management Team Support Group
LA/EHS	Local Authority/Environmental Health Service
MST/EG	Management Support Team/Executive Group
NHSGGC	NHS Greater Glasgow and Clyde
OCP	Outbreak and Incident Control Plan – this document
OCT	Outbreak Control Team – synonym for IMT
OCTSG	Outbreak Control Team Support Group – synonym for IMTSG
OMST	Outbreak Management Support Team – synonym for MST/EG
PAG	Problem Assessment Group
PF	Procurator Fiscal
MedVet Group	The Greater Glasgow and Clyde Public Health (Health Protection) Liaison Working Group which consists of public health doctors, health protection nurse specialists, EHOs, medical and non-medical microbiologists, Scottish Water and veterinarians with an interest in public health issues relevant in the NHSGGC area; and which owns the authorship of this plan
PHPU	The Public Health Protection Unit, NHSGGC
PRO	Public Relations Officer
SRUC	Scotland's Rural College
SEPA	Scottish Environment Protection Agency
SOP	Standard Operating Procedure
STAC	Scientific and Technical Advisory Cell
SWHP	Scottish Waterborne Hazard Plan
WDC	West Dunbartonshire Council

- During the life of this plan HPS will join with other national bodies to form Public Health Scotland (PHS). The roles and responsibilities in relation to this plan remain unchanged.

Contents

Introduction

The first edition of the NHS Greater Glasgow and Clyde Outbreak Control Plan for Food and Waterborne Gastro-intestinal illness (including GI infection) brought together the two outbreak control plans that operated in the former NHS Greater Glasgow and NHS Argyll and Clyde. It was revised in 2012, and again in 2015.

The fourth edition of the plan has had more significant updates to the text; however, the key principles of outbreak control remain the same. The plan has been expanded to cover all incidents which would be covered by the key national guidance on the subject - *Management of Public Health Incidents: Guidance on the Roles and Responsibilities of NHS led Incident Management Teams (MPHI).*

This plan was developed in conjunction with the Public Health (Health Protection) Liaison Working Group. It is endorsed by all six local authority departments of environmental health and by Scottish Water.

The purpose of the plan is to provide those responsible responding to incidents and outbreaks, and those responsible for monitoring that process, with an agreed understanding to facilitate effective and consistent response. It should be read in conjunction with other local and national guidance, including *MPHI.*

We hope this fourth edition proves as useful to those responsible for preventing and controlling food and water borne outbreaks as the previous editions. We would welcome feedback on the usefulness of this document at any point in the future in order to help us improve on it for future updated versions.

Dr Iain Kennedy

Chair

Public Health (Health Protection) Liaison Working Group,

Greater Glasgow & Clyde

(The “Med-Vet Group”)

A. Operational response

Tiered response

1 **This incident management plan is part of a tiered response to incidents across local and national agencies.**

2 **Incidents are usually locally led for tiers 0, 1 and 2. Tier 3 may be locally or nationally led dependent on the incident. The tier of an incident depends on the threat to the public health – complexity, severity, geography. The tiers are intended as a guide only, and the response taken may vary depending on the individual circumstances and risk assessment carried out by the Incident Management Team (IMT) managing the incident. Definitions of the tiers and suggested responses, as detailed in *MPHI,* are contained in appendix 1.**

Recognising a possible outbreak or incident

3 **Any agency which suspects that an outbreak or incident may be occurring should contact a CPHM (CD/EH) or the on-call CPHM at the earliest opportunity. Monday to Friday 0900 – 1700: 0141 201 4917, option 3. Out of hours and bank holidays: via NHSGGC switchboard 0141 211 3600, ask for "GGC public health on-call".**

4 It is recognised that some public agencies have statutory or other responsibilities for the provision of emergency/immediate actions to protect life and control the incident, and that these may take precedence over informing PHPU. However, the CPHM should be contacted as soon as these initial control steps have been taken.

5 There is a myriad of ways that an outbreak can be suspected or identified. Information which draws attention to the possibility of an outbreak may come to the attention of any of the following:

- Local Authority's Environmental Health Service
- Diagnostic and reference laboratories
- Infection Prevention and Control teams
- Local GPs
- Local clinicians (in hospitals or clinics)
- Departments of Public Health (NHSGGC and others)
- Scottish Water
- HPS/PHS
- Care homes, schools and nurseries
- Food Standards Scotland
- Members of the public

6 Each organisation has its own procedures for surveillance, detection and control. PHPU carries out surveillance activities, including the monitoring of incidence of specified

pathogens on a weekly basis (mumps, measles, campylobacter, cryptosporidium, salmonella), and daily coincidence alert and context surveillance of HPZone data.

7 Additionally, PHPU clinical staff flag cases and enquiries where there are unusual features, such as clustering of cases or severe clinical presentations. The increased use of molecular diagnostics, such as Whole Genome Sequencing (WGS), mean disease clusters that would not previously been recognised are being identified. These clusters are more likely to cross geographical boundaries.

Definition of outbreaks and incidents

8 Public health incidents are defined in *MPHI* :

A **public health incident** may arise in the following situations:

- a single case of a serious illness with major public health implications (e.g. botulism, viral haemorrhagic fever, XDR-TB) where action is necessary to investigate and prevent ongoing exposure to the hazardous agent;
- two or more linked cases that could indicate the possibility that they may both be caused by the same known or unknown agent or exposure i.e. an outbreak;
- higher than expected number of cases or geographic clustering of a serious pathogen;
- a high likelihood of a population being exposed to a hazard (e.g. a chemical or infectious agent) at levels sufficient to cause illness, even though no cases have yet occurred (e.g. contamination of the drinking water supply).

  All these definitions also apply to non-biological hazardous agents

9 **The Public Health (Scotland) Act 2008** includes a legal definition of a public health incident, which is summarised in *MPHI.*

Initial response

10 An initial assessment is required to determine if an outbreak or incident is taking place. This may be carried out by the CPHM, or through a Problem Assessment Group (PAG).

11 The initial assessment will be based on available information. It may not be possible to make a decision on the information available immediately and further investigations may be required. A PAG may not always be required, and it is not necessary to hold a PAG prior to activating an IMT.

Role of a PAG

12 The CPHM may choose to hold a PAG if it is unclear if there is a threat to public health. A PAG may by face to face, or via teleconference. The membership is usually smaller than an IMT. There is no defined membership, but the CPHM will need to ensure appropriate expertise to help guide decision on future management is available. The purpose of the PAG is to assist the CPHM in making a decision on whether there is an incident, and if so, what further action is required. Questions to guide that process are included in box 1.

13 PAG outcomes may be:

- No significant risk to public health, PAG stood down, monitoring continues
- Significant risk/interest/need for close management – IMT required
- Remains uncertain – further investigations agreed, and decision to stand down or hold IMT pending those results. In this case it is essential the timescale is agreed.

14 A PAG will only meet once – if a further meeting is required, this will be an IMT.

15 PAGs are often described as "informal". Whilst they do not have the full framework of an IMT, it is important that decisions, including whether to stand down or move to full IMT, and the rational for those decisions, are recorded.

Box 1: Key Questions for CPHM/Problem Assessment Group

- Are there or could there be a large number of cases?
- Is there a possibility of further cases?
- Is the source or transmission route uncertain?
- Are additional control measures required?
- Is co-ordination necessary?
- Is the suspected organism unusually pathogenic or has other unusual features?
- Is communications and media management required?

If the answer is "yes" to any of these, an IMT may be warranted.

Incident Management Teams

Purpose

16 The IMT is an independent[1], multi-disciplinary, multi-agency group with responsibility for investigating and managing the incident. The IMT provides a framework, response and resources to enable the NHS board and other statutory agencies to fulfil their remits which are to:

- reduce to a minimum the number of cases of illness by promptly recognising the incident, defining how cases have been exposed to the implicated hazard, identifying and controlling the source of that exposure, and preventing secondary exposure;
- minimise mortality and illness by ensuring optimum health care for those affected;
- inform the patients, actually or potentially exposed groups, staff, clinical and management colleagues, public, their representatives and the media of the health risks associated with the incident and how to minimise these risks; and
- collect information which will be of use in better understanding the nature and origin of the incident and on how best to prevent and manage future incidents.

17 The IMT will agree and co-ordinate the activities of the agencies involved in the control and investigation of the outbreak in order that the aetiology, vehicle and source of the outbreak are identified and control measures are implemented as soon as possible and if required, legal advice sought.

18 The IMT is not simply an advisory group but an independent group set up specifically to investigate and manage the response to a public health incident. As such it is empowered to make both decisions on control measures, and recommendations to partner agencies on control measures or other matters related to the outbreak or incident (see Decision making, below)

Membership

19 The three core members of an IMT for a community incident are:

- CPHM
- EHO
- An expert on the (known or presumed) causative agent – such as microbiologist, scientist or toxicologist.

1 ---

[1]Whilst independent of Department/Sector/Divisional management structures, the IMT gains its authority from, and remains responsible to, the Chief Executive and Board through the mechanisms described in this document, and the Board's wider clinical and care governance structures

20 These core members should each nominate a deputy who will be regularly and fully briefed on progress.

21 The CPHM and EHO will be expected to be responsible for any action under the Public Health etc (Scotland) Act 2008, and therefore they should be Competent Persons under the meaning of the Act and subsequent regulations. If they are not designated Competent Persons then a further suitably qualified CPHM or EHO as appropriate should be included in the IMT.

22 For most incidents, a communications officer and a representative of HPS will also be invited.

23 Other members of the IMT will depend on the nature of the incident/outbreak. A non-exhaustive list of possible members is included in Appendix 3.

24 In complex incidents, consideration should be given to the membership including a second CPHM (or ICD depending on chairing arrangements), so that there is no expectation that roles of chair and of provision of specialist expertise will fall on a single individual.

25 The IMT should review membership at every meeting to ensure that it continues to meet the needs of the incident. It is important that membership should not become so large as the IMT loses focus and direction. In general agencies/departments should have no more than two, and an absolute maximum of three, members of any IMT.

26 Members must be of sufficient seniority to implement decisions and allocate resources. At the first IMT (or when a member is asked to join subsequently) the status of IMT members (full member/in attendance/observer) should be confirmed. This will include the roles and responsibilities for IMT members.

27 Individuals who are not full members may continue to attend the IMT by invitation, but should not expect to have equal rights in terms of determining the conduct of the investigation, the advice given to the public, the content of press statements, or the final IMT report.

28 Members should also be asked to declare any potential conflicts of interest. The interest and the determination of the IMT in handling that interest will be recorded in the minutes. A potential conflict may alter that individual's membership status.

29 The Chair, in consultation with the IMT, reserves the right to invite other experts as required.

Administration

30 Arrangements will be made to ensure sufficient administrative support for the IMT. The investigation of an outbreak can involve a large amount of work under pressurised conditions. It is essential that adequate administrative and secretarial support be offered by the NHSGGC's Corporate Services or PHPU, or by the lead NHS Board if not NHSGGC.

31 This should include an experienced minute taker who is accustomed to dealing with outbreaks and incidents. As far as possible there will be continuity in the minute taker.

32 In addition, a member of the administration team should, ideally, be appointed from the relevant NHS Board to organise/oversee the entire process in terms of booking meeting rooms, circulating agendas and minutes, taking calls during meetings, etc.

33 Room used for IMTs should be of suitable size and layout with necessary information and communication technology facilities. IMTs should be given priority in room booking. Consideration should be given to block booking rooms for IMTs.

34 In exceptional circumstances, the Chair (or another IMT member with delegated responsibility), in consultation with the IMT, may require to discuss the need to convene an administrative IMT Support Group (IMTSG) with NHSGGC's lead officer, the DPH. A separate IMTSG plan is prepared by NHSGGC PH Directorate.

35 To enable efficient working, where possible IMT members should meet face to face. However to ensure full participation, teleconference facilities will be provided for all IMTs.

Operations

36 The chair of the IMT should be agreed at the first meeting. This will usually be the CPHM (or ICD in hospital outbreaks) however it may be another IMT member if appropriate. For example, in land contamination incidents, or incidents with prolonged recovery phase, this may be a local authority officer.

37 In especially complex incidents, the chair of the IMT may discuss with the DPH the need for a suitably qualified and experienced senior clinical manger (such as Head of Health Protection, Deputy DPH or Deputy Medical Director) to take on the role of chair.

38 The first meeting must be held no more than 72 hours after decision to convene an IMT. Most incidents will require a faster response.

39 At the first meeting terms of reference should be agreed, a preliminary risk assessment conducted and incident level confirmed (appendices 1 and 2).

40 A communications strategy should be agreed early and reviewed as necessary

41 The IMT should regularly review available resource to ensure appropriate response can be maintained.

42 The IMT will be chaired so that all members are able to participate, and all relevant aspects of the incident are tabled. This includes supporting a culture which balances acknowledgement of roles and expertise, and 'respectful challenge'.

43 The IMT may wish to set up subgroups (or "cells") to carry out detailed investigations or completion of tasks to allow the full IMT to maintain focus on strategic priorities and the overall incident management. Any subgroup will have a named lead who will be a full IMT member, and a terms of reference detailing the remit, scope and limits of delegated authority of the subgroup. Subgroups may include members who are not members of the full IMT. Membership will be agreed, in consultation with the IMT, between the Chair and the cell lead.

44 Any subgroups will report directly to the IMT. The IMT will not normally rehearse the detail of discussions in the subgroup, but will expect clear and regular reporting of any decisions/actions/recommendations to the IMT, and detailed recording of the rationale of those decisions, to provide assurance/oversight, as the IMT retains responsibility for the activities of the subgroup.

45 Common cell types include:

- Food – Used when food chain investigations are required. Usually chaired by Local Authority. Further details are contained in the *MPHI* foodborne illness supplementary guidance.
- Epidemiology – carry out detailed epidemiological investigation, generally only used in very large outbreaks or if complex analytical studies are required.
- Media – brings together communications officers from all involved agencies to ensure clarity and consistency of message. Probably the most commonly used subgroup. Led by the senior communications officer from the IMT lead agency.
- Technical – necessary when there are detailed engineering or other technical specialist investigation or control measures.

46 There may be occasions where external pressures bear on the IMT in a way which detracts from the IMT's central role of the investigation and control of hazards to public health. In these circumstances additional resource, for example the activation of resilience partnerships, or a senior NHS corporate response through a setting up of a Management Support Team/Executive Group. The role of a corporate response is not to replace the IMT's responsibility for investigation and control of the incident, but to support the IMT in management of wider organisational responses. These may include

service or financial impacts of recommended control measures, or management of external relationships when there are high levels of public or political interest.

47 The IMT has a right to request legal advice. The IMT will need to consider if there is a need for enforcement, or other legal action, or if there is possibility of a crime having occurred, and to contact Police or Procurator Fiscal, and consider other actions as necessary on their advice.

48 Incident management is intensive and can be long running. Agencies/departments should make arrangements to allow rotation of staff to prevent fatigue and maintain efficient working.

Decision making

49 It is expected that the IMT will reach collective decisions but it may be necessary for the IMT Chair to make difficult decisions if the IMT cannot resolve an issue by consensus or if urgent decisions are required between IMT meetings. Where time allows, if consensus cannot be reached, the Chair should consider if allowing additional time for discussion or gaining additional information will assist the IMT reach a decision. When taking a decision as IMT Chair, the Chair should consider peer support from another key IMT member or senior from their own organisation. The final decision on action rests with the IMT Chair.

50 All members of the IMT must recognise their individual roles as a member of the IMT and that they should be in a position to commit to act on behalf of their organisation.

51 If a member is not supported by their organisation to agree to the consensus position, and this cannot be resolved by the IMT chair, then it must be escalated to a higher executive level, the DPH in the first instance, and if necessary to the chief executives of the organisations involved.

52 Decisions must be clearly documented. The record must include not only the decision made, but the alternative options considered and the rationale for the choice(s) made must be also be documented. A template is available in *MPHI* annex H.

53 Whilst correct IMT membership will minimise the need for external consultation on decisions, there may be situations where there are significant operational or financial consequences for partner agencies, and these recommendations should be discussed with executive colleagues, to mitigate against knock on impacts on service delivery and operational stability that may be disproportionate to the risk the action is intended to manage.

54 Similarly, if work escalates or goes beyond the scope of the IMT, consider seeking support through LRP/ RRP / Regional Resilience Coordinator and other personnel.

Data sharing

55 Discussion of patient identifiable information at IMT meetings should be kept to a minimum, but can be unavoidable. All IMT members should be reminded of their duty on confidentiality of information shared in the IMT at the start of each meeting, and IMT documents marked appropriately.

56 It is a fundamental breach of IMT protocol for information gained at the IMT to be shared without permission of the IMT chair.

57 Information will need to be shared between partner agencies in the course of responding to the incident or outbreak. In doing so, there will have to be a balance between the responsibility to protect personal information with the responsibility to protect the health of the population. IMT members should ensure they are aware of their organisational policies on data sharing in outbreaks. Further detail is included in *MPHI* Annex E.

B. Incident investigation

58 Whilst the stages of investigation and management of an incident are laid out in a logical order below, many of these activities can and should occur in parallel, and they should not treated as a strict chronological path.

Case definition

59 A good case definition is essential for successful investigation. It should be agreed by the PAG/IMT at the first meeting, and should be reviewed regularly as further information becomes known.

60 IMT may decide degrees of case definition – confirmed, probable, possible. The term "suspected case" is sometimes used to describe a patient who might be a case but for whom sufficient information to classify correctly is unavailable (for example refused to be interviewed)

61 Case definition should include clinical, and epidemiological (time, place, person) factors. In some incidents a definition of population at risk/cohort (i.e. those who attended a particular function) can be included.

62 Specific risk factors should not be used define the population at risk - "attended wedding" is acceptable, "attended wedding and ate the chicken liver parfait" is not.

63 Where a laboratory diagnosis is available (i.e. causative organism or chemical has been identified) this should be included in the case definition. Other laboratory tests may be useful in differentiating between possible and probable cases.

64 The case definitions can also include exclusion criteria

65 It may also be necessary to agree definitions for contacts of cases. These definitions may also be stratified (i.e. household/shared space/transient/healthcare etc)

Case finding

66 Initial notifications of cases may represent only a small proportion of individuals, so the IMT should consider options for identifying further cases.

67 There are several reasons to carry out active case finding which can include:

- Gaining additional epidemiological, microbiological or risk information to better characterise and therefore control the incident
- Identify individuals who require medical intervention
- Monitor effectiveness of control measures
- Support decision to declare incident over.

68 Case finding can be through:

- Enquiry of household and other close contacts of known cases;

- review of other notifications/lab results;
- raising awareness with health and social care staff to identify further cases;
- enquiry of other groups who may be collecting useful information (such as occupational health departments or school absence rolls);
- and rarely other techniques such as media appeals or population screening.

Investigation

Epidemiological

Descriptive

69 Descriptive epidemiology, sometimes referred to as "data orientation", is central to understanding the incident. The descriptive epidemiology is the basis for generation of hypotheses for the causes of the incident, and will help direct control measures.

70 All cases should be interviewed. When interviewing cases, consideration should be given to the use of appropriate data collection tool – this may be the standard enteric form, disease specific enhanced surveillance form, or an incident specific data collection tool.

71 Line listing should be prepared. Line listing is a type of epidemiological database, laid out like a spreadsheet, with one row per case, and columns being variables such as case identifiers, demographic, clinical and microbiological factors (including those in the case definition) and exposures. Templates are available in PHPU.

72 Data should be summarised or "oriented" in terms of time, place and person. This should include the preparation of an epidemic curve. Other methods of displaying data, such as detailed timelines or geographical mapping of cases may also be helpful.

73 Once prepared, the data will need to be interpreted in the context of the clinical, microbiological and environmental results – this is the process of turning data into intelligence.

Analytical

74 Analytical epidemiology is a means to test hypotheses developed by the IMT during the investigation. While it is best practice to carry out analytical epidemiology where possible, many incidents do not progress to analytical study. This may be because causative hazard, route of transmission and control measures are clear from descriptive epidemiology and other investigations, or there are too few cases (incident ends). Analytical studies are resource intensive, and the IMT needs to consider the value of an analytical study in the context of the outbreak or incident.

75 Prior to starting an analytical study, descriptive epidemiology and hypothesis generation must be completed and a written study protocol must be prepared. The most common study types are case-control and cohort studies. Support for analytical studies should be taken from PHPU and HPS. The PHE Communicable Disease Outbreak Management operational guidance also has useful information on analytical studies and study protocol development. Other more exotic analytical study types are occasionally used, but should only be carried out in conjunction with HPS.

Microbiological

76 There should be an investigation into the nature and characteristics of the implicated hazard. This will often be microbiological, but may be toxicological, radiological etc.

77 It is essential to involve scientific, especially diagnostic laboratories, as early as possible in the investigation of an incident. The scientific specialist on the IMT should advise on the taking of appropriate specimens and arrange for relevant investigations. This should include liaison with the relevant reference laboratory in Scotland, or other specialist laboratories in the UK if necessary.

78 Microbiological testing should not occur in a haphazard way. The IMT, on advice of the microbiologist or other laboratory specialist, will determine a sampling plan.

79 This advice should also include guidance for staff on correct sample type and technique, and labelling to allow prompt identification of incident samples on receipt at the laboratory.

80 Non-human samples should go to the relevant laboratory (public analyst or veterinary) as appropriate.

81 The IMT should consider best use of lab resources, taking into account of relevant issues such as turn around times and reporting

82 Molecular microbiological techniques, including Whole Genome Sequencing, may be considered, and advice should be sought from the relevant reference laboratory.

Environmental

83 There should be specific investigation into how cases were exposed to the infective agent or other hazard, and to trace back to the probable source of infection, infestation or contamination. Along with other investigation strands, this will aid in generation of hypotheses and application of control measures.

84 Environmental investigation is usually led by LA Environmental Health, but depending on the circumstance may be another agency (such as FSS for food chain investigation, or infection control in the hospital setting.)

85 The investigation may include the taking of relevant samples, such as food, water or environmental swabs. Similar to microbiological investigation, this needs to be undertaken in a planned manner, with clear rationale.

86 Other aspects of environmental investigation may include inspection of physical environment; review of documents, policies, procedures and records; and tracing of food or other materials.

Risk assessment

87 There are two different, but complimentary aspects to risk assessment, the specific, considering investigatory findings and generating hypothesis to support decisions on interventions, including deciding if the risk has been adequately controlled; and the general, global judgement on the situation.

88 Risk assessment is a dynamic process and risk assessments should be regularly reviewed by the IMT.

Hypothesis generation

89 In this assessment the IMT will review the information available from the investigations so far, as well as knowledge from national/international guidance, previous incidents and the published literature. It may take into account points such as the nature of the hazard, the nature of the exposure, the population exposed, if the exposure has ceased or is ongoing, existing mitigations and the likely effectiveness of available control measures.

90 One framework for this assessment, associated with use in environmental incidents, is shown in Fig 1. Other similar schema include 'host - vector - disease/agent'; 'source - pathway – receptor'; and 'chain of infection' (Figure 2)

91 It is important that the hypothesis generation step is carried out in detail, as it will guide control measures. It is also essential that brings together clinical, epidemiological, microbiological, environmental, and other investigations. Relying on just one or two of these strands can be misleading.

92 In some outbreaks it will be possible to formally test the hypothesis through analytical study (see Analytical epidemiology above). This step should be carried out if at all possible. However, this is often not possible due to factors such as not enough cases/outbreak over; resource or time constraints;

Global

93 A global judgement on the incident allows the IMT to assess effectiveness of response, and consider if escalation/de-escalation or further communication and alerting is required.

94 The risk assessment module of HPZone can be used for this risk assessment and is based on the following criteria:

Severity: Dynamically assessed risk of the degree of foreseeable harm that may be caused to individuals or to the population and possible issues with recovery.

Confidence: Knowledge, derived from all sources of information that confirm the existence and nature of the threat and the routes by which it can affect the population.

Spread: The size of the actual and potentially affected population.

Interventions: The availability and feasibility of population interventions to alter the course and influence the outcome of the event.

Context: The broad environment, including media interest, public concern and attitudes, expectations, pressures, strength of professional knowledge and external factors including political decisions.

95 For incidents in healthcare settings, the HIIAT tool should be used.

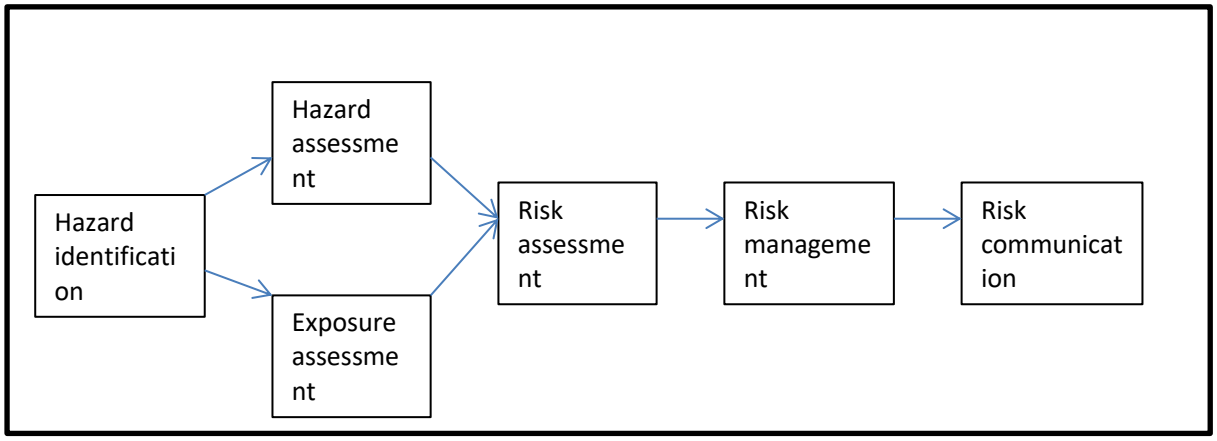

Figure 1.

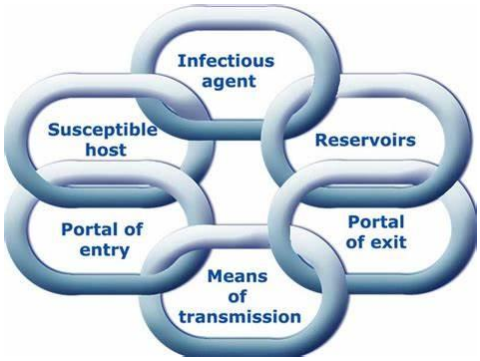

Figure 2: Chain of infection

Risk management

Patient/People care

96 Throughout the incident, it should be remembered that the purpose of the response is to protect the health of the public. There will be individual patients/citizens and communities who are affected.

97 Therefore, care of people/patient update will be included on the agenda of every meeting of the IMT.

Control measures

98 Given the varied nature of incidents, it is not possible to give a comprehensive list of possible control measures. Some examples are listed below. Some examples could be included under more than one of these categories.

99 Control measures agreed upon should be documented with clear responsibilities and timescales for implementation.

100 Control measures can be considered under a series of broad headings, and should be linked back to the hypotheses and framework used in hypothesis generation.

Control of source

- Food recall
- “boil water” notices/provision of alternative supplies
- Contaminated land remediation
- Disinfection or decontamination

Protect people at risk

- Chemoprophylaxis
- Vaccination or immunoglobulin
- Shelter in place/evacuation

Prevention/reduction of spread

- Hand hygiene
- Disinfection or decontamination
- Exclusion/restriction/quarantine

Prevention of recurrence

- Recommendations to stakeholders or other bodies for improved preventative measures
- Education
- Guidance development
- Enforcement action

Risk Communication

Principles

101 How any incident, the potential risk involved, and subsequently the utility and acceptability of control measures are perceived depends on the communication during the incident and outbreak.

102 Key principles for communication during outbreaks and incidents as described in WHO communications guidance are contained in box 3 below.

103 The CDC Field Epidemiology Manual describes that the key points of trust and credibility are supported by communications which demonstrate:

- Empathy and caring,
- Honesty and openness,
- Dedication and commitment, and
- Competence and expertise

104 During an outbreak or incident the roles and responsibilities of organisations and individuals in communications should be established and agreed by the IMT. Similarly a communications plan should be agreed early by the IMT, based on the described principles. NHS GGC will develop a generic outbreak communications plan to support the development of incident specific plans

105 The IMT should also consider the potential requirements for communication under statutory or professional duty of candour, and the chair of the IMT may wish to seek specific advice on duty of candour.

106 Notwithstanding the specific functions of individual agencies to protect public safety, it is a fundamental principle of incident management that no communications should be made without the approval of the IMT chair, and that all communications must follow the communications plan agreed by the IMT.

Box 2 – Principles for outbreak communication

1. **Trust**

The key principle of outbreak communication is to communicate in ways that build, maintain or restore trust between the public and outbreak managers. Without this trust, the public will not believe, or act on, the health information that is communicated by health authorities during an outbreak.

2. **Announcing early**

Proactive communication of a real or potential health risk is crucial in alerting those affected and minimizing an infectious disease threat. Announcing early - even with incomplete information – prevents rumors and misinformation. The longer officials withhold information, the more frightening the information will seem when it is eventually revealed, especially if it is revealed by an outside source. Late announcement will erode trust in the ability of public health authorities to manage the outbreak.

3. **Transparency**

Maintaining the public's trust throughout an outbreak requires ongoing transparency, including timely and complete information of a real or potential risk and its management. As new developments occur over the course of an outbreak they should be communicated proactively. Transparency should characterize the relationship between the outbreak managers, the public and partners as it promotes improved information gathering, risk assessment and decision-making processes associated with outbreak control

4. **Listening**

Understanding the public's risk perceptions, views and concerns is critical to effective communication and the broader emergency management function it supports. Without knowing how people understand and perceive a given risk and what their existing beliefs and practices are, decisions and required behavior changes necessary to protect health may not occur and societal or economic disruption may be more severe.

5. **Planning**

Public communication during an outbreak represents an enormous challenge for any public health authority and therefore demands sound planning, in advance, to adhere to the principles described above. Planning is an important principle, but more importantly, it must translate into action.

From: World Health Organization outbreak communication planning guide – 2008 edition.

Box 3 - What to Include When Developing Outbreak-Related Messages

- An expression of empathy.
- What's known and a call for action, including Who? What? When? Where? Why? How?
- What's known and what's not known, and how answers will be obtained for what's not yet known
- Explanations of what public health actions are being taken and why.
- A statement of commitment.
- When additional information will be provided.
- Where to find more information in the meantime.

From CDC Field Epidemiology Manual Chapter 12.

Types of communication

107 IMT should consider communications in terms of specific groups, including:

- Patients/cases/contacts
- Members of the public (by which is meant direct communication for those members of the public where there is a potential risk, need for action, or information for reassurance)
- Professional/staff (both clinical and non-clinical. It should be remembered that there may be staff groups outwith the NHS)
- Media
- Senior management/HPS/Government

108 Whilst the communication to these groups may differ (for example professional groups may need more detail on control measures so they can be successfully implemented), the messaging should be consistent, and it should be remembered that any communication may end up in the public domain.

Ending the incident

109 The IMT will decide when the public health response to an incident can be stood down, and if appropriate will make a public statement to that effect.

110 Criteria for standing down the public health response should be clearly documented. Examples of these criteria include:

- There is no longer a risk to the public health that requires further investigation or management of control measures by an IMT.
- The number of cases has declined.
- The probable source has been identified and withdrawn.

111 A debrief should be held within two weeks of the close of the incident. The Board civil contingencies team or RRP Learning and Development Co-ordinator can be asked to assist in the debrief process, but the IMT remains the sponsor of the debrief, and the debrief report will be "owned" by the IMT Chair.

112 Subsequent to the debrief an incident report should be prepared. The format will be decided by the IMT chair in consultation with the IMT. Advice on which format to use is included in *MPHI.* The format will be one of:

- SBAR (Situation, Background, Assessment, Recommendations) report (*MPHI* Annex J)
- Full IMT report standardised data set (*MPHI* Annex L)
- Full narrative report.

113 The draft report should be produced within three months of the incident stand down.

114 The IMT should agree the report, and where consensus is not reached, any disagreements should be noted in the report.

115 Considering the incident investigation, debrief and draft report, the IMT should develop targeted recommendations with timescales. The Board, via the IMT Chair or DPH, will ensure there is a response from the organisation(s) responsible for implementing a recommendation, and where necessary an action plan developed. Further guidance on follow up of recommendations, including reporting to Scottish Government, are included in *MPHI.*

116 The incident report may need to be restricted in circulation/delayed if there is ongoing enforcement/legal action.

117 Consideration should also be given to submitting a report for peer reviewed publication if there is learning relevant to a broader audience. PHPU can provide guidance on reporting.

C. Supporting information

118 This part summarises some of the key points around supporting information, but does not replace the detailed content of national documentation and these documents should be referred to for full detail.

Roles and responsibilities

119 Roles and responsibilities are detailed in *MPHI*. Key organisational responsibilities for are summarised below. Responsibilities of individual core IMT members from these organisations are included in appendix 1

NHS GGC

120 NHS boards have statutory responsibilities under the National Health Service (Scotland) Act 1978 and the Public Health etc (Scotland) Act (2008). As the lead agency for protecting health, the Board is responsible for the overall integrity of the arrangements for planning for public health incidents and for the effectiveness of the incident response, including leading the response and the related IMT.

121 Within NHS GGC this responsibility is provided by PHPU on behalf of the DPH. PHPU includes CPHMs, Health Protection Nurse Specialists, Programme Managers and administrative staff who can all be called on to support incident response.

Local authority

122 Environmental Health Officers constitute the prime LA resource in health protection. They also have the principal local responsibility for reducing the risks from many environmental hazards.

123 Advice will be taken from a senior EHO of the appropriate local authority, or authorities. Support from EHOs might include assistance with interviewing cases of illness using the standard or disease-specific questionnaire agreed with the PHPU; investigating food hygiene practices and taking samples from food premises; advising on and enforcing public health legislation including the Food Safety Act, etc.

124 The active participation of an EHO is considered a critical component of any IMT, which should not be allowed to make crucial decisions without such local authority representation.

125 In addition, it is important to ensure that at least one EHO representative is invited from each local authority affected by the outbreak.

Governance

126 Within each organisation there should be a senior responsible officer for incident/outbreak management. In NHS GGC that role is fulfilled by the DPH.

127 In NHS led incidents the IMT chair is operating on delegated authority from the DPH on behalf of the Chief Executive and the Board.

128 It should be remembered that the IMT is and of itself a governance mechanism, and can be supported in this by NHS Board and partner agencies senior officers, and the Board's clinical governance team. should be If it is failing in that role then IMT performance should be reviewed

129 Related processes are also included under Decision making, Reporting, and Performance management.

Reporting

130 Agency/department representatives are responsible for ensuring their senior managers are updated as appropriate.

131 The Chair of the IMT has responsibility for ensuring Scottish Government is informed of outbreaks and incidents. Whilst in practice this is on occasion done by HPS on behalf of the IMT, the responsibility of reporting to government remains with the Board.

132 For healthcare incidents, the agreed national reporting mechanisms should be used.

133 The IMT chair will give consideration to using a formal 'executive update' reporting template in incidents that are likely to be long running/more complex.(Appendix 7)

134 Outbreak/incident reports will be tabled at the Board Clinical Governance Forum, and other committees as required to ensure recommendations are followed up and lessons learned.

Documentation

135 In common with all territorial health boards, NHSGGC PHPU uses the HPZone case management system.

136 Minutes, action logs and reports from the IMT will all be collated and retained by PHPU.

137 All agencies should be aware of, and follow, their policies on document retention, giving due consideration to possible future legal/enforcement action.

138 In general IMT documents should be considered as confidential, and dependent on circumstances, some may require to have protective marking. IMT documents may be subject to freedom of information requests. Advice should be sought from Board FOI/Information Governance teams as necessary.

Training

139 Every three years a full exercise involving a broad range of partners/larger cohorts of staff will be held.

140 Signatories to the plan commit to ensuring those responsible for outbreak/incident response have sufficient opportunity to keep up-to-date

141 Training will be provided to those who may be expected to chair an IMT, and other senior officers as appropriate.

Special circumstances

Hospital outbreaks

142 Outbreaks in healthcare settings, most notably hospitals have additional complicating features, such as the demographics, underlying health/vulnerability of the population, semi-closed setting, and additional challenges in implementing control measures.

143 These outbreaks are normally led by an infection control doctor or other consultant microbiologist. Consideration will be given to the IMT being chaired by PHPU if there is one or more of: wider community involvement; involvement of external (non-NHS) agencies; conflict of interest.

144 Detailed procedures are included in NIPCM chapter 3 and the NHS GGC IPCT outbreak SOP.

145 Environmental health officers do not normally attend IMTs for incidents limited to the hospital setting. EHO representation should be considered if there is community interest (such as community cases or potentially implicated food businesses), if the incident is thought to be foodborne, or if the incident is an outbreak of an organism where community follow up would usually be carried out by the EHO.

146 Any issues with incident management, or requests for PHPU support beyond "business as usual", will be resolved through discussion between DPH and HAI executive lead.

High-consequence infections

147 HCID include diseases such as viral haemorrhagic fevers, MERS and other high risk emerging pathogens.

148 These cases require special management, and close working between PHPU, infectious diseases, infection control and HPS. For confirmed cases of HCID, it is likely that HPS will take over chairing of the IMT.

Major incidents

149 All organisations should have their own plans for major incidents and mutual aid. Activation of resilience partnership structures are likely in these circumstances.

Water incidents

150 Where there is a potential or significant impact on the public water supply that may / will impact public health the multi-agency Scottish Waterborne Hazard Plan (SWHP) held by Scottish Water will be invoked. Where any potential / actual impacts

are restricted to the NHS GG Board's area any Problem Assessment Group (PAG) and subsequent Waterborne Hazard – Incident Management Team (WH-IMT) set up will be chaired by a CPHM from NHS GGC. Where any potential / actual impacts are spread over a number of NHS Board areas a CPHM from NHS Greater Glasgow will represent NHS GG on any PAG and WH-IMT formed with the CPHM who will chair these allocated as detailed in the SWHP.

151 Similar way for significant pollution events that originate from and / or impact Scottish Water assets the multi-agency Pollution Incident – Risk Management Guidance (PI-RMG) will be used. Under the PI-RMG the Chair of the Risk Management team being held by the Lead CPHM where there are significant potential or actual public health risks, or the Lead EHO when environmental risk predominate.

Animal incidents

152 Incidents involving animals or zoonotic infections must include involvement of APHA. As well as providing support and advice, APHA have statutory responsibilities for notifiable animal infections.

Performance assessment

153 The DPH will oversee an assessment of the IMT performance. The aim is to demonstrate the use of essential good practice and structure processes employed in controlling the outbreak. It may be appropriate to ask external assessors to undertake this work to ensure transparency and answer concerns that may arise about conflict of interest.

154 The key indicators for incident management are detailed in *MPHI*:

- A state of preparedness;
- Clarity of purpose and integrated working;
- An early and effective response;
- Effective communication with the public and among agencies;
- Learning from experience; and
- A prepared workforce.

155 Should any member of the IMT be unhappy with the way the team is functioning, they are encouraged to raise this with the group or with the chairman in private. If their concerns cannot be resolved satisfactorily they are free to raise them with their senior manager who in turn can raise it with the chief executive of their agency. That chief executive has the option of raising it with the chief executive of the NHS Board leading the investigation who will ultimately bring it to the attention of the chair via their DPH, involving the relevant counterparts of any other agency involved in the dispute. The lead officer for the NHS Board is responsible for resolving these issues, preferably within the framework of the multi-agency IMT.

156 Suggested standards for audit of IMT performance are included in Appendix xx. These are a combination of audit standards collated from *MPHI* with additional items from the PHE operational guidance. It should be noted these are newly included in this plan.

Appendices

Appendix 1 - Incident response tiers

0	**Initial identification of potential incident** - significance in public health terms not clear	NHS board led Problem Assessment Group (PAG)	Local HP team and LA staff	Consider HPS Consider SGHSCD HIIAT in HAI	Consider hot debrief template if any significant learning identified
1	**Limited local impact** - no significant risks to public health beyond the immediate group/setting affected in a single NHS board area	NHS board led IMT	Local NHS Board and LA staff as required. Support from HPS and other agencies as required	HPS Consider HPS Alert DPH and senior managers in NHS board and LA as appropriate HIIAT in HAI SGHSCD Consider briefing LRP if appropriate	Hot debrief template SBAR to HPS and NHS board/LA

2	**Significant local impact** - significant risk to public health beyond group/ setting affected mainly in single NHS board area	NHS board led IMT with links to other NHS boards as required Consider need for Resilience Partnership co-ordinated response if wider consequences	Local HP team and LA staff Consider need for corporate response and/ or mutual aid Support from HPS and other agencies as required.	HPS Consider HPS Alert HIIAT in HAI DPH/senior managers in NHS/LA; SGHSCD according to protocol; Consider briefing RRP/ LRP partners & elected members	Hot debrief template SBAR or full incident report for NHS board/ LA and HPS
3	**Significant wider impact** - significant risk to wider public health affecting more than one NHS board	NHS board or HPS-led IMT with input from affected NHS boards as required Consider need for RP co-ordinated response if wider consequences	Local HP Team and LA staff Support from other agencies as required Consider need for corporate response and/ or mutual aid C Consider need to activate Business Continuity Plan (BCP) or Major Incident Plan (MIP)	HPS Alert HIIAT in HAI Consider UK / EWRS / IHR alert DPH/senior managers in NHS/LA; SGHSCD Consider briefing RRP/ LRP partners and elected members	Hot debrief template Full incident report for NHS board/LA and HPS

4	**Severe local or wider impact** - major ongoing risk to wider public health affecting one or more than one NHS board with significant disruption of services	NHS board led Civil Contingencies response RP if impact in one NHS board area. or SG led RP response if more than one NHS board area is involved	All available public health resources in the NHS board(s) and LA staff deployed. Request mutual aid Consider HPS Activate BCP and/or MIP	HPS Alert UK / EWRS / IHR alert as appropriate DPH/senior managers in NHS/LA SGHSCD RRP/LRP partners and elected members	Hot debrief template Full Incident report for NHS board/LA and HPS
5	**Catastrophic impact** - major ongoing impact on public health with major disruption of normal societal functions	SG led RP	All available public health resources in the NHS board(s) and LA staff deployed MIP activated	HPS Alert UK / EWRS / IHR alert as appropriate DPH/senior managers in NHS/LA; RRP/ LRP partners; SGHSCD elected members	Hot debrief template Full Incident report for NHS board/ LA and HPS

Appendix 2 - IMT template Terms of Reference

Incident Management Team for [INCIDENT]

The lead agency and Chair of the IMT will be agreed at the first meeting

The membership of the IMT will be agreed at the first meeting and regularly reviewed

The purpose of the IMT is to provide resource, framework and response for the investigation and management of the above named incident, with the aim of meeting its remit as described in the NHS GGC Outbreak and Incident Plan.

It will do so by the following actions:

- ensure that systems are in place to collect and collate all relevant information and verify, review and interpret its significance;
- carry out a risk assessment and decide on courses of action necessary to protect the health of the public;
- co-ordinate the investigation and management of the incident within the protocols and codes of practice of the agencies involved and having regard to extant legislation;
- liaise with HPS, SGHSCD and other relevant agencies to share information, draw on their expertise and ensure the agencies implement the actions that they are responsible for.
- co-ordinate the issuing of advice and information to the public directly and through the media, liaising as necessary with the SGHSCD communications team;
- ensure arrangements for the care of patients are in hand, and keep all relevant clinical professionals updated;
- agree criteria for standing the IMT down and declaring the end of the incident; and
- produce a full IMT report or SBAR for the NHS board Clinical Governance Committee normally within three to six months of the debrief. The report should be shared with SHPN if appropriate to ensure lessons identified are captured and shared

Appendix 3 Core IMT roles and responsibilities

CPHM

(a) On behalf of the NHS Greater Glasgow and Clyde to take the lead in managing community outbreaks of infection including implementing this plan. To ensure that an appropriately qualified professional is able to take the lead in managing hospital-based outbreaks of infection including implementing this Plan in conjunction with hospital OCPs. To take the lead in hospital-based outbreaks if required inline with agreed protocols.
(b) After appropriate consultation to determine whether an outbreak/incident has occurred and the incident tier
(c) To inform the relevant agencies, NHS hospitals and general practitioners when an outbreak has occurred.
(d) To convene and chair the IMT inviting additional members as necessary and to report all relevant information to the IMT.
(e) To ensure appropriate epidemiological, microbiological and environmental investigations are carried out.
(f) To ensure that control measures are agreed and implemented.
(g) To ensure that the necessary communications and consultations occur, including liaison with General Practitioners and all aspects of public relations.
(h) To monitor progress.
(i) To allocate resources to enable the efficient control of the outbreak/incident and report on this to the IMT.
(j) To decide when the incident is over (after consultation).
(k) To ensure a final report is written, circulated and submitted to the appropriate agencies/individuals.

LOCAL AUTHORITY ENVIRONMENTAL HEALTH OFFICER OR NOMINATED OFFICER

(a) On behalf of the Local Authority to take the lead in managing community outbreaks of infection including implementing this plan.
(b) To allocate resources to enable the efficient control of the outbreak and report on this to the IMT.
(c) To report all relevant information to the IMT.
(d) To ensure that the following are undertaken in line with this plan and Departmental procedures (after appropriate consultation):

- premises relevant to the outbreak are inspected;
- necessary samples and swabs etc are taken and submitted in the appropriate manner;
- appropriate epidemiological and environmental investigations are conducted (together with the CPHM);
- at risk persons receive adequate and suitable advice;

- contaminated or potentially contaminated material(s) are disposed of or rendered safe;
- appropriate pest control measures are enacted;
- there is effective liaison with EHOs in adjacent authorities as necessary;
- appropriate Elected Representatives are kept informed;

(e) To consider the evidence collated by LA officers and consider legal proceedings where necessary.

CONSULTANT MICROBIOLOGIST

(a) To ensure appropriate early response by laboratory staff to suspected outbreaks and provide information and assistance at the request of the CPHM.
(b) To act as a core member of the IMT
(c) To advise on appropriate clinical, food and environmental specimens, including sampling, transportation and storage, in consultation with the microbiologist at Glasgow Scientific Services
(d) To perform, or arrange for, relevant microbiological investigations on samples
(e) To liaise with the relevant reference laboratory and arrange for further identification, typing and characterisation of isolates
(f) To advise on further sampling in the light of initial results
(g)To report and interpret results of microbiological analyses to the IMT
(h)To advise on further samples, clinical treatment and/or antibiotic prophylaxis of affected patients and contacts
(i)To make contact with and seek specialist microbiological advice, if required, from a centre of expertise (depending upon organism)
(j)To communicate with the relevant Medical Director(s), other NHSGGC Infection Prevention and Control Teams and Divisional Director, in particular about hospital implications
(k)To provide epidemiological information from laboratory computer systems
(l) To advise on risk to public, in consultation with CPHM
(m)To activate hospital outbreak SOP if anticipated large numbers of patients requiring tests, treatment or hospitalisation or if outbreak is thought to be of hospital origin

Appendix 4 - PAG agenda template

Agenda - Problem Assessment Group

[LOCATION]

on

[DATE] [TIME]

1. Introduction & Confidentiality
2. Minutes of the last meeting
3. General Statement of Situation
4. Clinical Reports
5. Investigations
   - Microbiology
   - Environmental
   - Epidemiology
6. Risk Assessment
7. Risk Management (including further investigation and control measures)
8. Communications
9. Summary of Actions
10. Date of Next Meeting (if applicable)

Appendix 5- IMT agenda template

Agenda -Incident Management Team

[INCIDENT]

[location]

on

[date]

1. Introduction (Reminder of confidentiality and need for accurate records)
    a. **[first meeting only – Agree Chair and terms of reference]**
2. Declarations of interests
3. Items not on the agenda
4. Minute of last meeting including review of actions agreed **[if applicable]**
5. Incident/Outbreak Update:
    a. General situation statement;
    b. Patient report;
    c. Epidemiology
    d. Microbiology/Toxicology;
    e. Environmental Health;
    f. Other relevant reports.
6. Case definitions
7. Risk Assessment:
8. Risk Management/Control Measures:
    a. Patients;
    b. Public Health;
    c. General;
9. Care of Patients - Hospital and Community

10. Further Investigation:
    a. Epidemiological;
    b. Environmental;
    c. Microbiological / Toxicological.
11. Risk Communication:
    a. Agree common data set;
    b. Patients
    c. Professionals
    d. Public
    e. Media
    f. Executive management/Elected members;
    g. Inform other authorities e.g. Procurator Fiscal.
12. Review (standing agenda items):
    a. Appropriate membership;
    b. Resourcing;
    c. Framework (incident management structure);
    d. Obtain contact details of all key personnel within and outwith hours;
    e. Assess effectiveness of action;
    f. Other management groups formed or required;
13. AOCB
14. Action list with timescale and allocated responsibility
15. Date and time of next meeting
16. [**Future activity - final meeting only - collation of documentation, reporting, possibility of future inquiries]**

Appendix 6 - Possible IMT members

NB. This is a non-exhaustive list

- NHS GGC Public Health Protection Unit (CPHM, HPNS, Admin)
- Local authority Environmental Health Officer
- Microbiologist/virologist
- Communications officer
- Health Protection Scotland
- Clinical teams responsible for care of cases
- Infection Prevention and Control team
- Other clinical staff as appropriate to expertise required
- NHS Board and/or Hospital General Management
- Relevant Reference Laboratory
- West of Scotland Specialist Virology Centre
- Glasgow Scientific Services
- Health and Social Care Partnership
- Other Local Authority departments, for example Education
- Other NHS Boards and Local Authorities in incidents which cross boundaries
- Public Health England
- Scottish Environment Protection Agency (SEPA)
- Food Standards Scotland
- The Care Inspectorate
- Healthcare Improvement Scotland
- Scottish Water
- Animal and Plant Health Agency
- Scotland's Rural College (SRUC) Veterinary Services
- Drinking Water Quality Regulator
- Police Scotland (if the outbreak is deemed to be the result of a criminal act, a deliberate release of a CBRN agent, or a need to control public disorder or protect assests, etc.)
- Other 'blue light' agencies
- Others, as dictated by the outbreak/incident

Appendix 7 - SitRep template

[Incident title] [Update no #]

Date and time:
Author:
IMT Chair:

Introduction and incident background

This update was produced using data available at [date and time]

[Background to incident, including response tier, case definitions, completed investigations and risk assessment]

Common data set

[Key information agreed by IMT– no. Of cases/contacts/hospitalisations/deaths/recoveries etc]

Objectives

[Current principle objectives of the IMT]

Agencies/departments:

Participating in IMT
Receiving updates

Summary of control measures

Summary of ongoing investigations

Operational Issues

Forward look (including de-escalation plan)

Communications

Requests for additional support (including legal issues)

Appendix 8 - Audit standards

1	The NHS board has undertaken a risk assessment following receipt of initial information.
2	The NHS Board has recorded whether there is a significant risk to public health; • scale of problem; • severity of problem; • possible cause of incident/outbreak; • initial actions to be taken and why.
3	Decisions on whether the situation should be declared an incident/outbreak, and whether an IMT should be called recorded.
4	All agencies/disciplines involved in investigation and control represented at IMT meeting
5	Roles and responsibilities of IMT members agreed and recorded
6	Lead organisation with accountability for incident management agreed and recorded
7	Case definition agreed and recorded
8	Descriptive epidemiology undertaken and reviewed at IMT. To include: number of cases in line with case definition; epidemic curve; description of key characteristics including gender, geographic spread, pertinent risk factors; severity; hypothesis generated
9	Decisions on microbiological and environmental investigations agreed by IMT and recorded
10	Analytical study considered and rationale for decision recorded
11	The IMT has kept records of decisions made about incident control measures and documented: whether these measures have been applied; and • if not, the reason why; • if yes, by whom, when and where they have been carried out; • any further action arising from above.
12	The IMT has reviewed the impact of control measures at each IMT meeting and documented its view on this.
13	The IMT has reviewed the risk to public health arising from the incident and the likely overall impact of control measures on it
14	Communications strategy agreed at first IMT meeting and reviewed throughout the investigation.
15	The IMT has agreed a single press spokesperson and press officer who have regularly reported to the IMT on the tone and content of communications and responses to them.
16	The IMT Chair has ensured that there is a check maintained on the above aspects of incident management and that this is recorded in the IMT minutes.
17	The IMT Chair has regularly reported on the incident to relevant senior management of the LA and NHS board.
18	The IMT has agreed criteria for stepping down the IMT, and recorded when these criteria have been met
19	The IMT Chair has conducted a debrief immediately at the conclusion of the response phase. (within 2 weeks of step down)
20	The IMT Chair has arranged for a report, in the format agreed in consultation with the IMT, and submitted the report to the relevant NHS board committee (within 3 months of step down)
21	The IMT Chair has forwarded the report to relevant organisations with responsibility for taking forward its recommendations and has agreed with the DPH means of ensuring recommendations are followed up.

Queen Elizabeth University Hospital Review

Review Report

June 2020
A50125560

Contents

Executive Summary

When the Cabinet Secretary for Health and Sport asked us to co-chair an independent review of infection control concerns at the Queen Elizabeth University Hospital and Royal Hospital for Children we were pleased to accept. We were keen to lead a process in which the agreed emphasis was to be on delivering a clinically-focused, forward-looking report that sought both to understand the origins of the situation in Glasgow but more importantly to assess the current state of the hospitals and identify learning applicable to future capital projects.

The decision to establish the Review had been prompted by public and political concern following reports of the deaths of three patients between December 2018 and February 2019. The deaths had been linked to rare microorganisms and concern was growing that these organisms were in turn linked to the built environment at the Queen Elizabeth University Hospital (QEUH) and Royal Hospital for Children (RHC). At the time the Review was established there was already considerable external and internal scrutiny of the new hospitals in Glasgow. Several investigations had produced findings and others were expected to do so during the course of the Review. As a consequence, when agreeing its terms of reference and remit the Review was keen to ensure its activities were complementary to those underway, adding value and knowledge.

The Review's remit and terms of reference are reproduced in full in Chapter 1.

The remit is:

"To establish whether the design, build, commissioning and maintenance of the Queen Elizabeth University Hospital and Royal Hospital for Children has had an adverse impact on the risk of Healthcare Associated Infection and whether there is wider learning for NHSScotland".

In undertaking its business the Review faced a number of challenges, which are detailed in the report (Chapter 1). Of particular note was the way that further issues arose during the course of the Review leading to a greater sphere of concern for the Review but also additional scrutiny from other sources, including Government, statutory bodies, national agencies and a public inquiry. While there was significant overlap between the various agencies and their processes, each had a distinct perspective. This led us to establish dialogue with the other agencies involved and to regularly reappraise the work of the Review to ensure it remained focused on our core remit and responded within a meaningful timescale. Other external influences, such as COVID-19, though not directly related to the matters under scrutiny at QEUH, undoubtedly influenced the Review and how it was able to conduct its business during its latter stages.

In the course of the Review we received information from and met with key individuals, reviewed reports from a number of sources and sought expert advice in relation to construction and infection prevention and control (IP&C). We have been generally impressed by the professionalism of the individuals, clinical teams, management and estates staff we encountered.

The duration of the time period we have been looking at inevitably means that there have been many changes of key personnel and post holders within NHS Greater Glasgow & Clyde (NHS GG&C). We have endeavoured to meet with relevant people involved throughout the various stages of the project and this includes people no longer in post.

We have been impressed with the resilience of clinical staff, hospital management, patients and families in their focus on effective and high quality care, recognising the opportunities and advantages of modern hospital facilities, whilst acknowledging the significant setbacks that are the focus of this Review.

We found a complex story with a variety of perspectives and views. Undoubtedly and with hindsight the Health Board, groups within it, and the Design and Build Contractor could have reached different decisions and produced results that would have reduced infection risk. We have tried to concentrate on learning from the experience in a way that will avoid repetition of mistakes and enhance future projects.

While the issues we have identified in relation to construction apply to the entirety of the new QEUH/RHC building the clinical impact and risks to patient safety we identify are confined to those clinical specialties caring for and treating a defined group of patients at high risk. Patients, staff and visitors who are vulnerable due to immuno-suppression, or who are in proximity to patients with certain highly infectious communicable diseases, have been exposed to risk that could have been lower if the correct design, build and commissioning had taken place. Since the building's opening, and particularly since 2018, measures are in place, or under development, to bring about a sustained reduction in these risks.

The series of problems and influences that we have identified through the phases of the QEUH project has also resulted in a multitude of secondary effects. These include: eroding the confidence of the public in the hospital's ability to protect them adequately from healthcare hazards; disrupting treatment for defined groups of patients and creating additional concern for their families; providing additional workload for IP&C teams, many clinical groups and management; diverting resources and attention from the running of this large and complex facility; and undermining the reputation of the hospital.

We have two main high level findings and nine principal findings which relate directly to the specific issues examined by the Review in responding to its remit.

Our main findings are:

- In the course of the Review, through examination of documentation, listening to witnesses, discussion with experts and input from the Review's expert advisers, and site visits, we have not established a sound evidential basis for asserting that avoidable deaths have resulted from failures in the design, build, commissioning or maintenance of the QEUH and RHC;

- The QEUH and RHC combined now have in place the modern safety features and systems that we would expect of a hospital of this type. The general population of patients, staff and visitors can have confidence that the QEUH and RHC offers a setting for high quality healthcare.

As the Review progressed the emergent findings caused us to focus on defined groups of potentially vulnerable patients and their families, and the clinical teams, management and facilities staff who support their care. We judge that the hospital was not built, finished and handed over in a manner that took full account of their specific needs. Certain aspects of the design, build, commissioning and maintenance of the QEUH have posed challenges in creating the optimal conditions for IP&C and have increased the risk of Healthcare Associated Infection;

1. NHS GG&C has put in place, and is still working on, improvements to the wards where these vulnerable patients are managed. A series of remedies which minimise the additional risk to tolerable levels have been or are being implemented;

2. The QEUH project would have benefitted from greater external expertise and greater uptake of internally available expertise to support decision making on the water and air ventilation systems at key points in the design, build and commissioning phases;

3. The design of the hospital did not effectively reconcile conflicting aims of energy efficiency and meeting guidance standards for air quality;

4. Some of the difficulties encountered with water and ventilation systems were the result of ambiguity concerning the status and interpretation of guidance;

5. The level of independent scrutiny and assurance throughout the design, build and commissioning phases was not sufficient;

6. Governance of the project during design, build, commissioning and maintenance did not adequately take account of the scale and complexity, and specialist nature of the building project;

7. The effectiveness of IP&C advice was undermined by problems within the NHS GG&C IP&C leadership team and internal relationships with the wider IP&C and microbiology cohorts;

8. There were deficiencies in the quality and availability of management and technical information relating to the QEUH project, especially relating to the build and commissioning stages. This constrained the Review and continues to hamper effective running of the QEUH/RHC building;

9. Communication about QEUH and its problems since opening has been variable ranging from appropriate and effective in relation to clinical communication with patients and families, to inadequate and reactive in relation to external communication about serious problems with the building and possible links to infectious disease events.

More detailed findings are contained throughout the body of the report.

The Report makes 63 recommendations. They cover matters that we address to:

- NHS Greater Glasgow and Clyde, its Board and headquarters staff
- The QEUH and RHC, its staff and the population it serves
- Scottish Government, NHS Scotland, its Boards and specialist agencies, policy makers, Estates and Facilities, Infection Prevention and Control communities
- The new National Centre for Reducing Risk in the Healthcare Built Environment, and networks, collaborating organisations, learning and research institutions that it will bring together, including producers of technical guidance
- Professional and standard setting organisations in clinical, construction and engineering disciplines
- Construction companies and the wider industry, the disciplines and stakeholders in that sector

We also highlight three specific areas for research needed to enhance future capital projects (Chapter 9):

- Air quality in clinical environments;
- Water quality in clinical environments;
- Rare microorganisms and their clinical significance.

The findings and recommendations are collated in Chapter 10.

We welcome plans for the National Centre for Reducing Risk in the Healthcare Built Environment that will focus on Health Hazards and the Built Environment to provide greater focus and concentration of knowledge and expertise to ensure that lessons learned are rolled out and that there is greater confidence in the delivery of future capital projects. We offer further detailed comments and suggestions in Chapters 8 and 9.

While establishing the infrastructure to support the QEUH Project NHS GG&C complied with available guidance. This included setting up arrangements for expert input and governance. The problems identified by this Review and other scrutiny processes however, call into question the suitability and adequacy of the guidance available at the time. The creation of the National Centre for Reducing Risk in the Healthcare Built Environment and its involvement in future capital projects should help to minimise or avoid similar challenge.

There were issues that arose in the course of the Review such as whistleblowing and duty of candour that were not part of the remit or terms of reference but which nonetheless had an impact on events and we also offer comment on those.

We believe this report provides an understanding of events during the design, build commissioning and maintenance of the QEUH and highlights the issues in relation to IP&C that have emerged and caused concern since the hospital opened. The circumstances that led to the difficulties are now clearer and lessons can be learned that will enhance confidence in future major capital projects. We also believe that this report complements the work of other agencies including the Oversight Board and its subgroups and provides useful pointers for the forthcoming public inquiry to be chaired by the Right Hon. Lord Brodie.

The experiences we have described, and that NHS GG&C has been through with staff and patients, bear many lessons. Some of the problems that they have encountered are rare if not unique but they can, nonetheless, help others in the future. We have described some lessons from an IP&C, construction and clinical perspective. The leadership of many facets of this project, and more recent incidents, should share their learning freely outside their own area and normal local networks.

Finally, NHS GG&C's experience and practice can help others who are planning hospitals, caring for vulnerable patients, encountering unusual infections, questioning the role of the built environment in creating and preventing health hazards, and evaluating policy with the potential for unintended consequences.

We thank our outstanding team and advisers who have worked hard to organise the review, inform our work, and prepare this report.

[redacted] [redacted]

Co-chairs
June 2020

Glossary of Medical and Technical Terms

A

Acute Services Review (ASR)	A review of generic medical and surgical treatments provided in hospital and hospital configuration carried out by Greater Glasgow Health Board, the precursor to NHS GG&C in 1999/2000.

B

Biofilm	A collection of different types of microorganisms and extracellular matrix of microbial origin which adheres to surfaces. Biofilm can be found in water systems.
BREEAM	Building Research Establishment Environmental Assessment Method. A sustainability assessment methodology for master planning projects, infrastructure and buildings. It recognises and reflects the value in higher performing assets across the built environment lifecycle, from new construction to in-use and refurbishment.
Brookfield Multiplex	A global construction company responsible for the construction of the Queen Elizabeth University Hospital.
Building Services Research and Information Association (BSRIA)	The non-profit distributing, member-based association which promotes knowledge and providing specialist services for construction and building services stakeholders.

C

CAPEX	Capital Expenditure.
Capita Symonds Ltd.	The former name of Capital Property and Infrastructure Limited, which specialised in real estate and Infrastructure work across the public and private sector to design, build and optimise their real estate and infrastructure assets. Capita Symonds were the NEC Supervisor for the Queen Elizabeth University Hospital Project.
Chartered Institute of Building Services Engineers (CIBSE)	CIBSE is the professional body that exists to support the science, art and practice of building services engineering, by providing members and the public with information and education services.

Chilled beam	A type of radiation/convection heating, ventilation, and air conditioning system designed to heat and cool large buildings.
Crown Office and Procurator Fiscal Service (COPFS)	The organisation responsible for the prosecution of crime in Scotland whose responsibilities include the investigation of sudden or suspicious deaths.
Cryptococcus	A fungus widely found in the environment. The species '*C. neoformans*' is the major human pathogen, most commonly affecting patients with compromised immunity.
Cupriavidus	An environmental gram negative bacterium which can be associated with infection in immunocompromised patients.
Currie & Brown	Currie & Brown were the Lead Consultant for Queen Elizabeth University Hospital project.
D	
Dead legs	A length of waterworks pipe leading to an outlet which has been removed or is rarely used or unused entirely. Water in the pipe can be stagnant, leading to a build-up of potentially dangerous pathogens.
E	
Enterobacter	Gram negative bacterium found in the human gut. Several strains of these bacteria are pathogenic and cause opportunistic infections in immunocompromised patients.
F	
Full Business Case (FBC)	A Full Business Case (FBC) refines the Outline Business Case (OBC) and any analysis and assumptions made in this, as well as presenting the findings of any formal procurement or partner selection process. The Full Business case contains documented contractual and arrangements as well as the detailed management arrangements for a successful delivery of a project.

G

Greater Glasgow and Clyde Health Board (NHS GG&C)	The body responsible for the delivery of healthcare services in the Greater Glasgow and Clyde region. 'GG&C Board's project team', is also referred to as the 'project team' within this report.

H

Haemato-oncology (Haem/Onc)	The medical sub-specialty concerned with the diagnosis, treatment and prevention of malignant diseases of the blood such as leukaemia and lymphoma.
HAI	Healthcare Associated Infection
Health Facilities Scotland (HFS)	Provides operational guidance to NHSScotland bodies on a range of healthcare facilities topics.
Health Protection Scotland (HPS)	The organisation that co-ordinates health protection in Scotland and was part of NHS National Services Scotland. Since April 2020, part of Public Health Scotland.
HIIAT	Healthcare Infection Incident Assessment Tool (HIIAT) – initial assessment reporting tool, within the Scottish National Infection Prevention and Control Manual, to gather epidemiological data and clinical assessment information on the patient's condition.
HIIORT	Healthcare Infection Incident and Outbreak Reporting Template (HIIORT) – more detailed assessment and reporting of an incident within the Scottish National Infection Prevention and Control Manual.

I

Immunocompromised	A person who is incapable of developing a normal immune response, usually as a result of disease, malnutrition, or immunosuppressive therapy.
Infection Prevention & Control (IP&C)	The clinical discipline and collection of interventions aimed at preventing healthcare associated infections.
Intensive Care Unit (ICU)	Specialist hospital wards, staffed by specialists, that provide treatment and monitoring for people who are very ill. Hospital units providing care to seriously ill people often requiring ventilation or other organ support.

J	(No entries)
K	(No entries)
L	
Legionella	A genus of gram negative bacteria that includes the species *Legionella pneumophila*, the cause of Legionnaires' disease. Legionella is common in many environments, including soil and aquatic systems. Outbreaks of Legionnaires' disease are often associated with poorly maintained water or cooling systems.
M	
Medical Microbiology	The clinical and laboratory discipline that diagnoses, treats and prevents infections.
Microbes / microbial	Organisms that are too small to be seen by the naked eye and are found everywhere. They can live in water, soil, or in the air. The human body is home to millions of these microbes, also called microorganisms. Some microbes can cause sickness, while others are critical for our health.
MRSA	Methicillin Resistant *Staphylococcus aureus.* See *Staphylococcus aureus*
Mucor	A type of mould/fungus found in things like soil, digestive systems, plant surfaces, and some cheeses. Most species of Mucor are unable to infect humans due to intolerance of body temperatures.
N	
Neutropenic	The adjective of Neutropenia. This is a blood condition characterised by low levels of neutrophils, which are white blood cells that protect the body from infections. Without enough neutrophils, the body can't fight off bacteria. Having neutropenia increases the risk of all types of infection.
O	
Oncology	The study and treatment of tumours.
P	
Pascal	A derived unit of pressure.

Positive Pressure Ventilated Lobby (PPVL)	The design of patient room whereby the lobby to the room is at positive pressure to both the external corridor and the patient's room, creating a curtain of air that prevents movement of airborne infectious organisms both into and out of the patient's room.
Private Finance Initiative (PFI)	A procurement method which uses private sector investment in order to deliver public sector infrastructure and/or services according to a specification defined by the public sector.
Public–Private Partnership (PPP)	This is a cooperative arrangement between government and business to work together to complete a project and/or to provide services to the population.
Pseudomonas	A type of bacteria belonging to the family Pseudomonadaceae which contains 191 species. It has widespread occurrence in the natural environment.
Pseudomonas aeruginosa	A type of bacteria known for its role as an opportunistic human pathogen, particularly in hospital environments.
Q	(No entries)
R	(No entries)
S	
SBAR	Situation Background Assessment Recommendation. A structured reporting tool often used to describe clinical situations.
Staphylococcus aureus	A type of bacteria from the family staphylococcus. This includes at least 40 species. Most are harmless and reside normally on the skin and mucous membranes of humans and other organisms. Some are associated with disease in humans and certain species are resistant to certain antibiotics e.g. Methicillin Resistant *Staphylococcus aureus* (MRSA).
Stenotrophomonas	An uncommon bacteria, which can result in a difficult-to-treat human infection.
T	(No entries)
U	(No entries)
V	(No entries)

W	(No entries)
X	(No entries)
Y	(No entries)
Z	
ZUTEC	Company which provides construction management software and the name of its proprietary digital Operation and Maintenance (O&M) manual for the QEUH and RHC.

Chapter 1

Introduction, Terms of Reference, Remit & Method/Approach

1.1. Introduction

1.1.1. The Queen Elizabeth University Hospital (QEUH) and Royal Hospital for Children (RHC) is a vast and aspirational project. Completed and opened in 2015, it provides modern facilities for specialist health care for people of all ages and an array of conditions. It is a local hospital to much of South Glasgow, a regional specialist hospital for the West of Scotland, and a national hub for treatment and care of specific conditions.

1.1.2. Building the QEUH/RHC complex has been a major achievement. Together with highly specialised care and the capability to adjust to cope with the ever-changing requirements of healthcare, it collaborates with, and hosts, leading teaching and research that Universities are undertaking on the campus. It has achieved a reputation for high quality care and learning in many respects.

1.1.3. We were commissioned to review the hospital in light of a series of adverse events, culminating in the deaths of three patients who had been undergoing treatment in the hospital. These events created concerns over links between the building and its ability to provide an environment that prevents and protects patients from Healthcare Associated Infection (HAI). The hospital has encountered other construction related challenges. While the hospital carries out many of its clinical functions effectively, our focus has been on the built environment and problems related to infection prevention and control (IP&C) and learning from the lessons we find.

The QEUH Independent Review Remit and Terms of Reference

The events that led to this Review arose from mounting public concern about patient safety as well as potential deficiencies in the construction and operation of the new buildings. On 22 January 2019, the Cabinet Secretary for Health and Sport announced in Parliament an Independent Review to “look at the building’s design, the commissioning of the work and the construction, handover and maintenance of the building to identify where issues were raised that should have been addressed and where current maintenance programmes should perhaps be more robust or frequent — or whatever the Review’s recommendation might be”.

On 5 March 2019, Dr Andrew Fraser and Dr Brian Montgomery were appointed to lead the Independent Review and developed a Remit which set out:

“To establish whether the design, build, commissioning and maintenance of the Queen Elizabeth University Hospital and Royal Hospital for Children has had an adverse impact on the risk of Healthcare Associated Infection and whether there is wider learning for NHS Scotland.”

Terms of Reference

On 27 June 2019 it was announced:

"There is public and professional concern that the built environment at the Queen Elizabeth University Hospital and Royal Hospital for Children is compromising best practice in infection prevention and control and increasing the risk of Healthcare Associated Infection.

Dr Andrew Fraser and Dr Brian Montgomery have been appointed by the Cabinet Secretary for Health and Sport to co-Chair an Independent Review ("the Review") to investigate these concerns, make recommendations and highlight learning for NHS Scotland. The Review has specifically been tasked to undertake a clinically-focused approach which examines the built environment with particular reference to the design, build, commissioning and maintenance of QEUH/RHC.

The Review, which is non-statutory, will be conducted according to the principles laid out in Professor Alison Britton's report, "An Investigative Review into the process of establishing, managing and supporting Independent Reviews in Scotland."

Scope of the Review

The Review will examine:

- ✓ The new QEUH and RHC buildings on the greater QEUH campus site;
- ✓ The governance processes in place to oversee the project as it moved through the phases of design, build, commissioning and maintenance with particular regard to issues relating to infection prevention and control;
- ✓ The extent to which decision makers took account of infection prevention and control issues at each phase;
- ✓ The overall design of QEUH/RHC with particular reference to site selection, the safety of water systems, drainage systems and ventilation systems – general and specialised;
- ✓ Whether at all stages of design, build, commissioning and maintenance, the built environment complied with relevant legislation, standards, recommendations and guidance relating to infection prevention and control that applied at that time;
- ✓ If changes to the specification occurred, whether issues relating to infection prevention and control were considered and addressed appropriately;
- ✓ Whether the hospital has been utilised in a way that differs from the original design intentions and whether this has compromised the delivery of optimal conditions for infection prevention and control.

Out of Scope

- ✗ Other buildings on the campus, including the retained estate that predates the QEUH/RHC;
- ✗ The clinical management of individual patients or specific groups of patients;
- ✗ Aspects of the design, build, commissioning and maintenance of QEUH/RHC which do not impact directly on infection prevention and control;
- ✗ Issues relating to the concerns at QEUH/RHC which have already been satisfactorily addressed and implemented, or are going to be addressed by one or more of the concomitant reviews, inspections or inquiries.

1.1.4. NHS Greater Glasgow and Clyde (NHS GG&C) hospitals have been the focus of previous reviews of infection control in the past two decades and in relation to outbreaks of HAI. The NHS GG&C Board, and Scotland in general, has made important strides in responding to lessons learned, policy and practice changes, with the net effect of sustained reduction in HAI incidence. Hospitals are not, and never will be, risk-free environments but patient safety has improved steadily and significantly over time.

1.1.5. In the course of this Review, the COVID-19 pandemic has provided an unexpected backdrop which serves to intensify the profile and importance of the principles of IP&C in the daily lives of the entire population. This applies not just in hospitals but to every community location including business premises, our own homes and - through physical distancing and other control measures - in our daily routines. Prior to this year, IP&C was for most people an intermittent consideration dependent on clinical circumstances and applicable to a restricted number of physical locations. The wider public has come to appreciate its significance.

1.2. Issues Impacting on the Review

1.2.1. This Independent Review was constituted in March 2019 and completed in June 2020. Compared with many reviews of this scope and depth, that is a comparatively short space of time. We consulted on our Terms of Reference and Remit and expanded it slightly in response to representations. We sought to be clear on what we included in our Remit but also on issues which we have not covered.

1.2.2. The Review's Remit included:

- ✓ Only the QEUH and RHC buildings; none of the other buildings on the site, the so-called "retained estate";
- ✓ The environment of a defined set of very ill young people and the location of their care;
- ✓ The effects of the built environment and other matters that focused primarily on Infection Prevention and Control.

1.2.3. The Review's Remit did not include:

- Comparison with other hospitals in Glasgow or elsewhere;
- Assessments of the clinical care of individual patients or the patient group (which are the subject of separate case reviews);
- Policies relating to complaints, personnel, adverse events and whistleblowing. However these issues significantly influenced the subject matter of the Review and we make comments in the context of our information gathering and interviews.

In the course of this work, further events and developments arose which materially impacted the conduct of the Review, including several other concurrent processes, namely:

- An investigation with consultation on Healthcare Hazards of the Built Environment, conducted by the Scottish Parliament Health & Sport Committee. It reported in May 2019;
- The referral of deaths to the Crown Office and Procurator Fiscal Service Fatal Accident Inquiries unit;
- An investigation by the Health and Safety Executive that began in January 2019 and reached a preliminary conclusion in December 2019 but which remains open;
- Three reviews conducted by NHS GG&C into various aspects of the hospital which reported to the Board of NHS GG&C between December 2019 and January 2020;
- A review being compiled by Health Facilities Scotland relating to certain aspects of the building.

During the course of the Review, the following matters also occurred:

- A prolonged incident investigating a cluster of bloodstream infections amongst children, with a further commissioned external study of the infection cluster by Health Protection Scotland, published in November 2019;
- In July 2019, the Cabinet Secretary for Health & Sport commissioned three reports to investigate the events leading to postponement of the opening of the Children & Young People's Hospital and Neurosurgical Unit in Edinburgh;
- In September 2019, the Scottish Government announced in its Programme for Government its intention to consult on, and set up, a New National Centre for Reducing Risk in the Healthcare Built Environment;
- In September 2019, the Scottish Government also announced its intention to set up a Public Inquiry into events surrounding both the QEUH/RHC in Glasgow and the Children & Young People's Hospital and Neurosurgical Unit in Edinburgh;
- In October 2019, Professor Craig White was appointed by the Cabinet Secretary for Health and Sport to review concerns raised by patients and families in relation to infection control, safety and actions at Queen Elizabeth University Hospital and Royal Hospital for Children;
- In November 2019, The Right Honourable Lord Brodie agreed to chair the Public Inquiry;

- Later in November 2019, the Scottish Government placed NHS GG&C in Stage 4 of the NHS Board Performance Escalation Framework (also described as "special measures")[1] for infection prevention and control, communication and engagement with patients and families and governance. Stage 4 brings direct oversight and guidance from Scottish Government to the operation of the Queen Elizabeth University Hospital and Royal Hospital for Children. An Oversight Board was established and under its auspices, the work of Professor White became the Engagement and Communication Sub-Group;
- At its December 2019 Board meeting, NHS GG&C announced that it would instigate civil legal proceedings against several of the hospital's construction contractors and consultants;
- The COVID-19 pandemic hit in March 2020 and has resulted in a number of consequences. First of all, it has impacted directly on the Review team and its capacity. In consequence, some delay in completing the Review was inevitable. Secondly, although some people were indisposed, senior management and clinicians of NHS GG&C as well as officials from Scottish Government, were willing to spend time at (virtual) interview with us as the crisis engulfed them. We thank them all for taking time out of their important work to engage with our Review.

1.2.4. The list of developments cited is not exhaustive; pieces of work that are very relevant to the Review remain incomplete. Several tightly focused NHS GG&C internal reviews continue on specific matters related to the resolution of problems and as yet are unresolved. The Oversight Board will shortly complete its work and report. The case review series will take longer, and we look forward to learning their findings and conclusions.

1.2.5. The Review has benefitted from the views and perspectives of all those who formed part of, and wrote reports on, the list set out above. However, civil legal proceedings have resulted in restricted access to important documents that form the mainstay of the litigation. Following an introductory meeting early in the process, we invited representatives of the design and build contractor for Brookfield Multiplex, to meet the Review co-Chairs for a formal interview but they declined.

1.2.6. The Review has adjusted to these developments, and engaged with individuals and organisations undertaking parallel and sequential work to our own, in order to interpret the Review's role and relevance in the context of those other pieces of work. It soon became clear following the announcement of a Public Inquiry that the Review would have to re-visit its scope to avoid the potential for duplication or unnecessarily prolonging its processes to address a steady flow of new issues and additional information that was coming to light. We therefore determined that our role should be to complete the work programme that we had already established. Our findings would address public concern promptly, allowing lessons to be available for practical application in the short to medium term, and would inform the Public Inquiry about matters that they might wish to address. We trust that our report enables us to meet the original aims of the Review and the terms of our Remit.

[1] www.gov.scot/publications/nhs-scotland-and-integration-authorities-consolidated-financial-reporting-2019-2020/

1.2.7. The Review therefore has navigated through developments which are an inevitable consequence of operating a complex undertaking in a dynamic environment and dealing with a wide-ranging subject which has not concluded and continues to evolve. The Review has encountered unforeseen challenges that have further constrained its work. Whilst undoubtedly there have been events and circumstances which have required the Review to reshape its approach, we believe this has been done in a way which preserves the values and integrity of the Review while delivering the Remit that we agreed with the Cabinet Secretary and with stakeholders.

1.2.8. We hope that the findings and recommendations of this Review report will be a genuine reflection of the matters that we have considered and relied on primarily as a document to provide assurance to the Cabinet Secretary and to address public concern. We further hope that it will be a resource for study and development for the forthcoming Public Inquiry into closely related matters in Glasgow and Edinburgh.

1.2.9. As is clear from the title of the Independent Review, the report's content and outlook is entirely the responsibility of the co-Chairs, and does not necessarily reflect the views of our Advisers or any other party to the Review.

1.3. Our Approach to the Review

"We found the 'Investigative Review' into the process of establishing, managing and supporting Independent Reviews in Scotland, chaired by Professor Alison Britton, to be a useful framework for our work." – **Co-Chairs of QEUH Review**

1.3.1. The QEUH Independent Review is a non-statutory inquiry. It differs in several important ways from other types of inquiry. There is very limited guidance in respect of the conduct of non-statute based inquiries such as this one. We acknowledge that the guiding principle of any public-facing inquiry is investigation to address public concern, but the nature of the subject and style of investigation varies widely. We found the experience of our Head of Review and Deputy Head of Review in the conduct of previous inquiries, as well as Professor Alison Britton's 2018 Report ("the Britton Report"), invaluable. [2]

[2] Professor Alison Britton: Review into the process of establishing, managing and supporting Independent Reviews in Scotland: www.gov.scot/binaries/content/documents/govscot/publications/independent-report/2018/10/investigative-review-process-establishing-managing-supporting-independent-reviews-scotland/documents/00542453-pdf/00542453-pdf/govscot%3Adocument

1.3.2. An Independent Review takes an inquisitorial approach, seeks to establish facts, conclusions, and learn lessons, while ensuring fairness in doing so. Unlike a statutory Public Inquiry, an Independent Review cannot compel witnesses to give evidence; nor is it an adversarial legal process that seeks to find fault, apportion blame or give rise to criminal or civil litigation.

1.3.3. The announcement of a Public Inquiry that will bring both the QEUH and a new Edinburgh hospital into its Remit, and initiation of litigation between NHS GG&C and several contractors altered the nature of the Review's work. It will no longer determine several matters within its scope as first intended given it lacks the legal authority to compel the production of documents and witness testimony.

> "[By contrast], at a public inquiry such as this one the process is inquisitorial, in that it takes the form of an investigation led by the inquiry and not by any of the parties. There are Terms of Reference but no more closely defined allegations or issues which have to be determined. There are no parties entitled as of right to call evidence of their own.
>
> The task of the inquiry is not to determine an allegation or a charge, and its findings are not determinative of civil or criminal liability. It is required to examine events that have occurred and identify lessons which in its opinion can be drawn from those events. It may as a matter of judgement identify criticisms it considers can be made of individuals or organisations arising from those events, but such findings are not binding on those criticised".

Figure 1.1: Robert Francis QC when discussing his approach to the Mid-Staffordshire NHS Foundation Trust Public Inquiry

1.3.4. Whilst we acknowledge that the Review has non-statutory status, we were strongly of the view that we should set standards that reflected those set out for our statutory counterpart. With this in mind, we were attracted by the principles and lessons learned approach endorsed by Robert Francis QC when discussing his approach to the Mid-Staffordshire NHS Foundation Trust Public Inquiry (See Figure 1.1 above).

1.3.5. We also sought to draw on the experience of other Independent Reviews and wider organisations in refining our approach. From the outset of our Review, we agreed that we would follow the framework set out in the Britton Report and strive for transparency in our work.

1.3.6. This section explains our approach to evidence gathering and the standards we sought to achieve.

1.4. QEUH Independent Review "Standard of Proof"

1.4.1. Within a legal context there are two recognised standards of proof: the "balance of probabilities" for civil cases and "beyond a reasonable doubt" for criminal cases.

1.4.2. The conclusions of this Review do not necessarily follow the same prescribed rules of evidence nor satisfy the aforementioned burdens of proof, which are reserved for court proceedings.

1.4.3. In the Mid-Staffordshire Inquiry, Robert Francis QC reflected that his approach drew on others and when challenged on standard of proof, he stated "….the terminology and requirements of the criminal or civil law are largely inapplicable. Thus it seems to us that we can and should reach conclusions without being bound by rules designed for court cases, such as who has the burden of proof and strict rules of evidence….". [3]

1.4.4. We are struck by the relevance of this approach for our Review and it is the one that we have adopted. We have therefore determined that we have a significant degree of flexibility as to the standard of proof that we can apply when considering the evidence that has been gathered during the course of the Review.

1.4.5. We propose that the following principles apply to the Review:

- In the absence of any statutory mandate, it is for the co-Chairs of the Review to decide on the approach to be taken and the standard of proof to be applied to findings, criticisms and recommendations as part of their role in determining the procedure of the Review;
- The context of the task set for the Review is important in deciding what the proper approach to making findings may be;
- The "*flexible and variable*" standard of proof approach[4] allows for appropriate findings to be made with varying degrees of certainty;
- The Review has discretion to express its findings as it sees fit and a person made subject to an adverse finding will be provided a fair opportunity to respond to it.

1.5. Considerations

1.5.1. While the Review concerns events which have caused great distress to many patients and their families, and considerable public concern about the standard of service in the hospital complex, it is not an investigation into the alleged commission of criminal offences.

1.5.2. Rather, the Review is an investigation into alleged deficiencies in a system which allowed clinical risks in treatment and care to arise which may have caused harm to numbers of patients. It is likely that a large number of individuals had a part to play in this, none of whom individually could have prevented the totality of what occurred. In the course of analysing what happened and why, it will be necessary to consider what could have been done better by individuals and organisations. This is an essential part of identifying the lessons to be drawn.

[3] See The Mid Staffordshire NHS Foundation Trust Public Inquiry Chaired by Robert Francis QC 2013: https://webarchive.nationalarchives.gov.uk/20150407084949/http://www.midstaffspublicinquiry.com/sites/default/files/report/Executive%20summary.pdf
[4] See also Baha Mousa Inquiry Report Volume 1 www.gov.uk/government/uploads/system/uploads/attachment_data/file/279190/1452_i.pdf

1.5.3. Findings or criticisms made in this report are not indicative nor determinative of any form of civil or criminal liability. In other words, the Review will not make findings or draw conclusions suggesting that either individuals or organisations have acted negligently. That is, or would be, for other legal fora to decide. That said, the Review should not be inhibited in the discharge of its function by any likelihood of liability being inferred from the facts that it determines or recommendations that it makes.[5] The duty of the Review is to set out its views and observations about what happened by way of comment or criticism and to offer what, in its opinion, are relevant recommendations.

1.5.4. In light of the above, we concluded that:

- The Review should make findings based on the evidence before it, including taking into account the findings of reports and investigations that have been completed prior to, or are running concurrently with it. Although there are no strict rules of evidence, the Review's findings will be guided by what is fair;
- Where the Review has received evidence and such evidence is thought to be credible and reliable, the Review is likely to accept it;
- The Review will make its findings on the basis of the evidence that it has preferred. It will adopt a common sense approach;
- Where the Review decides in relation to an important event that it is only possible to say it may have occurred, this will be made clear. The narrative of the report will state what the Review has concluded in respect of events and where appropriate will refer to evidence supporting that conclusion. As this is a report not a court judgement, a full account of the reasons for preferring the evidence cited will not always be set out;
- Criticisms of organisations and individuals may appear either in the course of a narrative account of what happened or separately. Criticisms may be explicit or be implied. Where a criticism is expressly stated or implied, this will be based on facts that the Review has found more likely than not to be true, following its assessment of the evidence it has received.

1.6. Evidence Gathering

Information Matrix

1.6.1. While there are numerous approaches to gathering evidence, we have taken a pragmatic approach, relying on mixed methods, as set out in each chapter and section of the report. Using these methods, we proceed to develop findings and conclusions, and make recommendations.

[5] Section 2 Inquiries Act 2005

1.6.2. The Review took substantial time and effort in the development of an 'investigation matrix', as a working tool to assist with the planning and development of the information gathering and processing stages. It enabled the Review to focus, explore, and explain the emerging findings in written documents and a series of informal, then formal interviews. We used this to form plans to conduct an engagement process with groups of the public, and with individuals who had made an approach to the Review following our call for evidence in June 2019.

1.6.3. In the light of subsequent developments between NHS GG&C and Scottish Government, we took stock of our approach to public engagement. The appointment of Professor White by the Government, as lead for communication and engagement with patients and families last autumn, together with the announcement of a Public Inquiry, meant this Review curtailed its direct engagement and worked through existing contacts and established channels to source perspectives from patients, families and the public.

Documents

1.6.4. In common with other inquisitorial processes, the Review issued a general call for evidence to all interested organisations, individuals (including NHS GG&C staff) and members of the public. We engaged with key organisations (such as the Scottish Government Health and Social Care Directorates and NHS GG&C) seeking information relevant to our Terms of Reference, including matters relating to Infection Prevention and Control; the Building's Design, Construction, Commissioning and Maintenance; as well as Project/Programme Governance.

1.6.5. In response, we initially received and catalogued over 3,000 separate pieces of information and correspondence, which populated the investigation matrix. Information received included documents, attachments, strings of correspondence, reports, draft reports, plans, drawings and photographs.

1.6.6. A significant number of these documents are not in the public domain, and now deemed to be commercially confidential and sensitive due to ongoing legal action between NHS GG&C and their former Design and Build (D&B) Contractors and other consultants. Several of these documents emerged, or were completed, at later stages of the Review. We continued to correspond with, and gather evidence from, individuals and organisations until a late stage of our Review to ensure that we could present as fair, accurate and complete an account as possible for all concerned.

"Investigators and reviewers encountered a lack of documentation of decisions and assurance reports throughout the construction and governance processes. This serves, at points throughout the narrative, to obscure a view of the process of construction and important matters relating to achievements, derogations and other exceptions, testing and assurance relating to the build and its completion to specification."

1.6.7. While we have found the organisations we approached to be generally helpful and cooperative, investigators and reviewers encountered a lack of documentation of decisions and assurance reports throughout the construction and governance processes. This serves, at points throughout the narrative, to obscure a view of the process of construction and important matters relating to achievements, derogations and other exceptions, testing and assurance relating to the build and its completion to specification.

1.6.8. Whilst there may be well-founded reasons as to why documents such as construction-related decision documents are unavailable after relatively short periods, and this may be standard practice in the management of documents in the construction process, the lack of documentation has been an impediment to our investigation process. Accordingly, we have made specific findings and recommendations about these matters.[6]

1.6.9. A further matter which became evident in sourcing reports, both published and unpublished, is the lack of availability of large bodies of documentation relating to who took decisions, whether the decisions were implemented properly, whether the planned building systems worked as intended and were free of complications and specifically free of contamination or risk of contamination.

1.6.10. This is illustrated in an excerpt from the Health Protection Scotland report of December 2018 addressing a water contamination incident at NHS GG&C (see Figure 1.2).[7]

1.6.11. We conducted limited literature searches to explore matters such as the risk thresholds for air change rates, chilled beam technology and infection risk, and material relating to environmental health and environmental health monitoring. The Review also sought routine monitoring data, assurance and ad-hoc reports from Scottish Water, Glasgow City Council and Health Protection Scotland.

"In an attempt to establish the extent of the water system contamination and any causative factor NHSGGC, supported by HFS and HPS initiated a detailed investigation into the contaminated water system within QEUH/RHC. Support was also requested from a number of external companies experienced in water incident management: These included Legionella, Public Health England (PHE), water solutions group and Makin & Makin. The detailed investigations led by NHSGGC and supported by HFS/HPS included reviewing commission, installation and maintenance records provided by the contractor. This proved to be challenging due to the archiving of data and there were very few members of the initial project team available who are technically qualified to retrieve data and provide verbal clarification"

Figure 1.2: Extract of Health Protection Scotland Summary of Findings Relating to Water Contamination Incident

[6] See: Chapters 4-9 of this report.
[7] Reference: "Summary of Incident and Findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital / Royal Hospital for Children and recommendations for NHS Scotland"

Interviews

1.6.12. We have sought to explain the findings emerging from a number of pieces of information we received through a series of interviews.

1.6.13. We have met people in the following order, accepting that there were overlaps at points:

a) Family members of those whose deaths were linked to allegations about the building, and unusual potential sources of infection;
b) Whistleblowers within NHS GG&C;
c) Senior individuals who have led reviews and inquiries, who have been leading investigations and preparing reports on aspects of the hospital and other relevant subjects;
d) Those closely involved with infection control in the QEUH/RHC;
e) Clinical staff with management and leadership roles, and senior clinicians specialising in infection and haematology;
f) Representative groups for staff and management at NHS GG&C;
g) Senior managers responsible for project decision-making, and management of the QEUH/RHC building including Estates and Facilities managers; and
h) General Managers and senior post-holders in organisations responsible for the planning, construction and operation of both hospitals.

1.6.14. Review investigators conducting interviews had both the necessary knowledge and briefing in both the subject matter and interviewing techniques.

1.6.15. Interviews took place in accordance with a protocol that participants agreed at the start of each session, in strict confidence, as semi-structured discussions. Interviewers posed questions or propositions and sought the interviewee's response.

1.6.16. Around forty different individuals were interviewed (some on more than one occasion), totalling an estimated 100 hours of interviews.

Site Visits

1.6.17. We undertook several site visits and inspections to the Queen Elizabeth University Hospital and a further matter which became evident in sourcing reports, both published and unpublished, is the lack of availability of large bodies of documentation relating to who took decisions, whether the decisions were implemented properly, whether the planned building systems worked as intended and were free of complications and specifically free of contamination or risk of contamination.

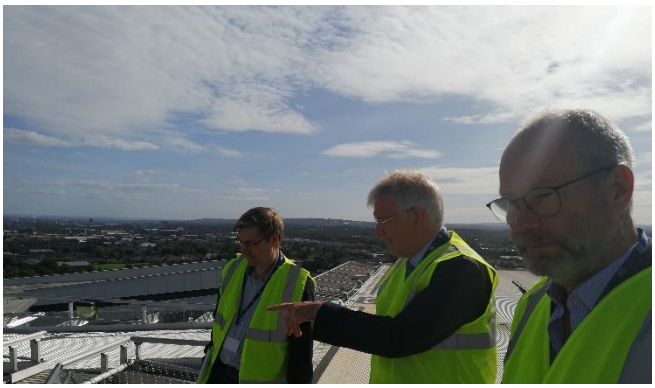

Figure 1.3 Photo of Professor Billy Hare and co-Chairs Inspecting QEUH Hospital (Left to Right: Professor Billy Hare, Dr Andrew Fraser, and Dr Brian Montgomery).

1.6.18. The Review's expert advisers Linda Dempster, Dr David Jenkins, together with Professor Billy Hare accompanied the co-Chairs and spent a day at the hospital, familiarising ourselves with the layout and scale of the hospital, its relationships, features such as the helipad, air intakes and handling units, water systems and ward areas that were key elements in our investigations (see Figure 1.3). We met clinical and facilities management staff at their places of work.

1.6.19. Over the course of the Review, members of the team visited the QEUH/RHC campus on seven further occasions which included two inspections of the facilities.

1.6.20. The Review team also made a separate visit to the neighbouring Shieldhall Waste Water Treatment Works, operated by Scottish Water, aiming specifically to establish concerns, raised by members of the public, that the proximity of treatment works to the hospital posed a risk to health and was a potential link to infections at the hospital.

1.7. Conclusion

1.7.1. The chapter sets out the parameters in which the Review operated, and the way it conducted its work. The report that follows delivers on its remit. It is an independent assessment of the events surrounding the construction of the QEUH/RHC hospitals and takes account of several important developments that have taken place since the establishment of the Review.

Chapter 2

Building a Hospital in the 21st Century

2.1. Introduction

2.1.1. This chapter outlines several specific matters that have emerged in the information gathering process of the Review and contributes to the wider learning element of the Remit. It acknowledges the complexity of building a very large hospital in a city site constrained in several respects. It takes three examples of guidance and policy that illustrate challenges that occur with hospital buildings, and draws some more general lessons.

2.1.2. Later chapters will go into greater depth on each topic, and place the general points made in this chapter in context.

2.2. Key Points

2.2.1. This chapter will not prescribe learning for future construction of hospitals in the 21st century, but aims to:

- Highlight the challenges faced by a major construction project of this type;
- Promote principles for continuous improvement;
- Encourage expertise and collaboration to solve future problems and share best practice;
- Encourage open debate;
- Stimulate innovation backed by structured evaluation;
- Stimulate research toward understanding about how to build better hospitals for populations, patients and specific patient groups with particular needs.

2.2.2. In turn, that learning has the potential to supply future project leads and their expert advisers with sound knowledge of the steps necessary to take good decisions; even more importantly, to avoid mistakes, ‘designing out’ risk in many respects, not least Infection Prevention and Control (IP&C).

2.3. Many Variables to Consider

2.3.1. Hospitals of the scale of Queen Elizabeth University Hospital (QEUH) are not constructed often and, by their nature, they tend to be far apart geographically. Therefore, learning and experience are not easily to hand. The main contractors that expressed interest in building the hospital may have had recent experience in hospital construction; their prime competitive attribute in seeking selection as preferred bidders was experience in large construction project management. Their understanding of a hospital, notwithstanding the expertise of architects they retained as consultants, was based on adaptations from other projects and drew on experience, but the blend of requirements: – clinical; population characteristics; budget and contract type; infrastructure; atmospheric and site conditions; stakeholder expectation; and local requirements such as sub-contractor recruitment and local sourcing – means that the overall project was highly complex and, in many respects, unique.

2.3.2. It is evident from the lessons of site selection and decisions behind the location of the QEUH contained in Chapter 3 which follows that:

- There are limited options for the siting of large hospitals;
- Most large facilities are to be found on land that NHSScotland or the public sector already owns;
- The environs of a hospital, not least closeness to the population it serves, connectedness to arterial transport routes – for patient and staff access, for visitor facilities, food and medicines, and for disposable goods consumed in large quantities – are key considerations.

2.3.3. Lessons from the QEUH, before the design stage, to bear in mind are that:

- The ambition to co-locate a general hospital with a range of services, women and children's acute services, and the highly specialist services that contribute to major trauma services (such as burns and plastic surgery, neurosciences) has sound logic in terms of efficiency and effectiveness.
- The consensus of modern specialist healthcare is that multi-system serious disease and injury management in a centre that manages many similar cases, in most respects, benefits clinical outcomes.
- QEUH is a local, regional and national hospital. It delivers a unique blend of services to the public.
- The project aimed to merge the services, also the customs and traditions, of four major and respected institutions in a single building – the human as well as financial, design, logistic and technical challenge was substantial.
- The aims and values of the building and its role, and the process by which the concept reached the drawing board in the design stage, gathered wide support in principle.

2.3.4. The site and its constraints meant that a high building was likely, with co-location of clinical services in a 'stack', and non-clinical services, such as administration, elsewhere. That meant the interrelationships between areas of the hospital were complex, vertical and horizontal, and over a wide area. These interrelationships were not confined to people and their movements, but affected all commodities and services in the hospital.

2.3.5. Hospitals are very complex structures. The understanding of what that means for the movement of patient, visitors, staff and equipment are one consideration. The supporting systems, ever more complex and inter-dependent technical and engineering matters, are also key considerations.

2.3.6. In principle, the integrity of vital services – air and water quality and supply systems in the context of this Review – are critical matters. This Review focusses on the importance of these systems performing consistently well.

2.3.7. Water use is a case in point – a report of an outbreak of disease in the Victoria Infirmary in Glasgow in 2002 dwelt on the lack of water points for basic hand hygiene, and urged debate about the design of old buildings (see also Chapter 8).[8] The QEUH design has at least four water points for each patient room – all standard rooms are single occupancy. Instead of lack of access to water, the risk then arises about lack of use of many water points, and consequent stagnation and build-up of potentially pathogenic bacteria unless there are regular flushing regimens.

2.3.8. In the case of air and ventilation, the decision to seal all windows resulted in a requirement for the entire air supply to be delivered and quality assured, through mechanical means. Added to that, air tends to move, subject to pressure, and with limited ability to control it. The consequences of such influences as frequent, large elevator movements propelling columns of air, with adjacent special facilities for positive and negative pressure to protect patients from infection depending on their clinical requirement, is a design issue where understanding about resulting air flows is far from complete.

2.3.9. When problems occur and infection control is an issue (see Chapter 8), shielding vulnerable people from infection, and isolating patients with infections from other people to prevent transmission, are important considerations. So too is isolation of malfunctioning parts of the hospital, whether it is a burst pipe or an underperforming air ventilation system.

2.3.10. All these diverse matters belong to the same hospital design, and eventually focus on the same outcome – an excellent building supporting clinically effective and safe care. But every such system is an example, a design challenge, a resilience contingency for those operating the building after it opens. Each problem is of equivalent significance and substantial potential impact – if not to actual risk – to the perception of risk, and consequently staff and public confidence in the institution.

2.3.11. Clinical practice is constantly changing. Already within the lifetime of this project, there have been several changing requirements. Examples include:

- To create a ‘common front door’ for out-of-hours primary care and emergency care, necessitating a GP-style of immediate care alongside a large emergency department;
- The assessment and immediate management of patients with a common and important condition – stroke – changed in important ways, necessitating re-design of the admission care unit;
- In the last decade, questions have arisen over the best styles of intensive care, particularly for seriously ill, immunocompromised patients and the best design of wards, rooms and background services to support their care was an issue, unresolved, that will form a part of this Review’s focus.

2.3.12. These are some of the many factors at play in the design of a hospital, and many bear on a number of potential risks, not least IP&C risk.

[8] See The Watt Group report www.sehd.scot.nhs.uk/mels/HDL2002_82WattReport.pdf

Building Very Large Hospitals

2.3.13. In the course of the Review, we have gathered a wealth of information on the factors that influence the construction of large hospitals and the weight to be attached to these factors when they compete. Several of these factors have been integral to passages earlier in this chapter – particular healthcare needs and the availability of land being two. There is no conclusive argument for or against a particular blueprint. Nonetheless, we report the following matters in order to encourage further discussion:

- New approaches to infrastructure – the current Infrastructure Commission[9] Key Findings will create a new framework for decision-making in Scotland and will shape investment decisions for future hospital building. Prominent amongst changes will be the contribution toward net zero carbon emissions, and emphasis on more effective use of existing assets. We discuss policy-practice implications of energy efficiency later in this chapter and several following chapters.
- Resilience – the closure of a portion of a large hospital or of a major part of a hospital's function, for whatever reason – pandemic, major incident or disaster, failure of a basic system such as water quality or supply – suggest that the efficiencies of a large hospital may be lost, and the resilience of health services is at stake. Are two large hospitals better than one? Is the physical separation, albeit with proximity, of parts of a very large hospital an advantage?
- Knowledge of complex systems – do we know enough about the structural characteristics of a large building, flows of people, services, utilities and basic systems to be confident that a very large single hospital building is sustainable? Is a very large hospital a sufficiently adaptable structure in the face of constant change in the shape and requirement of healthcare? The Open Building concept, with the aim of high flexibility of structural form to meet changing functional requirements, is one such approach.[10] [11]
- Cancer centres and intensive care – the evolving shape of care, possibly with profound immuno-suppression and transplantation as options for a growing number of cancer and non-cancer conditions, has implications for the settings for care and the built environment. Is it tenable to view a cancer centre or Regional Transplantation Centre as a single stand-alone physical entity, when home care or care in a homely setting is a significant element, and the concentration of intensive interventions in hospital necessitates rapid access to a range of supporting services in a different acute hospital? If the cancer centre is becoming more a concept than a hospital, what is the right blend and distribution of care elements?

2.3.14. These matters for discussion are broader than the remit that we have for clinical safety and IP&C, but these matters have a bearing on each of the discussion points.

[9] See Infrastructure Commission : Key Findings report 2020 https://infrastructurecommission.scot/page/key-findings-report
[10] See Open Building Concept, Steven Kendall, portfolio 2002-16 https://drstephenkendall.com/open-building-for-healthcare/
[11] Also covered in Chapter 4

2.3.15. The Review's prime focus is on measures to enhance IP&C. As will become clear as this report develops, there are numerous influences on IP&C risk. The most important point at this stage, though, is that IP&C is one of many considerations in the construction of a healthcare facility, let alone any structure that serves the purpose of accommodating people.

2.3.16. The field of knowledge that informs decisions is new, although there are extensive libraries of guidance and some peer-reviewed publications that inform and assure principles of good practice, not least engagement across disciplines. In many respects, there are detailed guidance notes for system design, build and commissioning that give clear specifications. The guidance series is the subject of discussion in Chapter 4 onwards.

2.3.17. One such document is the Scottish Health Facilities Note (SHFN) 30 (2007), an update on a 2002 document, published shortly before the design stage of the QEUH project.[12]

2.3.18. The note is an extensive document, and assesses in an early passage the current state of infection control and the built healthcare environment. It is worth reproducing in full:

Risk Management chapter in the publication
SHFN 30: Infection Control in the Built Environment: Design and Planning HFS 2007

5.19 The integration of prevention and control of infection risk management and construction is in its infancy. It represents a significant change in the management of healthcare facilities design and planning which will take time to develop to a level at which the greatest benefits can be achieved. Just as important then is the need to carry out research in the area of risk management, prevention and control of infection and the built environment to produce sound irrefutable evidence on which to base further risk management strategies.

Important:
• Always consult the Infection Control Team at an early stage:
- whenever refitting or refurbishment is planned;
- whenever major capital bids are planned;
• Do not wait until patients are ready to move in;
• Do not wait until fixtures, fittings and furnishings have been purchased;
• Do not let cost or space consideration override reason;
• Most advice will be common sense but not always popular financially.

From: page 23 SHFN 30 2007

[12] SHFN 30 denotes a series of documents detailing guidance on infection control in the built environment, including the HAI-SCRIBE documentation series, used for problem and risk assessment for building projects; guidance has been updated regularly in the intervening years from 2007.

2.3.19. We describe here three examples where guidance and new policy had consequences for the hospital as it neared completion and thereafter, and we propose learning from that perspective.

Taps Design

2.3.20. The guidance series specifies the type of standard tap for a hospital; at the time of the QEUH design phase this was a clear recommendation and the contractor followed the specification. However, in 2012 during the build phase, an outbreak report from Northern Ireland (1) about microbiological contamination of the flow straighteners at the tap nozzle necessitated a replacement programme. This was an example of evidence-informed change, with substantial cost implication but a direct benefit to infection control risk, guarding against water contamination and future risk to patients that may have been susceptible to infection.

Single Rooms

2.3.21. For privacy and dignity, and also infection prevention and control reasons, Scottish Government policy on hospital design changed shortly before the QEUH design stage from an open ward or four-bedded side ward as a predominant design for standard accommodation to a single room ward design. The attractions for privacy and dignity are self-evident; the advantages for infection control are separation of patients with a physical wall rather than a curtain, and en-suite facilities (sink in the bedroom; sink, toilet and shower in the adjoining room) for every patient. The number of water outlets then increased sharply from less than one per patient in a former communal ward to at least four per patient. The floor area, surfaces and the number of corners (eight) also increased markedly. The implications for patient care are, it is commonly understood, positive.

2.3.22. There was an evidence base behind this recent policy but there is a shortage of evidence (2) to evaluate its impact on key matters such as preventable infection. Modelling data from the current COVID 19 pandemic from England suggests a substantial beneficial effect of caring for patients with known infection at admission in single rooms in limiting onward transmission. An informal report in Scotland (personal communication) supports this view.(3) While the measure shows promise, its effect on reducing rates of healthcare associated infection (HAI – as distinct from further spread of community-acquired infection) requires further research to decide whether the policy works in that respect.

2.3.23. The water-related implications require more scrutiny. Underuse of water outlets brings its own risks, and we have seen that automatic tap flushing is now in place in some high risk environments; accordingly matters such as automation of water use and facilities management costs arise and require adequate recognition. These are learning points to highlight now, as policy directions that may have unforeseen practice consequences, and we return to the consequential matters in chapters that follow.

Energy Efficiency

2.3.24. Shortly before the design plans began for the QEUH, there was a UK Government policy instruction that new public buildings including those in the health sector should aspire to be 'BREEAM Excellent'. This is a rating scale – 'excellent' being second only to 'outstanding' – that is evidence based, devised by the UK Building Research Establishment, reflecting energy efficiency and sustainability of a building and its associated works (including public transport access and similar matters). NHS GG&C subscribed to this policy instruction and it was a clearly-expressed intention in the detailed design agreed for QEUH with the contractor. We return to this matter in Chapter 4.

2.3.25. We have already mentioned the design decision to seal all windows, so that all air supply to the building had to be drawn in and filtered by mechanical means. Guidance had stated that such an arrangement 'was not environmentally sustainable on a large scale' (SHFN 30 2007 para 8.16) on account of its expense to operate. The site location made any other solution except for sealed windows difficult to contemplate.

2.3.26. The net result was, we understand, a compromise that sought to resolve a conflict between energy efficiency and mechanical ventilation for a large structure, a hospital. The hospital building supports care for the general population but also some very unwell patients requiring intensive care or protection from infection. The effect on the general population of patients is uncertain. For places that host patients with high vulnerability to infection in isolation rooms or the adjacent areas it is of more immediate concern. However, the sound science needed to identify the critical thresholds for air quality that requires substantial energy use to assure it, is lacking; the notion of heightened infection risk from lower levels of indoor, in-hospital air quality is empirical and requires research. The implication of such engineering decisions is a matter to which we return in several subsequent chapters.

2.3.27. Segmenting the aims of zero carbon emissions so that separating lower energy use elements that are more straightforward and achievable from those that unavoidably require more energy and stretch decision-makers to achieve compensating savings may offer a more workable approach.

The Risk Consequences for Infection Prevention & Control

2.3.28. These three examples demonstrate specific installation of equipment, physical design and systems that have immediate and obvious links to IP&C risk –

- The tap flow straightener, and with a recent independent review report to back up the link;
- The Scottish Government's single room policy which aims to reduce healthcare associated infection (HAI) risk, although with implications that necessitate regular mitigating action and resource; and
- A UK Government policy aiming to promote the ambition toward zero carbon emissions that has the unforeseen but unquantified consequence of raising the risk of air-borne infection in hospitals, especially for very vulnerable patients if applied without proper consideration.

2.3.29. The shape of care now, and the design of hospitals and services to cope with community-acquired infection and HAI, alongside the need to continue to support care for patients with all other conditions, is a matter where planners for IP&C in the built environment are having to turn their minds immediately. The increasing prevalence of multi-resistant pathogenic bacteria, and the current COVID-19 pandemic, are prompting this strategic action.

2.4. Lessons

2.4.1. In the following chapters, we examine the three specific issues in further detail, how the decisions took place, and the concerns of practitioners and IP&C advisers as they started to work in the new hospital as it opened.

2.4.2. Here we offer the outline of lessons for building a hospital in the 21st century.

- **General** - We call for much higher profile for evidence generation and use relating to health, healthcare and IP&C in the built environment.

  There is no single blueprint for hospital design but there should be principles that encompass key matters such as IP&C, and more foresight toward the implications of general and specific health buildings policy for IP&C.

  There may be standardised modular elements of common components of a hospital design; however, as with the example of the taps, and with the constantly evolving shape of clinical care and the design consequences, this is a dynamic field requiring flexibility and wide collaboration from knowledge generation through to practice.

- **Guidance** – there needs to be continuing investment in evidence-based guidance to give design teams clear expectations of good design, build and commissioning practice, down to detailed levels, for instance the modular design mentioned above. We discuss specific aspects of guidance in future chapters.

  There also needs to be research investment to enhance the available knowledge that, in turn, informs guidance. We offer pointers for research priorities that reflect our findings; a wider debate on the future of environmental quality and sustainability, especially indoor air quality research in this context, is overdue.

- **Overall planning** – the shared values of a hospital construction project, and quality of relationships and involvement of people with up-to-date expertise, with assured competence and confidence to deploy that expertise, is a theme to which we return. **It is not enough to have the right people in the room.**

- **Policy and practice** – not only guidance writers and design teams but also policy makers should draw on evidence and use foresight to shape the outputs of their work. The most exacting task is the need to reconcile conflicting objectives and priorities in policy relating to building design, to surface and resolve these matters before the contractor proceeds to implement their agreement with the client and to use discretion where there is continuing uncertainty. Governance and assurance of good decision-making is integral to this endeavour.

2.5. Findings

2.5.1. The healthcare built environment needs to be flexible wherever possible. This work should also include identifying and managing potential risks to new and existing patient groups. The principle applies not only to new builds but also to upgrading existing facilities and to modifying the specification of new facilities in the course of the project.

2.5.2. Clinical practice is constantly evolving; this has implications for changing service models and specification of facilities. Altering or upgrading facilities in response to changes in demand, or developments in clinical practice need a flexible approach to healthcare design taking account of the full range of considerations including IP&C.

2.5.3. Delivering the QEUH within budget and on time were key achievements for the NHS Board and construction company, but secondary objectives mattered too. Success criteria for healthcare construction projects need to reflect a broader and clinically-relevant range of parameters.

2.5.4. Hospitals in the 21st century are significant parts of national infrastructure. The Infrastructure Commission sets out a range of principles and objectives that are broader than the previous era, with more attention to re-use of existing facilities and the overall aim of zero carbon emissions. Policy on energy efficiency, and the requirements of modern healthcare are areas for specific attention; intensive care interventions and air quality assurance problems are early candidates.

2.6. References

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Chapter 3

The QEUH

3.1. Introduction

3.1.1. The QEUH is an acute hospital campus built on the site of the former Southern General Hospital. This project was a major long-term undertaking, spanning 13 years from initial inception in 2002 to handover in 2015. The reasons behind its location are the subject of a section on site selection in this chapter.

3.1.2. The hospital comprises a newly built 1,109-bed adult hospital, a 256-bed children's hospital and two major Emergency Departments, one for adults and one for children, in addition to buildings retained from the former Southern General Hospital. There is also an Immediate Assessment Unit for local GPs and out-of-hours services, to send patients directly, without having to be processed through the Emergency Department.

3.1.3. The retained buildings on the site include the Maternity Unit, the Institute of Neurological Sciences, the Langlands Unit for medicine of the elderly, and alongside is a modern laboratory block, opened in 2012. The whole facility is operated by NHS Greater Glasgow and Clyde (NHS GG&C).

3.1.4. While some parts of the QEUH campus have their own distinct identity and dedicated specialist staff – such as the Royal Hospital for Children – each is completely integrated with linkages for patient transfer, diagnostic services, emergency care and even a rapid access lift from the emergency helicopter pad on the roof of the adult hospital. The new children's hospital is not only linked to the adult hospital but also both the adult and children's hospitals are linked to the redeveloped maternity building and to the Neurosciences Institute.

3.1.5. The QEUH hosts services relocated from the Western Infirmary and the Victoria Infirmary as well as some services from the Glasgow Royal Infirmary (GRI) and a range of inpatient services from Gartnavel General Hospital. In addition, the Royal Hospital for Children (RHC) which was previously based at Yorkhill in the west end of Glasgow, was relocated to a new building adjoining the adult hospital and renamed the "Royal Hospital for Children, Glasgow". It is the largest hospital campus in Europe, by area.

3.2. History

3.2.1. NHS Greater Glasgow undertook a review to develop a strategy to address a number of challenges relating to the delivery of acute services. This culminated in an Acute Services Strategy being approved in January 2002, which NHS Greater Glasgow planned to deliver across a number of phases. One of these phases constituted the significant reconfiguration of services provided at the Southern General Hospital site, seeing the co-location of adult, children, and maternity services. In 2006, NHS Greater Glasgow absorbed a large portion of the former Argyll and Clyde Health Board, and took on the designation NHS Greater Glasgow & Clyde (NHS GG&C).

3.2.2. In 2008, NHS GG&C submitted a business case to the Scottish Government proposing the creation of a new acute hospital to replace facilities at various aging Glasgow hospital sites. The project was initially to be procured through a Public Private Partnership (PPP) route where a delivery partner would design, finance, build, and maintain the facility for 25 years during which NHS GG&C would pay back all project costs. However, the model for the project contract changed to a Two Stage Design & Build route using public capital funding, preserving the construction budget.

3.2.3. In September 2008 Currie & Brown were appointed as Lead Consultant on a wide-ranging role covering design, project management, design support services, and site supervision. The Lead Consultant then prepared the Employer's Requirements to capture NHS GG&C's brief for the project.

3.2.4. A tender process known as 'Competitive Dialogue' was used to select a Main Contractor. In December 2009 Brookfield Multiplex ("Multiplex") were appointed to undertake design works and secure the necessary planning consents for the Full Business Case (FBC) to be approved.

3.2.5. During this time NHS GG&C amended the Lead Consultant's scope to reflect the finalised delivery plan and discontinued their design support services. Thereafter, the Project Board appointed a Supervisor (previously known as Capita Symonds, now Capital Property and Infrastructure Limited) to undertake a review of the design and monitor that the works were installed and commissioned in line with the various construction contracts.

3.2.6. The Board of NHS GG&C and Scottish Government approved the FBC in November 2009 with public funding. Nightingale Associates designed the adult and children's hospitals. The successful design and build contractor, Brookfield Multiplex, was instructed to commence construction works in December 2010. The works were delivered across a number of contracts. Scope agreements during the design stage were captured within a series of logs which have led to a complex hierarchy of documents forming the overall contract.

3.2.7. At the time of construction the hospital was Scotland's largest ever publicly funded NHS construction project, with £842 million allocated to the build. Originally termed South Glasgow University Hospital, it was granted the right to use the name "Queen Elizabeth University Hospital" by HM Queen Elizabeth II. Services began to transfer from other hospitals in spring 2015; the QEUH became fully operational during summer 2015.

3.2.8. With the exception of critical care, all of the patient areas in the adult hospital (which stands at 14 storeys high configured with four 'wings') are single rooms. Each room is equipped with en-suite shower and toilet facilities; it is the first hospital in Scotland to adopt this policy in full. The Royal Hospital for Children, while retaining a separate identity, is adjoined and integrated with the adult hospital. Around 80% of the paediatric beds are single en-suite rooms along with designated space for overnight accommodation for parents.

3.2.9. The retained buildings from the former Southern General Hospital, notably the Institute of Neurological Sciences, also underwent an upgrade to bring their appearance in-line with the new hospital buildings. The contract value of this work was around £10 million. The three Glasgow Universities also have extensive laboratory, research and teaching facilities on the site.

3.2.10. A physical above-ground link for patients and staff from the main adult building into the Maternity and Neurosciences Institute buildings was constructed, allowing most of the campus to be accessible without going outside. The main hospital facilities are also linked to the laboratory buildings via a tunnel and pneumatic tube system.

3.2.11. A timeline of key events from the opening of the hospital to the present is set out at Figure 3.1 at the end of this chapter.

3.3. Site Selection

3.3.1. Following feedback from the public launch of this Review, we adjusted the Remit to reflect concern about the selection of the site of the hospital and whether it had any bearing on issues relating to infection control.

3.4. Theory and Method

3.4.1. The Review team discussed possible theories that reflected public concern and then tested them out with experts in the field. The possible theories include:

- Association of odour arising from the neighbouring waste water treatment plant to the west and north, the waste collection and recycling combined facility further to the west being or signifying a potential source or risk of infection.
- The presence of birds, specifically pigeons, that fly, perch, feed or scavenge in substantial numbers in the vicinity of the hospital.
- Other pollutants or by-products of the waste water treatment process in the neighbouring facility.

3.4.2. We conducted a limited literature search to explore the association between these potential hazards. We interviewed experts in the field of environmental health, and practitioners in environmental health monitoring to assess the level of concern from enquiries. We sought routine monitoring data and ad-hoc reports from Scottish Water and Glasgow City Council.

3.4.3. The Review team visited and toured the Scottish Water-operated Shieldhall Waste Water Treatment Works, and toured the Shieldhall vicinity to the west of the hospital site including the waste collection site. The area includes a food manufacturing facility, various industrial units and a small static caravan park. To the south of the hospital is a housing estate and the A8 trunk road and M8 motorway. To the east is the remainder of the Southern General Hospital site, the A739 access road to and from the Clyde Tunnel and then an extensive area of housing.

3.4.4. We examined papers supplied by NHS GG&C relating to decisions about the Acute Services Review that concluded in 2001, and subsequent decisions.

3.5. Standards

3.5.1. The standards applied were:

- Studies and consultation that informed the original decision were reasonable and up to date in terms of what was known about environmental hazards relating to infection control.
- Undertakings by Scottish Water to invest in environmental improvements and manage the waste water treatment site had been implemented and sustained.
- Management of sites that have the potential to create hazards and host substantial bird accumulations was at a good level.
- No new knowledge or developments had altered the matter, or changed perceptions of the hazards in the environment that may have a bearing on the siting of the hospital.
- The level of concern notified to those with statutory authority or stewardship over any of the facilities was not sufficient to give cause for widespread concern at any particular point or over prolonged periods of time
- Direct observation of the sites, and bird populations, showed no appreciable additional level of hazard.

3.6. Findings

3.6.1. The hospital dates back to the 19th century, first of all as a Poor Law institution and then, in common with many other such institutions, incorporated into the NHS Estate when the NHS was established in 1948. The waste water treatment facility grew and developed alongside the institution and predates 1948, when the Southern General Hospital became a healthcare facility.

3.6.2. Consultation on the Acute Services Strategy for Greater Glasgow took place between 1998 and 2001. There was a specific study commissioned and carried out on the public health aspects of siting the hospital and the results reported to the Health Board were generally reassuring. It noted that the West of Scotland Water Authority (subsequently Scottish Water) was in the process of upgrading its waste water facility and it gave assurances about attention to abatement of the odour arising from the main sewers as they entered the facility. Public health considerations were one of several factors taken into account in Greater Glasgow Health Board making its decision in favour of expansion on the Southern General Hospital site. The decision appears to have been taken in a transparent manner and was reasonable in the circumstances.

3.6.3. Scottish Water duly completed its upgrading works and has maintained the site. It is closely monitored by its own internal processes and by SEPA (Scottish Environmental Protection Agency) as the regulatory agency. We understand that the facility has been scored ‘excellent’ in successive inspections; these standards are consistent with quality parameters set by the EU.

3.6.4. When the Review team visited and toured the waste water treatment facility, we found the grounds to be well maintained. There was no evidence of leaks or debris consistent with hazards or that might attract birds or vermin.

3.6.5. Our search of the literature did not reveal developments in the evidence base to suggest that the risk of siting a hospital near waste facilities has changed in the intervening period. There are studies showing carriage of pathogenic organisms through the air and, with the known exception of Legionella, without evidence that they cause harm by inhalation or other ingestion. This is consistent with theories of association of disease with odours that were dispelled when modern studies of the carriage of disease showed how infection and contagion takes place. These matters depend, of course, on the proper stewardship of facilities in order to keep down the level of general hazards such as vermin, and compliance with current standards, many of them set, until now, by the EU.

3.6.6. Complaints from the public or any other source do not suggest heightened levels of concern or other apparent nuisance in the area. Environmental monitoring in the surrounding area to the QEUH site, undertaken by the Glasgow City Council Environmental Health Department and taking in air quality, and comparing information with other Glasgow urban areas shows no additional concerns about poor quality and increased hazard.

3.6.7. Touring the vicinity and including the waste collection and recycling facilities showed maintenance at a reasonable standard, and with no substantial accumulations of birds, specifically pigeons and also seagulls. These visits were admittedly single points in time and do not give assurances about week-to-week appearances and stewardship of facilities over long periods of time. In our regular visits to the hospital we did not detect substantial accumulations of pigeons or other birds that are known scavengers at other times, posing potential hazards in terms of infection.

3.6.8. We would make two observations, though. The main sewers enter the waste water complex close to the western entrance of the hospital complex. When we visited, following a heavy shower of rain on a warm day with little wind, the odour was strong. We acknowledge that Scottish Water maintains the facility effectively to agreed standards and is open to receiving enquiries about its operation; we acknowledge also that there is no evidence of a link between odour and risk to effective prevention of infection. The second matter is the secondary effect of siting the hospital close to the waste water treatment facility as one reason to incorporate sealed windows throughout the design of the hospital – a matter that we consider in the next chapter.

3.6.9. The construction of the original South Glasgow University Hospital project was a very large, complex and ambitious project that culminated in the opening of a new and modern facility in 2015. Now known as the Queen Elizabeth University Hospital and Royal Hospital for Children, together they deliver general hospital services to the local population, and a range of highly specialist care to the regional and national population.

3.6.10. Greater Glasgow Health Board chose the site for the hospital after due consideration of the options, and following wide public consultation on its Acute Services Strategy. A public health assessment took account of potential hazards in the surrounding environment, including concerns about odour from the neighbouring waste water plant. Whilst the assessment was generally reassuring, the odour issue in part influenced the decision to seal all windows and opt for a mechanical ventilation system for the design of the whole hospital.

3.6.11. With the passage of time, the reasons for decisions are not so readily available for discussion and scrutiny. In addition, it is likely that standards and public expectations for environmental stewardship change, and so people have new questions about land use and surrounding places. Those who may be new to the area can be unaware and more sceptical of the reasons for decisions taken before their time. This finding is similar to one made in the recent report on two schools in North Lanarkshire.[13] We therefore make recommendations on public communications about past decisions that NHS Boards (and other public bodies) make.

3.7. Conclusions

3.7.1. We conclude that the site selection for the hospital was properly considered at the time of the Acute Hospitals Review when it completed in 2001, taking public health matters into account. Site management of waste water facilities adjacent to the site complies with regulatory requirements and the site appears well maintained on direct inspection; no new knowledge or information has come to light that challenges the assumptions and assurances on which the decision was founded; public concern has been expressed to us as part of this Review but generally recorded nuisance and relevant data remain at a low level, and not appreciably different to other areas in the city on routine monitoring.

[13] See Buchanan and St Ambrose Independent Review: final report www.gov.scot/publications/buchanan-st-ambrose-independent-review/

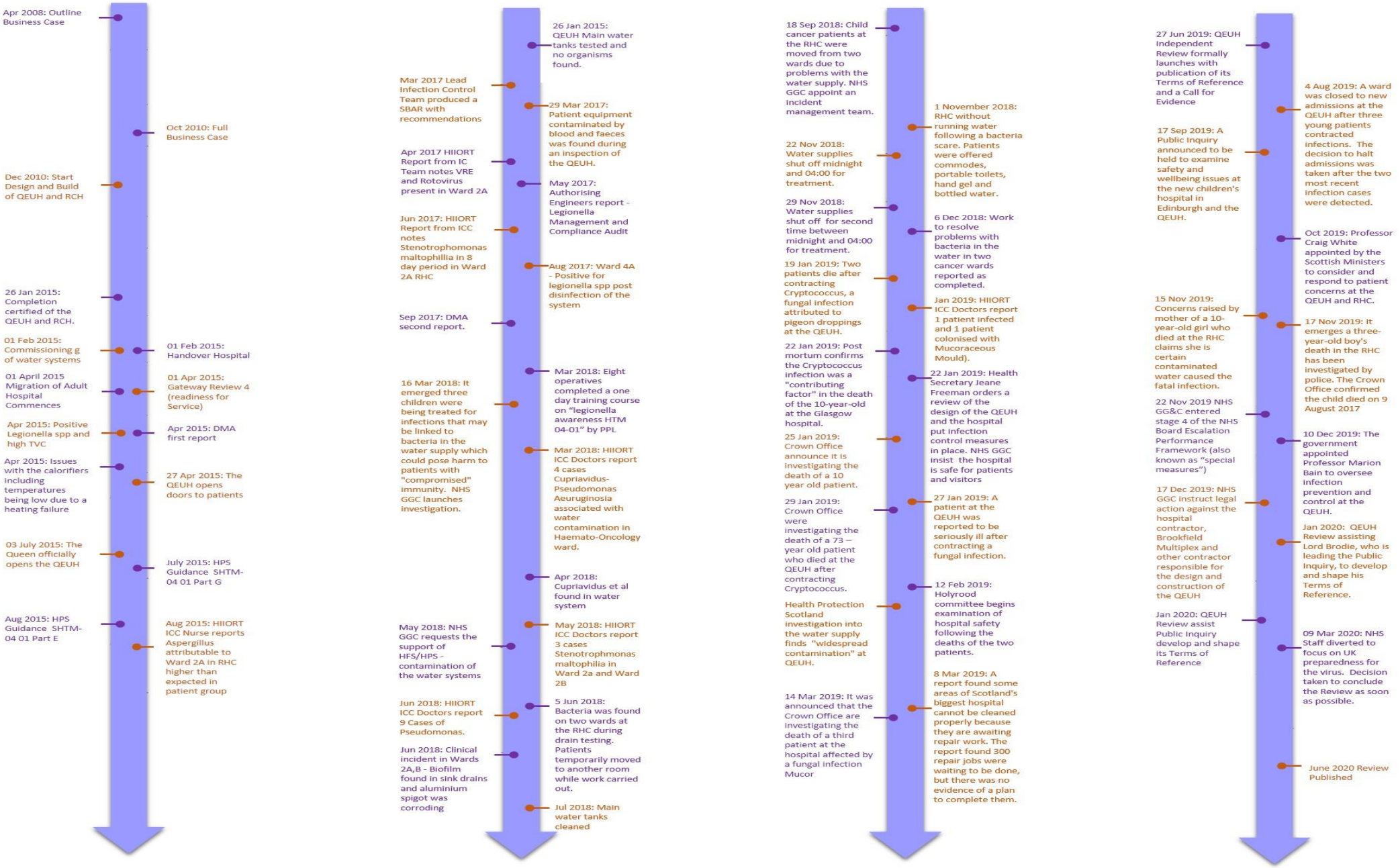

Figure 3.1: Queen Elizabeth Hospital Timeline

Chapter 4

Built Environment: Design

4.1. Introduction

4.1.1. This chapter reviews the design phase of the Queen Elizabeth University Hospital (QEUH) project, describing processes, events and decision-taking against guidance and standards relevant at the time. The accounts presented are based on documents from NHS Greater Glasgow and Clyde (NHS GG&C), NHS guidance and standards, third party reports, and information drawn from formal interviews.

4.1.2. The design of the built healthcare environment plays a fundamental role in infection prevention and control (IP&C), and can involve a wide range of processes (1). These may include; the initial concept; researching evidence, guidance and standards; developing drawings and specifications; and making changes to original plans, which can happen throughout the entire life of a project.

4.1.3. With respect to the QEUH buildings covered in this Review, the design phase includes: the decision to build a new hospital of this type; site selection; Outline Business Case (OBC); Final Business Case (FBC); development of drawings (usually 1:200 and 1:50 scale); specifications; and subsequent changes or derogations to what was previously agreed. In all cases, the focus of the Review was on issues identified as having a potential impact on risks of infection at the hospital, whilst acknowledging many other considerations that the design team had to take into account.

4.2. The Key Issues

4.2.1. The key building issues related to the design process covered in this chapter are as follows:

- Site selection;
- Helipad on the roof;
- Single rooms;
- Ventilation system and air quality;
- Water supply and quality;
- Budgets, client design changes and value engineering;
- Taps and basins.

4.3. Background and Context

4.3.1. The early decisions to build a campus of the scale and location of the QEUH were based on the Acute Services Strategy (discussed in Chapter 3). The QEUH is “one of the largest acute hospitals in the UK and home to major specialist services such as renal medicine, transplantation and vascular surgery, with state-of-the-art Critical Care, Theatre and Diagnostic Services” (2).

4.3.2. The scale and complexity of the hospital buildings was appreciated by NHS GG&C. This had implications in relation to finding people with the necessary experience to deliver it. This also represented a technical challenge for integrating extensive building systems, including specifically the ventilation and water systems, to expected standards. NHS GG&C assembled a team which it considered capable of meeting these challenges. However, not everything went to plan for reasons discussed later in the chapter.

4.3.3. The decision to design and build the QEUH with almost entirely single rooms was in response to a national policy (3) which had implications for procedures regarding IP&C. A single room configuration of this scale was challenging and innovative at the time, and this meant a review and revision of existing standards was needed. Because the wards and other clinical areas and facilities would be carrying out different functions and hosting patients with differing needs it meant that different standards would be necessary, depending on the specific circumstances of different patients in each area. These needs inevitably change over time, which is yet another consideration.

4.3.4. Another matter relevant to the QEUH design phase was a change to the project's financial structure, from a Public Private Partnership (PPP) to a publicly funded project. This change was in response to the PPP being assessed as unaffordable in the longer-term, coinciding with a national strategy to move away from private sector funding for public sector capital projects. This change was important for the QEUH project, as the future delivery partner would no longer provide a 25 year maintenance service (commonly referred to as the concession period) but instead, revert to a traditional handover of the building to the client for their Estates and Facilities teams to manage. The overall result of this is lower maintenance costs; however more onus is on the client to plan and manage for this.

4.3.5. The subsequent level of input from Estates and Facilities teams to the design phase should therefore be expected to increase. The actual level of input from Estates and Facilities at design stage was an area of concern that is discussed later. Despite the impending recession, NHS GG&C was able to protect the cost envelope for the capital investment element of the project, regardless of the change in funding mechanism.

4.4. Related Guidance and Standards

4.4.1. According to Health Facilities Scotland (HFS) the management or mitigation of infection risks in relation to the built environment requires knowledge from many sources, and should include input from IP&C teams, Estates and Facilities teams as well as design and construction teams (1). Whilst this HFS guidance postdates the design of the QEUH, its content draws from earlier publications titled 'Infection control in the built environment' (4) (5). Historically, the Department of Health has been the originator of UK-wide NHS building guidance with Scottish versions following later to adjust for local needs and circumstances. The guidance referred to above are known as 'Scottish Health Facilities Notes' (SHFN) and Department of Health HFNs.

4.4.2. The usual convention for Scottish building projects is to follow the Scottish guidance and if none exists, revert to the UK - wide publication. These guides signpost other relevant standards and specific guidance, which includes (but is not limited to) the following:

- Scottish Health Technical Memoranda (and Department of Health HTM);
- Scottish Health Facilities Notes (and DH HFN; now discontinued);
- Scottish Health Planning Notes;
- Scottish Health Technical Notes;
- DH Health Building Notes.

4.4.3. In addition to this guidance, relevant Legislation, Regulations, Scottish Building Standards (and Technical Handbooks) and British Standards apply. Whilst a detailed description of each is not needed here, the Review refers to specific guidance and standards throughout the chapter where relevant.

IP&C and the Design Phase

4.4.4. Figure 4.1 shows the recommended management structure for NHS building projects, based on guidance available at the time of designing the QEUH hospitals (5). This illustrates the level at which infection control should sit as Adviser within the project team, included within the Project Board (or similar).

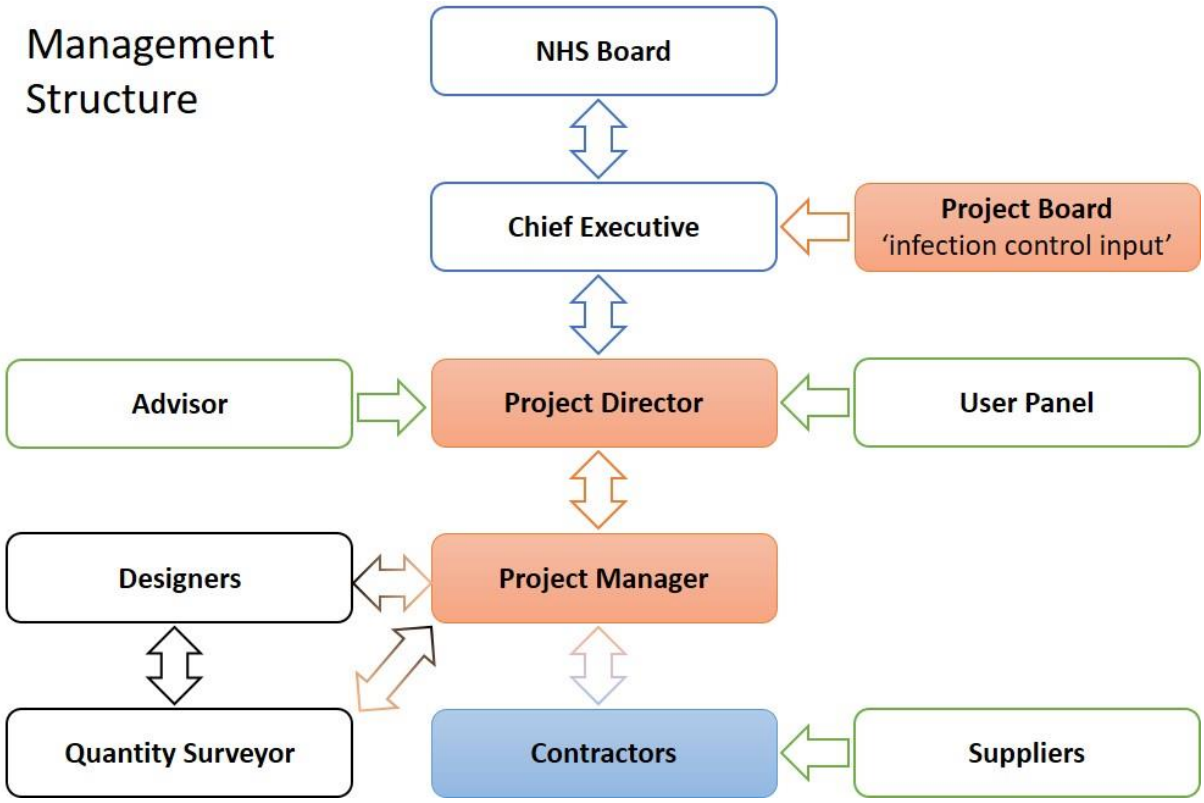

Figure 4.1 Recommended management structure for NHS building projects Source: *(5)* Page 14

4.4.5. Table 4.1 is part of a larger table from the same guidance (5) covering high level design-phase processes for NHS building projects. This shows what types of IP&C issues to consider and when. More detailed guidance on this is provided in the SHFN 30, some of which is reproduced here for reference.

	Planning Process	Issues
	Time Period	
Concept		**Issues to consider** Space Cleaning/disinfection/Sterilisation Specialist area Engineering facilities Waste Catering Laundry
Feasibility study	1 in 200 (some preliminary designs) →	
Sketch plans	1 in 200 draft activity data sheet equipment lists usually wish lists →	**Issues to consider** Storage (linen, waste, patient equipment, domestic equipment) Ancillary areas Changing facilities Lifts Pneumatic delivery systems Single rooms Isolation rooms
Outline Business Case		
Detail planning/design	1 in 50: fixtures and fitting (fixed items Group 1) →	**Issues to consider** Ventilation Heat/light Water systems Sewerage Vaccum Hand-wash basins Storage systems Ward kitchens Workflow Fixture and fittings
Full Business Case		
Tender		

Table 4.1 Design Phase Processes Source: *(5)* Page 38

4.4.6. IP&C teams are expected to be involved at various stages of projects. Although stated in relation to Private Finance Initiative (PFI) contracts, the advice at the time was that the infection control team needed to make sure that certain criteria were embedded into the contract in such a way that important decisions on design or build did not go ahead without being "signed off" by them (5). Studies show that common errors in design of healthcare buildings include "incorrect air turnover and airflow patterns"… "ventilation systems which are not fully commissioned" … and "negative air-pressure rooms being omitted from large, new inpatient buildings" (5).

4.4.7. Major changes to the project can also have a detrimental effect as demonstrated by Figure 4.2 the MacLeamy Curve, which illustrates the impact of late design changes. In addition to cost implications, the functional use of a building can be severely compromised by late changes, unless time and money is made available to redesign and accommodate the new function. In some cases, this can be mitigated to some extent if flexibility is built into the design (6). However many projects still employ a 'design freeze' in an attempt to avoid major changes mid-project.

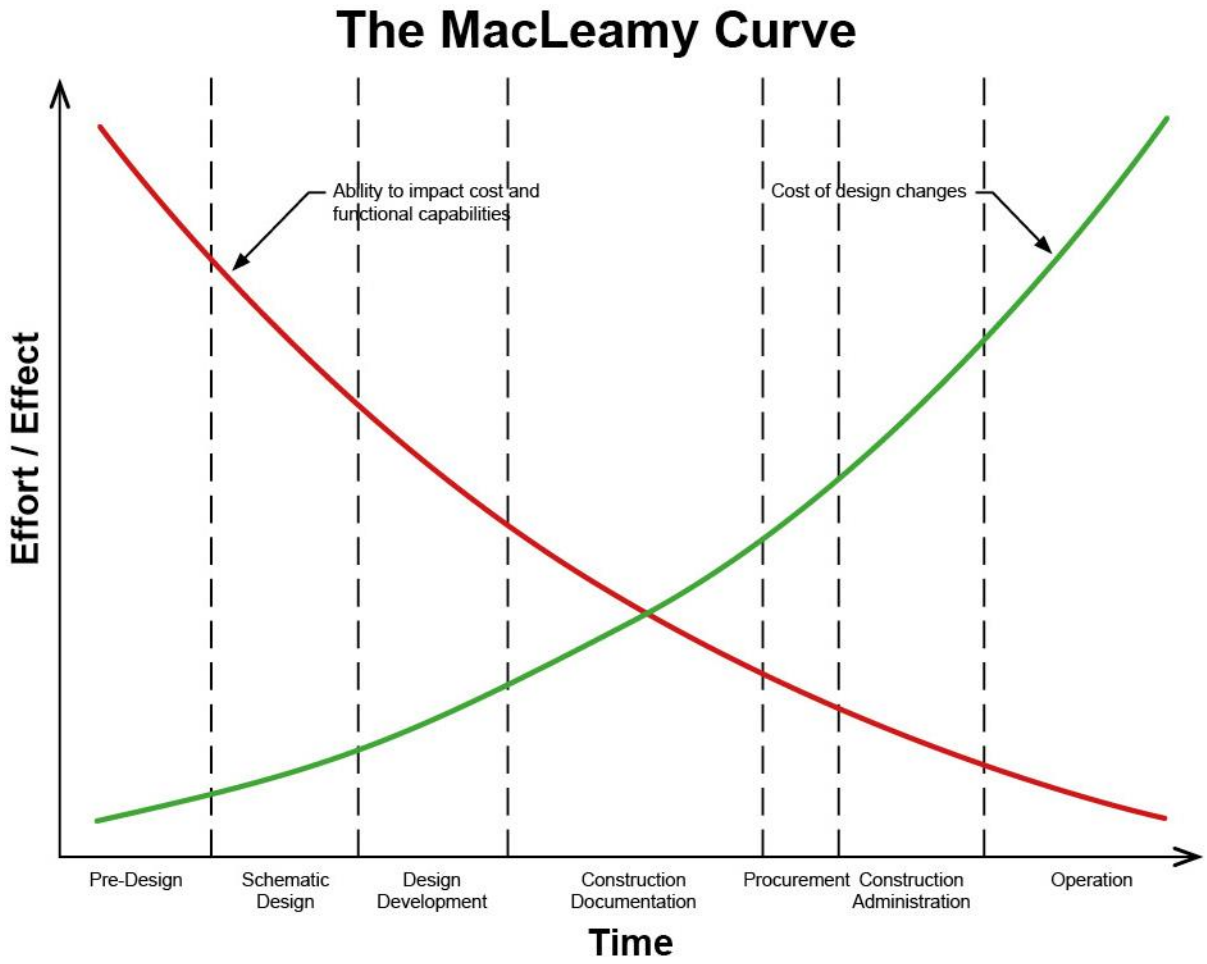

Figure 4.2 MacLeamy Curve: impact of late changes

Ventilation

4.4.8. Building ventilation is a very complex topic. In the context of prevention of infection, whether the system is natural or mechanical, the nature of ventilation serves to dilute droplet nuclei in the air and is the single most important engineering control in the prevention of transmission of airborne infections (7). However, while ventilation is important, it is only one part of a bigger picture, and cannot be relied upon as the only environmental strategy for protecting building occupants. SHFN 30 (2007) states that a closed air ventilation system is “expensive to run and not environmentally sustainable on a large scale.” This is due to the amount of energy required, and subsequent carbon dioxide emissions, which will become increasingly unsustainable.

4.4.9. The guidance goes on to state “For this reason, sites which necessitate sealed, air-conditioned buildings should be avoided.” However, due to the odour problem from the water treatment works, as stated in the previous chapter, this was unavoidable at the QEUH. It should also be noted that hospitals in general tend to incorporate sealed or minimal openings for a number of reasons, including preventing accidental or intentional falls from height. So natural ventilation is rarely possible with buildings of this type.

4.4.10. The quality of the air is important, starting with the outdoor air. The position of air intake vents needs to take into account wind speed and direction, building geometry, and adjacent activities that may produce pollutants. This air needs to be filtered to remove odour, airborne contaminants, as well as undergoing 'conditioning' which will involve humidifying, dehumidifying, heating and cooling so condensate does not form and the net effect achieves 'thermal comfort'.

4.4.11. For air handling units supplying parts of the hospital that rely on higher air quality, such as operating theatres, isolation rooms and wards supporting the care of patient groups who may be immuno-compromised, extra measures are in place. Once the air is conveyed through ducts it may undergo further high efficiency particulate air (HEPA) filtering before reaching these areas. The level and extent of air movement around these areas is also important. This will depend on the position of entry and extract vents and room temperature. These characteristics of the air ventilation system are all features to establish before even reaching the control of air pressures, and the number of air changes.

4.4.12. SHTM 03-01 covers the design and validation of ventilation in healthcare buildings and would have been applicable to the project (Version 1: 2011). This guidance provides recommended air changes per hour (ACH) for different applications, typically six ACH for General Wards and upwards of 10 ACH for more high risk areas. Air pressure levels are also covered, with specific reference to high risk areas such as positive pressure rooms, to prevent unwanted air entering the environment of immunocompromised patients, and negative pressure, to prevent air leaking from rooms housing patients with infectious diseases. The recommended pressure differentials are measured in Pascals (Pa), usually of between five Pa and 10 Pa. It is difficult to measure pressure differentials below five Pascals (7) cited in (4).

Isolation Rooms

4.4.13. Isolation rooms can be positive or negative pressure as described above. Negative pressure isolation rooms are needed for the care of people with infections transmitted by the airborne route (5). In addition, smooth, hard, impervious surfaces are recommended for ceilings in isolation rooms, as ceilings with removable tiles may allow air leakage and loss of pressure differentials; they may be potential sites for bacterial growth; perforated ceilings can allow dust to fall onto the area below during maintenance work (5).

4.4.14. During the design of the QEUH buildings there was "no definitive guidance on size, ventilation or the equipping of isolation rooms" (5). NHS Estates' HTM 2025 gave advice on natural ventilation, general extract ventilation and ventilation for specialist areas. In addition, SHPN 04 – Supplement 1 provided guidance on 'Isolation Facilities in Acute Settings', although a further supplement, covering areas where severely immuno-compromised patients are treated, was promised but never published.[14]

[14] Witness Statement: A27996988

Water

4.4.15. Contamination of the water supply is a long-established factor linked to infectious disease both in the public health arena and in the hospital setting. It is important, therefore, that drinking water in healthcare settings is safe, readily available to patients and is palatable to encourage drinking.

4.4.16. The EU Drinking Water Directive, which is transposed into Scots law by the Water Supply (Water Quality) (Scotland) Regulations 2001 (superseded by the Public Water Supplies (Scotland) Regulations 2014), contains provisions to ensure that the drinking water supply within buildings (including hospitals) to which the public has access remains wholesome and is not adversely affected by the domestic plumbing system (5). This essentially means water for most patients should be no different to that used in their own home, in that it should not contain microorganisms, parasites or substances at a concentration or value which would constitute a potential danger to human health. Likewise, the provision of sterile water would be considered unnecessary for most patients; however those patients, for example, undergoing profound immuno-suppression would need additional filtration to support their care.

4.4.17. Contamination of the water supply can occur due to poor design of pipework, inappropriate storage, or during renovation and refurbishment work (5). The main strategy recommended for the reduction of risk is maintaining a consistently high temperature (usually above 60^0C) in hot-water supplies, keeping cold water below 20^0C, and in both cases keeping the water moving. However, for buildings of the scale of the QEUH where it took two weeks to fill the water system and where system complexity could lead to non-compliance in some parts, introducing a form of on-line disinfection (e.g. chlorine dioxide or ionisation) should be a consideration if there is a risk of water temperature dropping (5).

4.5. Findings

Site Selection

4.5.1. Site selection for the hospital needed careful consideration of multiple issues. The chosen location, adjacent to an existing waste water treatment works, was met with public concern, as discussed in Chapter 3. However, these concerns were related more to odour i.e. foul smells, rather than any potential airborne infection. Conflating odour and transmission of disease is a common misconception.

4.5.2. The site location had an indirect effect on the design decision to specify sealed windows. This choice was made, partly, to help prevent the odours from the waste water treatment works entering the hospital.[15]

[15] Witness Statement: A28308555

4.5.3. Other reasons also influenced this decision, mainly high wind speeds expected at the upper levels, the prevailing trend of sealing buildings to prevent air leakage and to ensure greater control over air handling, e.g. opening windows can affect the designed air-flow and reverse pressure differentials (in relation to BREEAM).[16]

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4.5.4. Nonetheless, the decision to install sealed windows essentially removed the option to ventilate rooms naturally (as recommended by SHTM 02-00) and put a greater burden on the mechanical ventilation plant to achieve desired air quality and ACH.

Design Process

4.5.5. The project structure changed a number of times through the design phase.[17] However, it remained broadly similar to the general guidance shown in Figure 4.1.

4.5.6. On the face of it, IP&C input was fully evident, with the FBC of 2010 stating IP&C teams were involved in planning and giving examples of this – covering arrangements for infectious patients and generic references to “easily cleaned floor and wall finishes” (GG&C FBC: Page 51).[18]

4.5.7. Elsewhere, the FBC stated that IP&C teams were part of technical workgroups, and a senior Infection Control Nurse was a full time member of the project team.[19] This arrangement persisted through the design stage until half way through the build stage, which is typical, as design input overlaps the build phase in a ‘Design and Build’ project. However, when discussing ‘Technical and Facilities’ matters IP&C was still limited to issues of ‘surface finishes’ (GG&C FBC: Page 153). The Review heard evidence[20] that IP&C teams were consulted widely; with input from microbiologists on building services, however those involved in IP&C described examples focused more on operational matters and finishing detail rather than the more technical issues covered in SHFN 30 (discussed in more detail in Chapter 8). This reflects a gap in knowledge of critical built environment factors from IP&C staff.

4.5.8. Individuals with technical and engineering knowledge of issues that directly impact on IP&C (i.e. ventilation and water) were available in-house at NHS GG&C. However, the Review heard that there was a pattern of individuals offering assistance but either being declined, ignored or told not to interfere, despite their extensive experience in recent building design projects. [21]

4.5.9. The design team relied on support from external consultants to provide technical advice on Employer’s Requirements, including Clinical Output Specifications, exemplar drawings, 1:200 layouts, and 1:50 room drawings.

[16] Witness Statement: A28308555
[17] Review Evidence: A25961698
[18] Review Evidence: A25612185
[19] Review Evidence: A25612185
[20] Witness Statement: A27796503; and A27871832
[21] Witness Statement: A27867258; and A27920684

4.5.10. The Design and Build contractor prepared its proposals with the aid of its sub-contractors and consultants, which were reviewed by the NHS GG&C Board's project team, with support from other third parties through a Reviewable Design Data (RDD) process (8).

Helipad

4.5.11. The site of the hospital previously had a helipad at ground level whereas the new QEUH adult hospital design incorporated a helipad on its South West tower (known as 'Tower B'). An early hypothesis that had currency prior to the establishment of the Review was the possibility of air, contaminated by droppings from pigeons roosting below the hospital helipad, being drawn into the ducts that supply ventilation to the various parts of the hospital buildings.

4.5.12. The possibility of 'downwash' (or downdraft) from approaching helicopters was amongst the considerations. The QEUH Estates team commissioned an independent company (Quesada Solutions Ltd) to undertake Computational Fluid Dynamics (CFD) simulations to ascertain the probability of this being the case. [22]

4.5.13. Simulations for Air Handling Unit (AHU) air intake points at each of the four 'Towers' of the main adult hospital and those on the children's hospital building took account of scenarios for prevailing winds and the effect of approaching helicopters. The CFD simulations demonstrate that the air arriving at these AHU intake locations does not originate in the region beneath the helipad for any of the scenarios. It is therefore unlikely that debris or particles from the helipad area was or is being carried into the hospital ventilation system. This means birds congregating at or around the helipad, are unlikely to be contaminating the hospital ventilation system.

Single Rooms

4.5.14. The policy decision to provide single rooms for new build hospitals was made by the Scottish Government in 2008. Guidance document SHPN 04-01 contained reference to this and was published in October 2010. The QEUH building design incorporated this policy and the Full Business Case (FBC) was approved in December 2010, including single rooms. One of the claimed benefits of this policy was better infection control.

4.5.15. There were a number of unintentional consequences of this policy for operational resources in relation to IP&C.[23] One matter was an increase in the number of internal corners created by multiple single rooms that needed thorough cleaning. The second relates to an increased number of water outlets (sinks, drains, shower heads, toilets etc.) requiring cleaning, and in some cases reduced use leading to manual monitoring and periodic activation by staff to prevent water stagnation. This additional burden constitutes an increased risk unless the necessary resource is incorporated into the day to day operational requirement, as discussed in Chapter 7 and elsewhere.

[22] Review Evidence: A25964367
[23] Witness Statement: A28153165 and A27920684

Ventilation System and Air Quality

4.5.16. In general, hospital wards and single rooms are recommended to have six ACH to maintain acceptable levels of air dilution (SHTM 03-01; HTM 03-01). The 'general' single rooms in the adult hospital were designed only to achieve 2.5 ACH. IP&C staff did not expect this level of air change; it is well below the recommended level, even though it was accepted by the project team.

4.5.17. The project team did not share the decision with all IP&C staff. Later requests from IP&C staff to confirm if the ventilation system complied with 'national standards' were answered with confirmation they complied with the 'specification'. [24] This indicates there was confusion about what information should be shared in the interests of IP&C.

4.5.18. The Design and Build (D&B) contractor did not provide evidence to the Review and it was not possible to trace any technical members of their supply chain. However, the Review identified the following, in relation to the ventilation design of general single rooms:

- No reference to six ACH within the Employers Requirements from NHS GG&C (only references to SHTM 03-01 and HTM 03-01);
- Inclusion of 'chilled beams' for heating purposes;
- NHS GG&C were keen to meet 'BREEAM Excellent' status for the hospital and included £250,000 in the contract sum for the D&B contractor regarding achievement of the "energy consumption targets".[25]

4.5.19. This would indicate that the 2.5 ACH for general single rooms was accepted by NHS GG&C even though it is well below the recommended figure of 6 ACH. The specification of chilled beams and the pursuit of 'BREEAM Excellent' status for the hospital has relevance and provides one probable explanation for the decision.

4.5.20. BREEAM is a benchmarking method, developed to measure how sustainable a building is (as described in 2.3.24). One of the criteria used for a building's BREEAM score is energy use as this has a direct impact on CO2 emissions. NHS GG&C was pursuing the UK-wide Government policy of an 'excellent' rating (a score greater than 70%) which is the second highest rating and is considered 'best practice' for non-domestic buildings. To achieve this, those involved in hospital projects need to scrutinise (amongst other things) the proposed energy consumption during design.

4.5.21. Chilled beams provide a low energy solution for thermal comfort, for either cooling (with cold water) or heating (with hot water) air as it passes over specially designed fins.

[24] Witness Statement: A27920684
[25] Review Evidence: A28612207

4.5.22. The type specified for the QEUH are ‘active’ for heating purposes, which means they utilise hot water and mechanically transfer heat to the room’s air supply as it passes over the fins. These generally operate at low airflow rates as increasing output requires more energy and would defeat the purpose of specifying them. This allows lower ACH levels for thermal comfort and improves energy efficiency.

4.5.23. The Review was provided with information on the design process (the Mechanical and Electrical Clarification Log) regarding the chilled beams. [26] This indicated that a figure was used for air supply volumes of ‘eight litres per second per person’. This figure coincides exactly with the prescribed minimum found in the Building Standards technical handbook for non-domestic buildings (Section 3: Environment) for occupiable rooms.

4.5.24. Assuming a patient and up to four others occupy a room, this equates to 40 litres per second per room, which is approximately 2.5 ACH. The Review heard that the project team viewed six ACH as a ‘Recommendation’ (the title of SHTM 03-01 Appendix 1 is ‘Recommended air-change rates’) – not a mandatory standard – whereas the minimum, per Scottish Building Standards, has been estimated as 2.5 ACH, which reduces energy consumption. [27]

4.5.25. It is therefore probable that air flow in general single rooms has been designed as 2.5 ACH to assist the building in achieving a ‘BREEAM Excellent’ rating. The question of whether this impacts on infection risk does not have a satisfactory answer as there is a lack of definitive empirical evidence. The general principle is that infection risk increases as ACH reduces, which is true in shared rooms. Studies indicate that two ACH is a vital threshold for human health, which also relates to build up of CO_2 (9) (10). Therefore, this design decision is unproven for a single room configuration, has increased infection risk in general rooms with shared occupancy or staff in close attendance, and is very close to the vital threshold of two ACH. The combined disadvantage of not being able to open windows in these rooms means that the margin in the event of mechanical failure, even a minor reduction in performance (which is common), is slim.

Ventilation System and Air Quality – Specialist Rooms

4.5.26. The design of the ventilation system also had implications for several specialist wards. These were as follows:

- Isolation rooms (adult hospital);
- Haemato-oncology ward (adult hospital 4B);
- Haemato-oncology ward (children’s hospital 2A).

[26] Witness Statement: A28153165
[27] Witness Statement: A28153165; and A27996988

4.5.27. The main purpose of an isolation room is to prevent the spread of airborne diseases, by either preventing contaminated air leaving the room to infect others (source isolation), or preventing unfiltered air entering the room to infect the isolated patient (protective isolation). This is usually managed through careful design of the room and its ventilation equipment. The room needs to be well sealed so air can only move in and out of the room through controlled means, usually via HEPA filters.

4.5.28. At the time of the QEUH design phase, such rooms could be designed with a Positively Pressurised Ventilated Lobby (PPVL), which creates a secondary entrance between the room and the corridor to prevent air entering or leaving the main room. The importance of controlling the air pressure in these rooms is such that they need monitoring equipment and alarms to alert staff of any sudden changes or failures. Later chapters discuss some major drawbacks with the PPVL design for specific types of patient.

4.5.29. Various reports viewed by the Review identified a number of deviations from the original brief regarding isolation rooms, as follows:

1. Isolation suite extract vents terminate behind louvres on façade and formed turrets above plant room;
2. Safe change filter housings installed internally to the building;
3. Non-standard extract ventilation between bedrooms and en-suites;
4. No low level air transfer grilles within the en-suite doors;
5. Excessive access hatches in ductwork;
6. No gas tight shut off damper or spectacle plate on extract systems prior to extract fans;
7. No audio and visual alarms outside entrances to gowning lobbies;
8. No common alarm panel at nurse station;
9. Supply and extract plant and duct access hatches not identified as a biohazard;
10. Supply and extract plant and duct access hatches not identified with the rooms they serve;
11. Lobby dial pressure gauges inappropriate for monitoring the requisite pressure differential.

4.5.30. Most of these non-compliances impact on infection risk. For example, items one to six directly impact on the ability of the ventilation system to adequately control the quality and movement of air, and items seven to eleven relate to monitoring and management of any failures of the system that can lead to harm from contaminated or unfiltered air.

4.5.31. In the absence of evidence from the D&B contractor, it remains to be determined if these were omitted from the final design or are the result of installation errors. However, if they were the result of client design changes or D&B contractor design failings, then they may have been missed during the prescribed design review processes.

4.5.32. The haemato-oncology ward in the adult hospital (4B) required ‘protective isolation’ to prevent unfiltered air entering the room (as described earlier). This is because patients in these rooms tend to be immunocompromised or in a neutropenic state making them vulnerable to infection.

4.5.33. The Clinical Output Specification (COS) from NHS GG&C specifically identified this ward to include immunocompromised patients and stated side rooms for neutropenic patients to have positive pressure differential and HEPA filtration, citing HTM 03-01, although the Room Data Sheet (RDS) stated 40 l/s. This guide states 10 air changes per hour and a positive pressure differential of +10 Pascals for neutropenic patients.

4.5.34. The COS stated that the ward in general should be sealed with positive pressure to the rest of the hospital and supply air >90%, preferably by HEPA.

4.5.35. The design did not achieve the required air pressure differentials or air change rates. HFS and Health Protection Scotland (HPS) reports state that the ventilation system for ward 4B failed to achieve the following:

1. The requisite positive air pressure differential in patient rooms, relative to adjacent space;
2. The requisite air change rate in patient rooms;
3. The requisite positive air pressure differential between the general ward and the remainder of the hospital;
4. The requisite classification of HEPA filtration of air.

4.5.36. The Review received confirmation from respondents that Ward 4B only achieved 6 ACH (and not the recommended 10 ACH).

4.5.37. There was a lack of information on the ventilation design with regard to air pressure differential (both from room to corridor and corridor to remainder of the hospital) to prevent unfiltered air entering the patient area. However project documentation (PMI 424 & 471) and an independent report by HPS show only +7 Pascals between room and corridor and +2-3 Pascals between corridor and remainder of the hospital. These are below recommended levels and the closer the differential gets to zero, the greater the risk of air flowing in the wrong direction, especially if pressure stabilisers have not been installed to regulate and maintain the pressure differential. No evidence of such equipment was found in the drawings and documentation reviewed.

4.5.38. The design configuration for HEPA filtration was for the corridor to receive air from the bedroom which would be HEPA filtered. However there were ancillary rooms where non-HEPA filtered air was being supplied. This, combined with installation issues (discussed in the next chapter) had the potential to produce air quality problems; subsequent actions post contract have remedied some of these (discussed in Chapter 7).

4.5.39. The haemato-oncology ward in the children's hospital (2A) had to accommodate severely immunocompromised hematopoietic stem-cell transplantation (HSCT) patients. Like the adult Ward 4, this required 'protective isolation' with positive pressure relevant to adjacent spaces, to prevent ingress of unfiltered air, along with a highly filtered (HEPA) air supply. But, compared to the adult Ward (4A), there was far less detail around the specification of the ventilation at design stage.

4.5.40. There was an organisational split between the adult hospital and the children's hospital, each with their own Project Managers and respective teams. Consequently, there were slightly different approaches from each client team, evident in the level of information provided for their respective haemato-oncology rooms. The children's Clinical Output Specification was less comprehensive compared to the adult hospital.

4.5.41. The reason for this difference is not clear. However, some further confusion can be attributed to a lack of guidance covering severely immunocompromised patients. The guidance relied on for the specification was 'SHPN 04 – Supplement 1 Isolation Facilities in Acute Settings' (2008). This guidance explicitly excludes "infectious disease units or on wards where severely immuno-compromised patients are nursed" (11). The exclusion notice goes on to say "Guidance for these facilities will follow in a further Supplement to SHPN 04". No further supplement was ever produced.

4.5.42. Other relevant guidance (at the time) includes SHFN 30: Version 3 (January 2007) which recommends PPVL as a means of providing either source (negative pressure) ventilation for infectious patients, or protective (positive pressure) ventilation for immunocompromised patients. SHPN 54 (2002) recommends a balanced supply and extract ventilation to each room and lobby. HTM 03-01: Specialised ventilation for healthcare premises Part A: Design and validation (2007) provides guidance on design for immunocompromised patients, consisting of a positive pressure supply-only ventilation system, with criteria for a neutropenic patient ward as a positive pressure differential of +10 Pascals, 10 ACH and H12 filtration.

4.5.43. HPS (in collaboration with HFS) subsequently provided guidance to remedy the situation in 2018 based on HTM 03-01 criteria (discussed in Chapter 7), but the lack of consensus at the design stage should have resulted in a request for information and further discussion to resolve the matter. Since the D&B contractor has not provided evidence to the Review, it is not possible to ascertain if this was done. The resulting PPVL design was deemed by HPS to be not suitable for their purpose, given the exclusion in SHPN 04 – Supplement 1, and not fully compliant with other NHS design guidance. Remedial works in this respect are discussed in Chapter 7.

Water Supply

4.5.44. NHS GG&C required two water supplies for the QEUH (one from Govan Road and one from Hardgate Road) to allow for resilience, changeover and maintenance. Each supply was designed to serve both hospital buildings independently, feeding into two raw storage tanks of 100,000 litres each. The installed feed leads to the filtration plant that removes any dirt, debris and organisms to 0.2 micron (water-borne pathogens would be caught in this size of filter – Legionella, Pseudomonas and Cupriavidus microbes are generally in excess of 0.3 micron).

4.5.45. The main HFS guidance for water supply is SHTM 04-01 Water safety for healthcare premises. This guidance is published in several parts covering various aspects from design through to operation and use. Part A of this SHTM covers design, installation and testing.

4.5.46. The first version of this guidance was published in 2011; after completion of the Employers Requirements and midway through the design phase. Nonetheless, the D&B contractor was aware of the consultation draft and had committed to work to this specification. The contractor also made reference to the (then) superseded SHTM 2027 and the earlier English HTM 04-01, which creates confusion as to which guidance they followed.

4.5.47. Whilst IP&C and Estates and Facilities engagement was present regarding initial specifications and designs, Estates and Facilities teams felt that there were times when their views had been dismissed even with five of them involved in the project.[28] However, the Review assumes that NHS GG&C relied mainly on their external consultants and the D&B contractor for advice on the appropriate design solution. The Review heard that individuals from the Estates and Facilities teams with engineering backgrounds, who were consulted on, amongst other things, decisions about the water system, had little influence over these decisions.[29]

4.5.48. The design of the water supply included an additional 25% capacity in the distribution pipe work, pump systems, mains and risers, as well as a 10% spare capacity in the cold water storage when nil spare capacity was required. A retrospective review of the design by HFS noted that over sizing water pipe distribution systems may lead to stagnation in parts of the water system (larger diameter pipe work will have less velocity than smaller pipe work).

4.5.49. HSE guidance on the precautions to control Legionella in water systems, includes “ensuring water cannot stagnate anywhere in the system by regular movement of water in all sections of the systems and by keeping pipe lengths as short as possible, and/or removing redundant pipework and dead-legs” (HSG 274 Part 2 2014). Similar guidance is given in SHTM 04-01.

[28] Review Evidence: A27920684
[29] Witness Statement: A27920684

4.5.50. Another key aspect of the domestic water supply was the prevention of bacteria build up through the usual thermal control method. Both Scottish (SHTM 04-01) and earlier English (HTM 04-01) guidance recommends cold water to be no more than 20ºC and hot water in the system to be no lower than 55ºC, which is also consistent with HSE Regulations. The hot water feeding both hospital buildings was designed for 60ºC flow and 55ºC return.

4.5.51. This was designed to be heated in calorifiers via plate heat exchangers with Medium Temperature Hot Water (MTHW) from the Energy Centre. However, there were significant problems and delays with the design and build of the Combined Heat and Power (CHP) plant in the Energy Centre (January 2016).

4.5.52. Temperatures as low as 53^{0}C have been recorded and a review by HPS in 2018 found that “high levels of gram negative bacteria and fungus in the water system may indicate that temperature control required has not always been achieved”. [30]

4.5.53. Notwithstanding potential problems of the primary plant, a water distribution system the size and complexity of the QEUH would have benefited from specifying a secondary system for controlling build-up of biofilm and bacteria. [31] HSG 274 part 2 (The control of legionella bacteria in hot and cold water systems), states that in large systems, where a long period of time from filling to occupation cannot be avoided, continuous dosing with an appropriate concentration of biocide as soon as the system is wetted, combined with regular flushing at all outlets can control the accumulation of biofilm more effectively than flushing and temperature control alone.

4.5.54. While other disinfection methods could be used, maintaining 1–3 mg/l of chlorine dioxide is generally effective. However dosing at such high levels may reduce the life of the system pipe work and components.

4.5.55. This initial high level disinfection should not be confused with ongoing dosing at lower levels in operational systems where the water is intended for human consumption. The Review heard that one of the NHS GG&C engineers recommended a chlorine dioxide system but the project team did not consider it in their design (although no written evidence could be found). A chlorine dioxide system is now in use at the QEUH (as discussed in later chapters). [32]

4.5.56. In addition, the expansion vessels associated with the calorifiers are not of the flow-through type as recommended in the HSE guidance document HSG 274 part 2 (The control of legionella bacteria in hot and cold water systems). The devices used can introduce a potential problem of microbial colonisation as plant room temperatures generally exceed that of the incoming water and the internal lining of the diaphragm is made of a material which has been shown to increase the risk of organism growth.[33]

[30] Review Document: A26441192
[31] Witness Statement: A28153165
[32] Witness Statement: A27920684; and A28153165
[33] Review Document: A26435388

4.5.57. These deviations from standard practice uncovered in the water system design are significant enough to consider them to have a detrimental influence on infection risk at the QEUH.

Budgets, Client Changes and Value Engineering

4.5.58. There has been no evidence to suggest that the budget for the design (CAPEX) of the QEUH was inadequate. However, the change from PPP to traditional capital funding resulted in the abandonment of the 25 year concession period, which is normally associated with PFI/PPP as part of the overall contract (as discussed earlier).

4.5.59. The Review heard that consequences of this change included an increased resource requirement from existing Estates and Facilities teams to reflect work they would now undertake, which was underestimated. [34]

4.5.60. Any budget associated with the concession period for PFI/PPP includes repayment of the capital cost, therefore it would appear more expensive. However, going from thinking maintenance and facilities would be 'outsourced' to bringing it in-house would have still had an impact on the maintenance budget which may have been underestimated. Problems related to this change, subsequent to handover and transfer of service are discussed later. But several witnesses interviewed by the Review highlighted the impact on the design phase in terms of input of Estates and Facilities staff for planning and specification decisions subsequent to this change. Although they were involved, the impact of the change on their increased role seems to not have been fully appreciated.

4.5.61. Although there were a number of the NHS GG&C Estates and Facilities team involved in the Client's project team, they are recorded as having no influence with regard to the design of the mechanical and electrical services or any input into the practicality of maintaining these services.[35] One of the impacts of this has already been discussed regarding the chloride dioxide dosing. Others, include Value Engineering decisions e.g. the specification for floor tiles in the adult hospital main atrium were changed to thinner tiles that subsequently cracked and failed. Whole life costs and flexibility for change of use seems rarely to have been considered for the service life of the hospital.

4.5.62. Whilst value engineering is a widely accepted method of ensuring the client receives value for money, it can have the opposite effect if the relevant parties and expertise do not review for potential impact the consequences of changes before the contractor takes the decision.

[34] Witness Statement: A27920684; and A28153165
[35] Review Evidence: A26435172

4.5.63. Other significant changes from the original client brief included adult Bone Marrow Transplant (BMT) and Infectious Disease (ID) services in the QEUH, neither of which the original design incorporated. The details of these changes are discussed in Chapter 5. However, they illustrate the impact in relation to the design in Figure 4.2 on the MacLeamy Curve i.e. the later the change, the more it will cost and (more importantly for this Review) the more difficult it becomes to change the functional capabilities of the building.

4.5.64. In this respect, the system for ventilation and air quality (as discussed earlier in relation to Ward 4B) was already installed at the time of the decision to change the BMT service location, and the subsequent design arrangement could only be considered a "sub-optimal solution", as described by a witness interviewed by the Review.[36] Therefore, the net effect for BMT patients (already a high risk patient group) was a further increase in risk.

4.5.65. The ID service change was even later in the project timeline. This decision did not feature on the design or project team's problem list as it was such a late change.

4.5.66. Consequently, there was an overreliance on the PPVL design to provide functionality similar to a negative pressure room. This proved to be an error as discussed later. In both these cases it was felt that, despite these compromises and the associated risks, there were significant clinical gains in locating these services and their patients within the QEUH building. This is considered in more detail in Chapter 3.

Taps and Basins

4.5.67. The design of wash hand basins, showers and taps in the QEUH hospitals were in line with the Scottish Health Technical Memorandum (SHTM 04-01) in place at the point of specification of the sanitary ware. This included the installation of taps with flow regulators (mainly the Horne Engineering 'Optitherm' range).

4.5.68. HFS and HPS were involved in the decision making process as was the NHS GG&C Infection Control Team. SHTM 04-01 states:

".....the type of tap should be carefully selected to minimise the formation of aerosols. The water flow profile must be compatible with the shape of the wash hand basin. Rosettes, flow straighteners and aerators have been found to be heavily colonised with biofilm but their removal can create turbulent flow at increased pressure resulting in splashing of surrounding surfaces and flooring. Current advice is that they should be removed but this should be subject to risk assessment."

[36] Witness Statement: A28153165

4.5.69. The Horne tap design included a plastic flow straightener which is essentially a flow regulator and conditioner to reduce splashing. However, the device also retains water through surface tension, which can lead to colonisation. SHTM 04-01 was revised in 2015 and no longer supports the use of flow regulators in clinical wash hand basins as a previously published outbreak report identifies problems with biofilm formation in flow regulators. [37] This update was issued after handover of the QEUH and the Review discusses its impact in later chapters.

4.5.70. The tap manufacturer confirmed with NHS GG&C that chemical disinfection of the Horne taps was permissible using “correct processes and concentration of product”[38]. However, their shipping documents all state that use of “harmful chemicals” will invalidate the warranty, which seems to include hydrogen peroxide, silver peroxide, peracetic acid and all derivatives of this type of product. The main recommended method was thermal disinfection. [39] The type of tap specified is therefore limited in terms of cleaning and maintenance for IP&C purposes.

4.5.71. SHTM 04-01 recommends that taps be specified to allow Point Of Use (POU) filters to be attached, if needed e.g. high risk areas. The tap manufacturer confirmed that the design was compatible. However subsequent use of the taps fitted with POU resulted in the exit point of the water from the taps being closer to the wash hand basin and as a result caused more splash which can lead to disruption of any drain biofilm as well as potential environmental contamination.

4.5.72. HPS has noted that the specification of multiple hand wash basins, throughout single rooms and their ancillary spaces, has resulted in infrequent use of some. This, coupled with increased use of alcohol based hand rubs, means basins may be unused, placing additional pressure on staff to undertake regular flushing regimes. Therefore, whilst in line with NHS design guidance, the specification of multiple basins may have had unintentional consequences for IP&C, which may not be limited to the QEUH.

4.5.73. These design and specification issues around taps and basins were considered acceptable and in line with NHS design guidance at the time. The example of the taps illustrates an important point about constant change in knowledge and lessons from experience of IP&C risks with the built environment elsewhere that drives change and has practical impact on building projects in progress. So whilst the Review discusses problems and ideal solutions with the benefit of hindsight, most of the decisions on taps at the design stage would have been in line with guidance and considered normal practice at the time. We discuss other issues around installation and commissioning in the following chapters.

[37] Review Document: A26435172
[38] Review Document: A26435388
[39] Review Document: A26435388

4.6. Summary Findings

4.6.1. The change in funding model from Public Private Partnership (PPP) to a capital model, albeit one which sought to retain the benefits of PPP in the Employer's Requirements, impacted on the project. Management of Estates and Facilities issues were not the responsibility of NHS GG&C as the client under the PPP model, but they were under the capital model. That change was not adequately incorporated into the revised project plan when the model changed.

4.6.2. There have been unintended consequences of the policy of 100% single rooms; these include the risk of water stagnation associated with low frequency of use of the high number of taps and sinks, and increased staffing requirements for clinical care, cleaning and flushing. These issues require a clear and sustained management plan; otherwise they could pose an increased risk of HAI. Nonetheless, there is no evidence in our Review of a causal link with infections in QEUH.

4.6.3. Neither NHS GG&C nor the contractors fully anticipated (or took account of) a number of changes in NHS Design Guidance and Safety Notices which applied to the QEUH project and arose during its lifetime. Some of these were remediable, for instance, taps; whilst others would subsequently prove challenging – e.g. the energy requirements for a critical care environment pose significant challenges for achieving 'BREEAM Excellent'.

4.6.4. NHS GG&C didn't make full use of the expertise available within its workforce. There was a pattern of individuals with experience offering assistance being declined; specifically, those relating to clinical environments for high risk patients and chlorine dioxide dosing of the water system, although it is acknowledged that GG&C did consult widely on these matters. Consequently appropriate expertise did not influence decisions (with hindsight) about design of the water system, the ventilation system and air quality. This had consequences especially for vulnerable, immuno-suppressed patients.

4.6.5. The decision to specify sealed windows, to control the air environment of the hospital (and keep out foul odours), meant all fresh air had to be mechanically ventilated. The mechanical ventilation system does not achieve the number of air changes per hour specified in guidance (although some rooms have been upgraded per discussion in Chapter 7) and windows do not open to boost air flow.

4.6.6. The energy target within BREEAM appears to have been a significant influence in the decision to specify sealed windows, chilled beams, and minimise overall capacity for the mechanical ventilation system. However achieving the high rate of air changes recommended for critical areas requires plant which consumes greater energy (discussed in Chapter 7). In turn, the balance shifted toward achieving the 'BREEAM Excellence' target instead of air change rates that met NHS guidance standards.

4.6.7. We endorse the finding of the Quesada CFD Report that there is no evidence to support the hypothesis that there is a causal link between the helipad and air contaminated with pigeon droppings being forced into the hospital ventilation system.

4.6.8. There was – and still is – uncertainty between built environment professions and clinicians as to whether NHS design standards relating to air changes and pressure differentials, are mandatory or recommended guidance (despite HFS stating it is merely guidance). This has resulted in BREEAM taking precedence over these standards. The net effect is that the margin of safety in terms of hospital air quality impacting on routine infection prevention is likely to be slim. Regular monitoring and rapid problem solving is vital.

4.6.9. Late changes to room requirements, for adult Bone Marrow Transplant and Infectious Disease, resulted in sub-optimal ventilation systems for these patient groups. Air changes are below recommended levels, positive pressure levels in isolation rooms for immuno-compromised patients, and negative pressure for infectious disease patients, were not adequate when the hospital opened. Fixing these problems has meant service disruption for patients and staff, and additional costs.

4.6.10. The large and complex water system relied purely on temperature control to prevent build-up of biofilm and bacteria. From the outset of planning secondary measures, such as chlorine dioxide (now retrofitted), should be a serious consideration for large complex water systems such as that in the QEUH, to ensure water quality at all times.

4.6.11. The design of the hot and cold water systems has negatively impacted water quality. The water distribution system was over-sized, which is known to encourage water stagnation. And significant problems with the Combined Heat and Power (CHP) plant have resulted in hot water temperatures below recommended levels for bacterial growth.

4.6.12. There was an expectation that Health Facilities Scotland and its UK counterparts would publish the supplement to SHPN04 about detailed design of isolation rooms and associated areas for people with profound immuno-suppression; the lack of this document introduced significant uncertainty to the Project design.

4.6.13. The portfolio of Health Technical Guidance for construction and vital systems does not fully cross-refer with other policy driven elements, such as BREEAM compliance.

4.7. Recommendations

4.7.1. The implications of major funding changes need to be clear in relation to whole life costs and whole life risks, as the operational phase of a building's life is where such issues have the greatest impact.

4.7.2. The expertise available to the project team must accurately reflect the requirements of the contractual and funding models.

4.7.3. The impact and benefits of single rooms should be reviewed so that future design and management of facilities take full account of this policy in the light of experience at the QEUH.

4.7.4. NHS Boards should set up a specific working group for projects of long duration (more than three years) to advise changes or new guidance affecting IP&C and other key risks. This could be a function of the IP&C team or other dedicated resource, during major projects.

4.7.5. When considering specialist built environment expertise, NHS Boards should make diligent enquiries regarding in-house and national NHS agencies, in addition to external consultants, and ensure they are involved throughout the project. Decisions around water and ventilation systems in particular, when accommodating patients vulnerable to infection, can greatly benefit from those who have experience in such matters, and who understand the impact of design and contractor variations on infection risks.

4.7.6. When considering high-level options, design teams should consider fully the implications for built environment choices on IP&C, seeking specialist expertise early, and link satisfactory IP&C sign-off to release of funds (e.g. NHSScotland Design Assessment Process (NDAP). The new National Centre for Reducing Risk in the Healthcare Built Environment could provide or signpost to such expertise.

4.7.7. NHS building specialists and design teams preparing and reviewing guidance on BREEAM for certain specialist acute treatments should recognise the energy requirement that supports patient care and adjust goals for BREEAM accordingly.

4.7.8. The new National Centre for Reducing Risk in the Healthcare Built Environment should investigate and produce definitive guidance on the status and hierarchy of NHS Design guidance for IP&C and the built environment. Specifically, what is guidance and what should be mandatory.

4.7.9. Governance arrangements for change management, especially major changes during projects need to include input from those with knowledge and understanding of the built environment impact on IP&C.

4.7.10. NHS buildings guidance should make explicit reference to the need for secondary controls (beyond usual thermal control) for large and complex water distribution systems.

4.7.11. Advice and quality assurance on design issues that impact on infection risks – not just the water system but ventilation and others covered in Design Guidance SHFN 30 – should be stronger than it has been. The Design & Build form of contract should, in future, allow more robust design advice to clients.

4.7.12. NHS England and the new National Centre for Reducing Risk in the Healthcare Built Environment, with other UK national agencies with the remit, should produce the supplement for people with profound immuno-suppression, missing from Design Guidance SHPN 04.

4.7.13. NHS England and the new National Centre for Reducing Risk in the Healthcare Built Environment, with other UK national agencies with the remit, should agree and deliver a programme of guidance that reflects modern construction knowledge of good practice, and redress recent lack of investment in the Design Guidance HTM portfolio and associated publications.

4.8. References

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Chapter 5

Built Environment: Construction

5.1. Introduction

5.1.1. This chapter reviews the construction phase of the Queen Elizabeth University Hospital (QEUH) project, describing events and relating them to guidance, standards of workmanship and project management at the time. The accounts presented are based on documents from NHS Greater Glasgow and Clyde (NHS GG&C), NHS guidance and standards, third party reports and information drawn from formal interviews.

5.1.2. The construction phase of large projects tends to overlap the design phase, especially Design and Build (D&B) projects. Therefore, there is usually design development running concurrently with construction work.

5.1.3. This is a legitimate approach which saves time compared to the traditional way of completing the design first, then building it. However, this overlap is dependent on decision-making and design information flowing uninterrupted, or construction work can be affected. This issue is also true for late changes to the design, as mentioned in the previous chapter.

5.2. The Key Issues

5.2.1. The key building issues related to the construction phase were as follows:

- Water supply and quality;
- Ventilation and air quality;
- Impact of changes during the build;
- D&B Contractor arrangements for coordination and quality control;
- NEC Supervisor role in quality assurance.

5.3. Background and Context

5.3.1. The D&B contractor was employed from December 2009 to develop the design to Full Business Case (FBC), which was approved in October 2010. The client, NHS GG&C, then instructed the D&B contractor in December of the same year to start the design and build of the Adult Hospital, Royal Hospital for Children, and Energy Centre.

5.3.2. During this stage of preparation for the construction works, NHS GG&C appointed a Supervisor under the New Engineering Contract (NEC3) to undertake a review of the design and monitor that the works were installed and commissioned in line with the contract.

5.4. Related Guidance and Standards

5.4.1. Figure 5.1 shows the high-level processes of a typical construction project for the construction phase of healthcare buildings. This is the remainder of the Table shown in Figure 4.1 in Chapter 4, based on the original from SHFN 30 (1). The final column of Figure 5.1 highlights any infection prevention and control (IP&C) issues for NHS teams to consider. Note that for 'construction' the column is blank, indicating that as far as NHS clients are concerned, the contractor should be installing what has been agreed in the design. However, guidance recommends that infection control personnel inspect the construction site frequently to make sure the workers are following the correct guidance (1).

5.4.2. Meeting this recommendation would require IP&C practitioners to have particular and specific levels of knowledge and understanding of construction processes and their impact on IP&C.

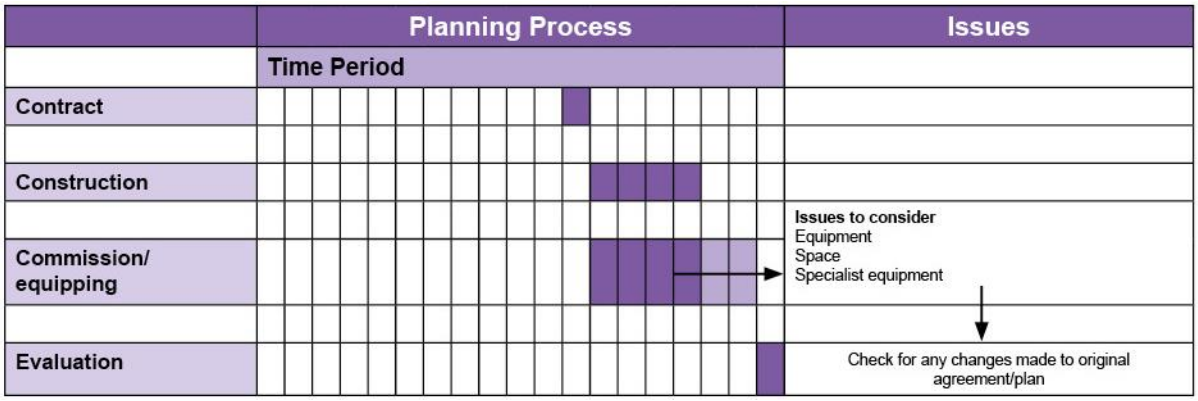

Table 5.1 Construction Phase Processes

Source: (1) Page 38

5.4.3. Installation of the water system should be in accordance with the Water Regulations Advisory Scheme (WRAS) regarding fittings and materials. Statutory Acts and Regulations also apply to water systems, including those covering control of Legionella risks (HSG 274 & L8), Scottish Water Byelaws (2014), as well as specific NHS Guidance documents already mentioned in Chapter 4.

5.4.4. Good practice for workmanship when installing building services, including water, heating and ventilation, is generally provided by organisations such as the Chartered Institute of Building Services Engineers (CIBSE) and the Building Services Research and Information Association (BSRIA).

5.4.5. Such guidance includes recommendations, such as protecting incomplete ducts and pipes to prevent contamination. Although guidance from these organisations is not mandatory, it is considered standard industry practice and in several cases reflects statutory guidance.

5.5. Findings

Water Supply

5.5.1. According to various reports on the water system, the following installation defects were found:

a) The use of mild steel pipework;
b) The use of copper pipework;
c) The use of flexi-pipes;
d) The use of pipework from manufacturers not included in the operation and maintenance (O&M) Manuals and not relevantly approved;
e) Leaving pipework open during installation work (making it vulnerable to contamination);
f) Pipework and fittings corrosion;
g) Corrosion of domestic water meters.

5.5.2. The Review found instances of the wrong type of steel being used for pipes, as well as wrong diameter pipes (314mm when 316mm was specified). We are aware of ongoing investigations regarding the suitability of these materials against WRAS approved guidance, but the presence of premature corrosion reported in relation to some fittings would indicate a possible problem with the suitability of the material for the function for which it has been installed.

5.5.3. Flexible hoses (or flexi-pipes) are commonly found in domestic plumbing installations as a quick and easy way to connect between different pipes, equipment and changes of height, especially when there is potential for movement e.g. vibration from pumps. However, their use is not recommended for pipes carrying potable water in healthcare settings because of their propensity to promote bacterial colonisation. Health Facilities Scotland (HFS) found evidence of installation of flexi-hoses in “potential contravention to Safety Action Notice SAN (SC)09/03” (2009).

5.5.4. This Safety Action Notice (SAN) relates to use of rubber-lined flexi-hoses for potable water installations, where Legionella bacteria and other potentially harmful micro-organisms can colonise. HFS stated the contractor had advised them that the flexi-hoses were WRAS approved, but it cites concerns raised by an independent contractor and the Authorising Engineer, which questions this. In any case, it was previously agreed that no flexi-hoses would be used in the build.

5.5.5. HFS notes in its report (March 2019) multiple examples of Supervisor reports identifying pipes with open ends prior to, or at intervals during, installation, providing opportunities for water and debris to enter. These examples included the hot, cold, heating, and chilled water pipework, with the Supervisor stating on several occasions that the contractor should be made aware of “ingress of moisture and subsequent corrosion that may develop”. In other cases these included pipes wide enough to allow small creatures to enter.[40]

[40] Witness statement: A28153165

5.5.6. HFS note in their report (March 2019) that SHTM 04-01 Part E (applicable at the time of installation) states, “Any pipes delivered unprotected or with open ends should be rejected”. This is in relation to the risk of moisture and debris ingress, which is equally applicable to partially installed pipework. In addition the specification made it clear that pipework should be protected by caps to protect against dirt, creatures, frost and other inadvertent damage or consequences.

5.5.7. HFS identified the cold water pipes as being crimp-jointed using a proprietary tool. According to Supervisor inspection reports uncovered by HFS, there were failures of crimped joints at various points in the hospital, with the Supervisor asking the D&B contractor to confirm if it proposed to carry out a percentage quality inspection of the crimped joints to identify if it was operative error. There is no full account of the extent to which this occurred or the cause of the failures, but this would partially explain water leaks and subsequent corrosion problems, as most of this work is now enclosed within the building.

5.5.8. There were reports of high levels of dust during and immediately after the construction works, and concerns for patient safety were minuted in Infection Control Committee meetings regarding the same. During the construction of the main hospitals, some older buildings were simultaneously demolished. Dust, dirt and potential pathogens from demolished health buildings can present infection risks (1).

5.5.9. There is no physical or recorded evidence of high dust levels during the construction phase. However, as discussed earlier, there were numerous examples of ‘open pipes’ on record during construction, and water samples from 2018 recorded high levels of fungi across all areas sampled including the main water tanks. This does not mean the two are linked, but the water system should have been sealed on completion of the installation, indicating contamination probably occurred before then.

5.5.10. These installation issues collectively represent potential threats to the integrity of the water system and would pose an increased risk to infection unless there are active steps to address these issues.

Ventilation and Air Quality

5.5.11. All ventilation plant and installations should be provided and installed in accordance with the design specification and drawings. This also means that only approved items, such as filters, sealants and other components should be used. However, it is also common for the D&B contractor to make variations to the design, with approval from the client.

5.5.12. The general single rooms should have been designed to receive 6 Air Changes per Hour (ACH) per SHTM 03-01, but this specification agreed as 2.5 ACH (as discussed in Chapter 4). Evidence shows that the installation to general single rooms achieved the 2.5 ACH, which is what the client (NHS GG&C) representatives and the D&B contractor agreed at the time.

5.5.13. As stated in Chapter 4, it has not been possible to ascertain if the list of defects and missing items in single isolation rooms has been the result of design changes or non-compliances during construction. In addition, the Review heard[41] that IP&C teams highlighted the requirement for solid ceilings in isolation rooms, as opposed to the typical suspended frame with tile inserts that were installed.

5.5.14. This preferred approach, recommended in SHFN 30 (2007), is "homogeneous plastered surface with flush-mounted recessed lights, ventilation grilles and other ceiling fixtures, where possible". The guidance goes on to say that "Removable ceiling tiles in a grid layout are not advised for isolation rooms" for the reasons given in Chapter 4.

5.5.15. The haemato-oncology ward in the adult hospital had a design for ventilation air changes and pressure differential below recommended levels, as described in Chapter 4. When the project moved into the build phase, client changes were made that compounded these problems.

5.5.16. Construction of the adult hospital began in early 2011. In June of 2013, NHS GG&C issued a change order to enable the Haemato-oncology ward (Ward 4B) to accommodate Bone Marrow Transplant (BMT) from the Beatson Oncology Centre.

5.5.17. Work on the fit out of this area was subsequently halted whilst the client requested design details using the previously prescribed design review process. A follow-up change order advises the need for a number of negatively pressured rooms included in the refurbished area e.g. the room where nurses prepared injectable drugs such as Pentamidine.

5.5.18. At the time there was no available UK guidance on the specification for BMT units and therefore the rooms were designed to standards set out in SHPN 04-01 and draft SHTM 03-01. This approach suffered from the same deficiency that we discuss in Chapter 4 i.e. the further supplement for SHPN 04-01 (concerning rooms where severely immunocompromised patients are nursed) was never published.

5.5.19. The isolation rooms had sealed external windows, no chilled beams, an air system supplying 6 ACH, high efficiency particulate air (HEPA) filtration, positive pressure of a small gradient (3-4 Pa) to the corridor, and in turn a very slight positive pressure from corridor to the rest of the hospital of 1.5-2.5 Pa.

5.5.20. As far as the contractor was concerned, they were working to the correct design. But the key issue that appeared to affect the operation of the air system and subsequent air quality was that the ceiling was not sealed. This allowed leakage into the ceiling void, so air with particles is able to move from this void into the room via loose fitting tiles or through the doorway when open due to a drop in room pressure.[42] As mentioned previously, NHS guidance for similar rooms recommends an airtight solid ceiling construction (SHFN 30: Para 9.117).

[41] Witness Statement: A27969615; and A27867258
[42] Review Evidence: A26346066

5.5.21. Correspondence around the time of the decision about the BMT Unit changes highlights the problems illustrated in the MacLeamy Curve (Figure 4.2, Chapter 4) on the difficulty in affecting functional capabilities. Correspondence viewed by the Review[43] described the Air Handling Unit (AHU) feeding Ward 4 as being at full capacity to achieve 6 ACH; therefore it would need to be upgraded to achieve 10 ACH, including major strip out and reinstatement of all associated plant.

5.5.22. Further upgrades were undertaken, post-handover, which are discussed in Chapter 7. However, the 'Pentamidine' room seemed to be installed with negative pressure as per the design with no further problems.[44] This was the only room identified as installed with negative pressure to the corridor.

5.5.23. Throughout the adult and children's hospital there were rooms indicated in the Employers Requirements as requiring negative pressure to prevent infectious diseases spreading. However, the client was convinced by the contractor's proposals that the positive pressure ventilated lobby (PPVL) design would achieve the same outcome by acting as a buffer between the room and the corridor, thereby preventing air moving in or out. This was not the case as the design (as built) allowed pressure changes when doors to and from the lobby rooms were opened, thereby allowing any air from a highly infectious patient to leave the room. Remedial actions to this problem are discussed in Chapter 7.

5.5.24. The children's haemato-oncology ward utilised a PPVL which is now considered unsuitable (as of January 2018) for immunocompromised patients. [45] However, this was the design that the contractor built with the knowledge of those responsible at NHS GG&C, even though there was no specific guidance at the time.

5.5.25. Reports containing arguments for and against the design and construction of this ward have been withheld from the Review for legal reasons. However, witness statements to the Review identified problems such as "abnormal ductwork connections" and use of 'thermal wheel', a device that increases energy efficiency but risks cross contamination from extract air to intake air ducts, as well as air leaking from voids via gaps in sink waste pipes through walls, and via permeable suspended ceilings.

5.5.26. Use of thermal wheels is permissible under NHS guidance for general wards, but not where vulnerable patients are treated. The Supervisor raised the issue of problems with future change of use where thermal wheels were specified. Therefore it would seem that, between design and installation, the use of these rooms should have triggered removal of the thermal wheel, but this was not the outcome[46]. Omission of HEPA filters have also been noted in Ward 2A rooms where they would have been expected. These factors all have an impact on air pressures and air quality.

[43] Review Evidence: A26346066
[44] Review Evidence: A26346066
[45] Review Document: A27939191
[46] Review Evidence: A28525853

5.5.27. Since the D&B contractor declined to be interviewed formally and suitable representatives from the Supervisor organisation could not be traced, this has prevented the collection of confirmatory evidence regarding quality control and assurance during the build from the D&B contractor's perspective.

5.5.28. Documentary evidence (already discussed) regarding pipes left open, use of incorrect materials, omission of HEPA filters, and poor workmanship around wall penetrations indicate gaps in quality control. Although these are easily rectified, some have had a detrimental impact on infection risk. The open pipes in particular were repeatedly mentioned in Supervisor reports.

5.6. Summary Findings

5.6.1. Without the benefit of explanations from the D&B contractor and their supply chain, the gathering of evidence which would give the Review the complete picture was materially restricted. The overall lack of project documentation was of concern and, while it may very well exist, much of it was not available to the Review team, or previous investigators. This problem was exacerbated by the contractor not participating in the Review.

5.6.2. There is a lack of documentation evidencing a robust approach to confirming and recording standards of finish in sealed areas such as behind walls and above ceilings prior to closure. Existing technology should have allowed this to be recorded.

5.6.3. There were non-compliances with the domestic water supply including open ended pipes during installation allowing debris to enter the system and corrosion on pipework; and stainless steel pipework in the basement water tank that was not to WRAS (Water Regulations Advisory Scheme) standard. These non-compliances allow contamination to occur and increase the risk of subsequent infection.

5.6.4. In general, ventilation systems were installed with air change levels that did not adequately take into account the risk of air-borne infection (in terms of air changes and pressure). IP&C teams could have alerted senior management if they had been involved in site inspections per SHFN 30 (see paragraph 5.6), assuming they had the requisite knowledge and understanding of such 'built environment' factors.

5.6.5. Ventilation systems to standard isolation rooms have been installed with numerous non-compliances. However, it is not possible, without forensic analysis, to determine if these were agreed design changes. All could have been rectified if spotted.

5.6.6. The D&B contractor did not query and resolve confusing/contradicting Employer's Requirements, which resulted in the system not attaining adequate positive pressure requirements.

5.7. Recommendations

5.7.1. There should be greater use of digital technologies to create, log and store project documentation. This would allow relevant information to be shared with project partners. It would also facilitate governance, and review of project activities and decisions.

5.7.2. There should be a reliable system of retaining major project records, with greater use of digital technologies to record images and other documents, as evidence of critical 'hold points' for future checking.

5.7.3. During the process of construction, tasks that do not comply with the specification, that the on-site Supervisor identifies, must be closed out and should act as a trigger to challenge the contractor if there are repeated errors.

5.7.4. Suitably qualified individuals from the IP&C team, with knowledge and understanding of the built environment, or someone representing the interests of the IP&C team (either from the NHS Board or the proposed National Centre for Reducing Risk in the Healthcare Built Environment) should have sight of IP&C-critical works for comment and have the opportunity to raise any concerns throughout the life of a project.

5.7.5. All contractors (including sub-contractors) need to understand the implications of (what might seem inconsequential) deviations from prescribed standards for healthcare projects before undertaking such works. Ensuring this should be a vital part of the site management.

5.8. References

1. **HFS.** Scottish Health Facilities Note 30 Infection Control in the Built Environment: Design and Planning Version 3. s.l. : NHS National Services Scotland, 2007. SHFN 30.
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Chapter 6

Built Environment: Commissioning

6.1. Introduction

6.1.1. This chapter reviews the commissioning phase of the Queen Elizabeth University Hospital (QEUH) project, relating the events that occurred to guidance and standards that applied at the time. These include various aspects of testing, validating and issuing of documentation for plant and installed equipment that make up the various building services systems. This account is based on documents from NHS Greater Glasgow and Clyde (NHS GG&C), NHS guidance and standards, third party reports, and information drawn from formal interviews.

6.1.2. The commissioning process usually consists of running the building services systems installed within a building for the first time and performing various tests and checks to ensure that they operate correctly. The building services of most interest to the Review were those specifically for water and ventilation. Likewise, the arrangements for implementing and checking these processes were also of interest.

6.2. The Key Issues

6.2.1. The key building issues related to the commissioning phase were as follows:

- The role of NHS GG&C;
- The role of the Supervisor (under the NEC3 Contract);
- The role of the Design and Build (D&B) contractor
- Commissioning documentation;
- Commissioning of the water system;
- Commissioning of the ventilation system.

6.3. Background and Context

6.3.1. Under the original Public Private Partnership (PPP) agreement, the Lead Consultant was to oversee the commissioning of building services as part of their contract. As discussed in Chapter 4 this changed to a traditionally-funded capital project, with subsequent change from a Joint Contracts Tribunal (JCT) contract, to a New Engineering Contract (NEC3) at the time This change resulted in a new Lead Consultant and the appointment of a ‘Supervisor’, in accordance with the terms and conditions of the HFS Consultants framework in place at the time, and in line with NEC3 standard appointments, to act independently of the Project Manager.

6.3.2. On the QEUH project, the Supervisor was required to: monitor the (D&B) contractor’s activities, test the building services and report direct to the client; identify, record and advise the client of any outstanding defects; and issue a final Defects Certificate along with assurance of correction of any outstanding defects after 24 months of issuing the Completion Certificate.

6.3.3. The D&B contractor had the responsibility to manage all technical commissioning via an Independent Commissioning Engineer, along with its specialist sub-contractors. In addition, the commissioning phase required other third parties to either witness or take part in the commissioning process. This included input from 'Authorising Engineers' (public sector positions usually held by experienced engineers, covering safety aspects of various disciplines, including water, as part of the operation of health-sector buildings) and witnessing by the Supervisor.

6.3.4. However, a Project Management Instruction (PMI) was issued by NHS GG&C in July 2013 to allow the D&B contractor to undertake the Independent Commissioning Engineer role directly.[47] The implications of this change are discussed later in this chapter.

6.4. Related Guidance and Standards

6.4.1. General guidance on commissioning activities can be found in the Scottish Health Facilities Note (SHFN 30) Version 3 (2007) which was applicable at the time. This guidance recommends a phased approach to commissioning, with a strong emphasis on controlling the systems post testing to prevent contamination and ensuring cleanliness until handover.

6.4.2. According to SHFN 30, the Infection Prevention and Control (IP&C) team should visit the site as often as possible to familiarise themselves with the layout of the various departments (once the building works are at a stage when site visits are practicable). This is to enable them to detect any unidentified problems or ones caused by design changes.

6.4.3. The commissioning stage is usually when appropriate staff training should be carried out for example operation of building services, and maintenance of plant and equipment. Training and familiarisation of clinicians usually happens in a later commissioning phase, as described below.

6.4.4. The Scottish Capital Investment Manual (SCIM) provides further guidance on the commissioning process for health-sector projects. This requires a Commissioning Master Plan to be created as part of Outline Business Case (OBC) and developed at Full Business Case (FBC). As the Master Plan is developed it should split the commissioning brief into 'Technical Commissioning' (TC) and 'Operational Commissioning' (OC).

6.4.5. TC should involve appropriate technical teams and be aligned with relevant technical standards, project designs, specifications and derogation lists. OC should include operational teams, e.g. IP&C teams, who should agree operational requirements, undertake site visits and attend required training.

6.4.6. The SCIM provides detailed guidance, templates and example checklists for the commissioning process, including roles and responsibilities for a dedicated Commissioning Manager and working groups, commissioning teams etc.

[47] Witness Statement: A27996988; and A28153165

6.4.7. Technical guidance is provided in the relevant SHTMs (03 series for ventilation, 04 for water) and by industry bodies, such as the Chartered Institute of Building Services Engineers (CIBSE) Commissioning Code 'A': 'Air Distribution' and Commissioning Code 'W': 'Water distribution'.

6.4.8. Provision of documentation is an important part of the commissioning process. The two main repositories of critical information for healthcare building projects are the Operation and Maintenance (O&M) manuals and the Health and Safety File (a Statutory requirement under the Construction (Design and Management) Regulations 2007 – amended 2015. These two files are invariably merged together, but between them they should contain documentation such as commissioning certificates, operation manuals, including information on appropriate cleaning, maintenance, any decontamination procedures as well as issues related to decommissioning.

6.5. Findings

The Role of NHS GG&C

6.5.1. The OBC for the QEUH made some passing references to commissioning in relation to IP&C, in that the expected benefits ("improved HAI rates" and "improved space") of single-room facilities would be monitored through the commissioning process.

6.5.2. The FBC provided more detail in a draft commissioning plan, indicating the hospitals would be 'Technically Ready' (i.e. Technical Commissioning) by 31 January 2015, with 'Hospital Commissioning' (Operational Commissioning) scheduled to take place 1 February 2015 – 20 July 2015 (23 weeks, two days). The end-date was in effect the planned entry date for patients. This end-date for Operational Commissioning also coincided with the planned start of demolition works to existing buildings. Therefore, Operational Commissioning would take place whilst demolition works were progressing close by.

6.5.3. According to the FBC, 6,000 rooms throughout the QEUH campus needed to be commissioned. However, the document deals almost exclusively with Operational Commissioning, such as installation of fixtures and fittings and migration of services. There was some mention of Technical Commissioning, scheduled to take place towards the end of the construction phase, which would be developed as part of the Employers Requirements at a later date.

6.5.4. The FBC stated that members of the Estates and Facilities teams would integrate, alongside the Supervisor team, into the construction phase, involved in testing, commissioning and handover, as well as interfacing with manufacturers and participating in awareness training.

6.5.5. Two Estates and Facilities team members were assigned to assist with coordination of commissioning activities. However, the Review heard that Estates and Facilities teams did not participate as fully as expected in the various commissioning activities (despite five of them being directly involved in the project).[48]

6.5.6. The Employers Requirements contained more information on the Technical Commissioning. They required the Supervisor to witness commissioning activities and undertake testing of building services installed by the contractor. As mentioned previously, the contractor was to appoint an Independent Commissioning Engineer to manage and collate all test results, certificates and related documentation for the Supervisor. This would have provided assurance that testing and commissioning was taking place in accordance with prescribed methods as well as aiding coordination of an extensive amount of documentation for future reference.

6.5.7. As mentioned earlier, NHS GG&C issued an instruction handing all duties of the Independent Commissioning Engineer to the D&B contractor. The reason given for this decision was that the D&B contractor already possessed the knowledge and understanding of the building systems and could therefore undertake the role more efficiently than a third party. However, this approach relies on a great deal of trust in the D&B contractor to have their own 'independent commissioning engineer' undertake testing at appropriate times, and take any corrective action – no matter what impact that may have on the works schedule or any implications necessary to remedy them.

6.5.8. In theory, the D&B contractor would incur potential reputational damage if they failed adequately to discharge this role, which may be considered enough incentive to do so. Senior members of the project team interviewed by the Review had no problem with this arrangement.[49] However, as it has transpired, the issues described throughout this Review would question this course of action. Further, as the Review discusses later, we have been told that commissioning documentation has been extremely difficult to find which means there has been a dearth of information to prove certain commissioning activities had in fact been completed or, if they were, whether they had met the design criteria and expected standards. Similar issues have been found in other reviews, such as the Edinburgh Schools (1).

The Role of the Supervisor

6.5.9. The Supervisor (under NEC3) had a specific contractual role in relation to commissioning, as described earlier, reporting to the Project Director. There were concerns around a drop in the provision of resources by the Supervisor during commissioning works.[50]

[48] Witness Statement: A27920684
[49] Witness Statement: A27796503; and A27871832
[50] Witness Statement: A27871832

6.5.10. This concern was reflected in minutes of Supervisor meetings in late 2014 as mechanical and electrical (M&E) testing activities began to increase. Whilst this role is predominantly concerned with site workmanship and commissioning (similar to a Clerk of Works), some clients utilise the Supervisor for an enhanced role to provide independent advice on the design and specification. This was the case on the QEUH project, but documents the Review examined indicated the fees agreed underestimated the full remit of the Supervisor.

6.5.11. If a consultant cannot complete their works within the agreed budget they generally carry that risk and need either to request additional sums or try to meet their contractual obligations with reduced resources if they want to remain within budget.

6.5.12. The fees and resource schedule for Supervisor services of the QEUH were capped (and subject to the terms and conditions of the HFS Consultant Framework in place at the time), with only NHS GG&C approval for any additional resources and there was no evidence of a request for additional budget. Unfortunately the Supervisor organisation has been subject to various mergers and organisational restructuring in recent years, resulting in problems identifying individuals who could provide information and their interpretation to the Review. Therefore, only information provided by others has been available.

6.5.13. Based on the documents available, the fees agreed appeared low for the scale and complexity of the services required for the project. The Supervisor organisation was required to monitor and audit the contractor's commissioning activities but the lack of commissioning evidence, as mentioned previously, prevents further investigation to assess to what extent they compensated for the absence of the Independent Commissioning Engineer.

The Role of the D&B Contractor

6.5.14. According to project documentation seen by the Review, the D&B contractor managed all aspects of testing and commissioning and the Supervisor witnessed these. Minutes of meetings identified numerous occasions where the contractor cancelled or rearranged testing (that the Supervisor was expected to attend), which is not uncommon but would have impacted on Supervisor resourcing.

6.5.15. There were also occasions of the D&B contractor undertaking testing that the Supervisor was not aware of. Towards the end of 2014, minutes of meetings mention an increasing number of M&E test failures (but there was insufficient detail to determine if these were specific to ventilation and/or water) and concerns that the commissioning period (which followed the testing) was becoming too tight. These issues would not have been overly concerning as long as they were addressed, but there was not enough documentation to confirm this.

6.5.16. There is a record of around 4,000 defects and incomplete works at handover. Given that the combined hospitals had 6,000 rooms, this seems on the face of it, a low number per room. However, Estates and Facilities staff reported around 300 workers from the D&B contractor, removal contractors and GG&C contractors on site post-handover. This gives some indication of the amount of activity which created operational problems for NHS GG&C staff, who were undergoing staff familiarisation tours at the time.[51] [52]

6.5.17. Another source of frustration for Estates and Facilities staff, was the feeling that certain remedial works were not considered as such by senior management, but rather as maintenance tasks. This meant additional work for operational staff to address building failures arising post-handover. This problem can arise when a specification is agreed to by the client but subsequently fails.

6.5.18. The documentation of this period is insufficient to ascertain if these snagging and remedial works were carried out in accordance with SHFN 30 e.g. protecting clean finished areas from dust and contamination.

6.5.19. We heard that some tasks were absorbed on to the maintenance work schedules. Whilst in-house maintenance staff would be expected to know and follow the guidelines in SHFN 30, there were reports of the D&B contractor staff carrying dirt and mud into the hospital during this time.

Commissioning Documentation

6.5.20. Under the terms of the contract, all technical testing and commissioning were to be made part of the O&M manuals, in both hard copy and digital format, uploaded to an online system; known as 'ZUTEC'. However, the Review has not seen hard copy O&M manuals and the ZUTEC system is missing a large proportion of testing and commissioning documentation. Supervisor meeting minutes contain multiple references, stating missing information in the ZUTEC system throughout the construction phase. [53] This was the D&B contractor's responsibility.

6.5.21. A review by Health Facilities Scotland (HFS) into the water system indicates that many of these concerns were not addressed. Regarding basement water services: "only one calibration certificate is presented in ZUTEC, which is surprising given the physical size of the installation", and regarding taps: "the data in ZUTEC is at best difficult to reference and is incomplete as NHS GG&C has had to ask the contractor for some of the results not contained within ZUTEC." [54]

6.5.22. In addition, the HFS report lists the following files on ZUTEC as "empty":

- Building description;
- Public and Local Authority Consents;
- Quality Assurance/Quality Control;
- Schedule of Guarantees and Warranties;

[51] Witness Statement: A28153165; and A27920684
[52] Review Evidence: A28046651
[53] Review Evidence: A28528038
[54] Review Evidence: A26435388

- Residual Hazards;
- Statutory Requirements;
- Employers Requirements;
- Principals of Design;
- Compliance Documentation;
- Third Party Approvals.

6.5.23. These are just some examples of many instances of missing documentation in the ZUTEC system. Estates and Facilities staff have conveyed frustration at trying to retrieve information and interpret information that has been found.

6.5.24. Virtually all testing and commissioning information in relation to the various problems investigated by the Review are missing. Overall, there is a lack of confidence in the ZUTEC system, which should have provided critical information to demonstrate that appropriate testing and commissioning had taken place, and to what extent it had passed or failed. Without this documentation, the Review can only rely on information uncovered and documented post occupancy and in retrospective reports such as those by HFS. It is also worth noting that an Independent Commissioning Engineer would have had the responsibility for coordinating and collating this documentation.

Commissioning of the Water System

6.5.25. As part of the commissioning process, the D&B contractor used a water treatment disinfection product known as ‘Sanosil Super 25’ which includes silver and hydrogen peroxide.[55] [56] This product complies with the relevant water supply and quality regulations and is recommended by HSE (HSG 274).

6.5.26. The D&B contractor sought advice from the manufacturer of the Mains Filtration plant on the concentration of Sanosil to use for disinfection of the water system. This was agreed as 150 parts per million (ppm). However, guidance from the manufacturer of the Sanosil quotes 500 ppm for general use in smooth pipe surfaces made of PVC or metal, and 1,000 ppm for a ‘shock disinfection’ of pipelines and tanks (if tests show bacteria are present).[57]

6.5.27. Even higher concentrations are recommended, of 6% where there is a high degree of contamination, and 10% to combat mould (mycelium), bacteria, yeasts and fungi. These concentrations also come with prescribed ‘contact times’ (how long it should remain in the system).

6.5.28. Records identified by HFS show the Sanosil was in the water system for one hour when the prescribed contact time was six to 12 hours. Further, the two main suppliers of taps for the hospital both state that hydrogen peroxide damages their products and its use invalidates the warranty. These are fundamental checks the D&B contractor should have either made or ensured their sub-contractors made.

[55] Witness Statement: A28153165
[56] Review Evidence: A26435388
[57] Review Evidence: A26435388

6.5.29. HFS also note in their report “the main 0.2 micron protection filters were not in place at the time the Sanosil was used, which may have caused micro-organisms to enter the system”.

6.5.30. Evidence from sterilisation tests of the water system in one of the plant rooms showed Total Viable Counts (TVC) of 10 and above, which is a test fail, as well as the presence of *E.coli*, a potential pathogen which is indicative of faecal contamination (although not necessarily human faeces). HFS provided evidence of repeated fails from samples taken at various water outlets during December 2014, stating that some were re-tested but failed again and there was no record of these being resolved at this time in the project timeline.

6.5.31. There was confusion as to which taps the tests relate to due to different (or missing) reference systems in the ZUTEC system, which is a problem in itself as discussed previously. More worryingly, there was no evidence of the *E.coli* finding being escalated to the NHS GG&C project team, IP&C team or others. The D&B contractor is the only party who could answer as to why this was the case.

6.5.32. The timeframe between sterilisation and commissioning to handover to the client was referred to as the ‘water management’. [58] The risk of water stagnation increases the longer it goes unused.

6.5.33. In such cases, (i.e. where buildings are not to be fully occupied immediately) HSE guidance recommends not commissioning the cold water tanks and piping until closer to occupation, when there would be demand for the water by occupants. However, discussion with manufacturers is needed to ascertain whether components need to be filled or can be left empty (HSG 274). If the system needs to remain wet for a prolonged period of time, HSE recommends regular dosing (noting chlorine dioxide as highly effective) in addition to flushing.

6.5.34. The contractor provided NHS GG&C with documentation stating their planned method for water management was flushing water through tap outlets regularly. When flushing, HSE recommend undertaking this weekly, as well as monitoring to keep cold water temperatures below 20^0C, and maintain required levels of any chemical treatments e.g. chlorine.

6.5.35. Unfortunately, due to a lack of evidence in the ZUTEC system it is impossible to ascertain what flushing regime took place or whether the additional activities recommended by HSE were undertaken.

6.5.36. In late April 2015, a Legionella consultant (DMA Canyon Ltd) undertook a water risk assessment. This identified a number of risks associated with the water system at handover. This included the following:

- A significant drop in calorifier temperatures (linked to failure of the heating system) resulting in hot water temperatures of 40-45^0C;

[58] Review Evidence: A26435388

- Dialysis, endoscopy wash, pressurisation units, steam humidifier units and MRI chiller cooling are all low usage but connected to the bulk water system, allowing potentially stagnant water to work back into domestic water supply unless backflow protection is installed;
- Cold water dump valves not triggering above 20^0C, allowing warm water (that should be cold) to flow to outlets;
- Installation of a reverse return circuit has resulted in longer dead-legs than SHTM 04-01 advises;
- Installation of flexi-hoses which present a risk of bacterial growth (as discussed in previous chapters);
- Steam humidifiers not yet commissioned and presenting a dead-leg problem without installation of backflow protection;
- A lack of management structure, including lines of communication and control of contractor activities (mostly remedial) during operational commissioning.

6.5.37. Most of these failures identified in the water risk assessment are potentially significant for IP&C. Prompt action did not follow on several of these findings, a matter that we address in the next chapter.

6.5.38. In addition to the DMA report findings, the Supervisor noted discoloured water in the domestic cold water supply a number of times during site inspections; they found debris in water tanks, indicating poor site practices.

6.5.39. HFS attempted to investigate anecdotal accounts of high dust levels during the latter stages of the construction works, possibly attributed to the adjacent demolition works. This was relevant due to the known risk of fungal spores (including aspergillus) that can be released during demolition of old healthcare buildings. But the results were inconclusive.

Commissioning of the Ventilation System

6.5.40. As with other areas of the Review, there was a dearth of commissioning documentation for the ventilation systems. The Supervisor had recorded pressure and flow testing of ventilation systems throughout the project. However, the Supervisor's role was limited to checking compliance with the works information; therefore the reductions in air changes and pressure differential levels approved by NHS GG&C would have been the Supervisor's benchmark.

6.5.41. Documentation of air flow test failures were in the Supervisor's meeting minutes. Some were subsequently re-tested and passed. However, there were others with no record of re-testing. We cannot resolve these issues without input from the D&B contractor.

6.5.42. During the run up to handover, there are minutes from the Board Infection Control Committee (BICC) meetings where repeated requests were made for assurances around the suitability of PPVL isolation rooms for patients with Middle East respiratory syndrome (MERS), Tuberculosis (TB) and multi-drug-resistant tuberculosis (MDR TB), all of which are highly contagious. PPVL rooms were considered acceptable by the Project Board, but subsequently replaced due to concerns around their limitations during operation, as discussed in Chapter 7.

6.6. Summary Findings

6.6.1. The decision, taken in 2013, to allow the D&B contractor to engage their own Independent Commissioning Engineer (ICE) was responsible, in part at least, for the high number of problems identified at handover. The majority of issues related to incompletion rather than defects and the ICE would have had independent responsibility to ensure appropriate tests were completed in a timely manner, including any re-testing for failures, and collation of certificates and documentation.

6.6.2. There was a lack of time, planning and coordination for the commissioning work. The D&B contractor's approach to filling, purging and disinfecting the water system did not follow good practice, and the Supervisor was not aware of the D&B contractor's activities in continuing to undertake testing.

6.6.3. There was a lack of documentation to prove the water and air ventilation systems in RHC wards 2A & 2B and QEUH 4B, were compliant with specification. This problem was evident across the whole hospital, even after handover when commissioning documents, risk assessments and other reports were either not available or withheld from those asking to see them.

6.6.4. After opening, systems within the building did not perform to the client's specification because of earlier unresolved problems with the design and build. This included mainly the ventilation, water and energy systems.

6.6.5. Estates and Facilities staff were not prepared for the level of problems they encountered when the building opened. They were overwhelmed by the new workload, combined with dealing with hundreds of contractors undertaking remedial works.

6.6.6. There were gaps in the provision of resources by the Supervisor to witness the testing and commissioning, linked to a lower than expected fee for the work to be done.

6.7. Recommendations

6.7.1. There should always be an Independent Commissioning Engineer, covering at least water and ventilation systems, to ensure testing and commissioning is undertaken in an appropriate manner and in a timely fashion, and that the contractor responsible for commissioning makes available certification and documentation for future reference.

6.7.2. Commissioning plans should allow a realistic timeframe for testing and commissioning, along with early-warnings to address anticipated problems or non-compliances.

6.7.3. There should be a transparent approach of presumption of data sharing with stakeholders in a way that fully evidences assurances that internal governance and external authorities seek.

6.7.4. Resources for operational commissioning, and migration of services, should be proportionate to the scale of the task, including potential double running of old and new hospitals.

6.7.5. Project Boards should place adequate value and invest resource in verification and smooth handover, in line with best practice and recent reports on testing, commissioning and certification, especially regarding water and ventilation systems; this should be considered separately from the requirements for design advice and on-site supervisor services with a realistic budget for both.

6.8. References

1. **Cole, John.** Report of the Independent Inquiry into the Construction of Edinburgh Schools. 2017.

Chapter 7

Built Environment: Maintenance

7.1. Introduction

7.1.1. This chapter reviews the maintenance phase of the QEUH project, describing events and outcomes against guidance and standards for operation and maintenance of buildings and their services relevant at the time. The accounts presented are based on documents from NHS Greater Glasgow and Clyde (NHS GG&C), NHS guidance and standards, third party reports, and information drawn from formal interviews.

7.1.2. Maintenance work is essential to ensure a building, including its plant and equipment continue to operate properly and remain in a good state of repair. To ensure that plant and equipment are always operational, a 'planned preventive maintenance' (PPM) programme should be in place.

7.1.3. To ensure that machinery operates continually, components that wear and have a limited lifespan need to be checked and replaced before they cease to function, and potentially create, amongst other things, infection risks (e.g. perishable gaskets in water pipes). Regular maintenance should ensure that these components are always in good working order.

7.1.4. Buildings and their plant and equipment (specifically services for ventilation and water) should be designed with maintenance in mind. This chapter considers how the design of building services impacted on maintenance activities as well as related issues during the period following handover.

7.2. The Key Issues

7.2.1. The key building issues related to the maintenance phase were as follows:

- How the design impacted on maintenance of building services;
- Post-handover problems and specifically if and how they affected infection prevention and control (IP&C);
- The NHS GG&C maintenance regime;
- Remedial works carried out during the maintenance phase.

7.3. Background and Context

7.3.1. All maintenance work would have been undertaken by an external contractor under the original Public Private Partnership (PPP) contract, as described in previous chapters. This service would have lasted 25 years and would have most probably involved adoption of NHS GG&C Estates and Facilities staff under the Transfer of Undertakings (Protection of Employment) Regulations 2006 (TUPE) scheme. The impact of the change from PPP to a traditional funding approach – on the design phase – was discussed in Chapter 4; namely the lack of influence of in-house expertise beyond early consultation on operational matters. The balance of factors and incentives in deciding the type of contract has been discussed in earlier chapters; the consequence for maintenance is the focus in this chapter.

7.3.2. The Review was informed that life cycle and maintenance issues were discussed with Estates an Facilities during the project, however the problems still transpired in this regard. Undertaking a traditional approach to public sector funding should not have resulted in the approach of building with the long term future in mind being abandoned; indeed Health Facilities Scotland (HFS) publication SHFN 30 (2007) states “Good design and equipment selection will ensure future maintenance is easy and cost effective.”

7.3.3. There was a change of Project Director at NHS GG&C in June 2013, due to retirement of the previous Director. NHS GG&C adopted what seemed to be a foresighted strategy by making a proleptic appointment whereby the new Project Director became Director of Facilities and Capital Planning on completion of the project.

7.3.4. On the face of it, this should have provided continuity between construction and maintenance of the building and facilitated a smooth transition. However, such a strategy required the individual to have a sound knowledge of both construction projects and estate and facilities management (FM) – not only for this building but the entire NHS GG&C estate. Again, on the face of it, the Project Director had the requisite skills and experience across both disciplines, but almost exclusively in higher education FM. The presumption would be that any teething problems would be minimal and a suitable PPM programme would be set in place.

7.4. Related Guidance and Standards

7.4.1. The requirement to design buildings with maintenance in mind is a statutory one under the Construction (Design and Management) Regulations (2007 at the time of the project, amended since in 2015). These Regulations place a legal duty on all designers as follows:

“Every designer shall in preparing or modifying a design which may be used in construction work in Great Britain avoid foreseeable risks to the health and safety of any person… maintaining the permanent fixtures and fittings of a structure”

7.4.2. This duty covers safe access to, amongst other things, plant and equipment that needs cleaning, regular inspection, general maintenance or replacement of components that wear over time. Therefore, designs of air handling and water systems need to be such that there is safe access and easy isolation for maintenance.

7.4.3. Examples of good practice include provision of suitably wide access hatches and enough space around ducts and components for maintenance workers to move around. SHFN 30 (2007) states that “Supply and extract ductwork should be installed in such a way that it can be accessed at pre-defined regular intervals and cleaned along their full length including all components”.

7.4.4. In terms of system isolation for maintenance, particularly in a hospital where continuity of service is essential, safe means of closing off sections of systems (air and water) for testing and renewing of critical components such as filters is crucial. SHFN 30 (2007) makes multiple references to the need for isolation of Heating, Ventilation, Air Conditioning (HVAC) systems for maintenance in specific areas. As does HTM 04-01 (2006 – applicable at the time) regarding isolation for maintenance of water systems against Legionella risks.

7.4.5. In addition to considering maintenance during the design, project planning should include putting management systems in place for PPM. According to SHFN 30 (2007) a planned maintenance system should start at the same time as handover or occupancy, together with record-keeping of PPM.

7.4.6. One example, under Regulation 9 of the Control of Substances Hazardous to Health Regulations, concerns components of air ventilations systems: all local exhaust ventilation plant should be thoroughly examined and tested at least once every 14 calendar months.

7.5. Findings

How the Design Impacted on Maintenance of Building Services

7.5.1. The design of the ventilation and water systems became a source of frustration for the Estates and Facilities team in relation to their PPM. For example, there was a desire to reduce the service voids during the design to create more ‘usable’ space. However this alteration has restricted access for maintenance staff to inspect areas of ducting, piping and other plant.

7.5.2. It is also impossible to replace certain parts without removing large sections of adjacent plant. [59] The “Major Plant and Equipment Replacement Strategy” within the digital O&M system known as ‘ZUTEC’ does not include reference to any pipe work access strategy. It is therefore unclear how pipe work would be replaced without disruption to the operation of the hospital.[60]

7.5.3. The section in ZUTEC titled “Access and Maintenance Strategies” only deals with access to the roof and its maintenance. It does not address the maintenance access required for isolating water services behind panels, ceiling voids or plant rooms. The HFS report on the water system (2019) states “Following a visit to site we raised our concerns that there are some locations where there is insufficient space for maintainable, replacement building services and plant as per the Employers Requirement Section 5.13 Facilities Management”.

7.5.4. In addition to the lack of ‘maintainability’ in the design, there were issues resulting from the installation with respect to maintenance contracts. Several components of the building services installation were sub-contracted to European contractors. [61] This strategy has rendered it extremely difficult to arrange maintenance contracts because no UK provider can service the components.

[59] Witness Statement: A27920684
[60] Review Evidence: A26435388
[61] Witness Statement: A27920684

7.5.5. These examples demonstrate a significant problem for the Estates and Facilities team in trying to implement an adequate PPM. This has had an indirect impact on their ability to manage infection risks, as areas of the ventilation and water systems are inaccessible for inspection and replacing components that are subject to wear is difficult. Therefore, there are potential risks such as reduced performance of the ventilation system leading to lower air changes, or components perishing and interrupting the water system.

7.5.6. The Employer's Requirements (Section 8.1.3.6) stated that services shall be configured to ensure local maintenance and isolation can be carried out in each room without the requirement to take other rooms out of use. This is in line with NHS and HSE guidance discussed earlier. However, this is not the result onsite; the level of isolation is not achievable due to the design of both the ventilation and water systems.[62] [63]

7.5.7. The building services for both the adult and children's hospitals are extremely complex and follow unusual distribution patterns. It is normal to have either a horizontal or vertical distribution system, but the QEUH is a hybrid of both. This means it is very difficult to isolate a single floor, let alone a single ward or room[64]. Routine maintenance, and current projects to remedy known problems, experience difficulties in devising a way to flush the water system without closing substantial areas of the hospital.

Post-handover Problems

7.5.8. Elsewhere within ZUTEC, the contractor provided comprehensive details of plant and equipment PPM routines, general maintenance instructions and fault finding instructions.[65] This information is an improvement on the commissioning documentation, as discussed in the previous chapter. However, Estates and Facilities staff still had problems, for instance with a lack of 'asset tags' (physical labels for individual assets including elements such as water and ventilation plant and equipment).

7.5.9. The Health Finance Directorate strongly recommend asset tags during the timeframe of the project (Capital Accounting Manual 2007). The FBC stated the requirement for an Asset Register and the Employer's Requirements (Section 8.1.28) outlined the need for asset tags, covering "all elements of the Electrical, Mechanical, Public Health Medical Gases and Specialist systems" to be provided by the contractor.[66] The contractor eventually provided asset tags in 2017.[67] This hindered the process of putting a PPM in place due to the scale and complexity of the systems.

[62] Review Evidence: A26435388
[63] Witness Statement: A28153165
[64] Witness Statement: A28153165
[65] Review Evidence: A26435388
[66] Review Evidence: A25612185
[67] Witness Statement: A27920684

7.5.10. The strategy of retaining the Project Director, post project, as Director of Facilities and Capital Planning did not appear to meet expectations. Witnesses interviewed by the Review suggest that, rather than using the transition between posts to facilitate continuity, the incumbent chose to compartmentalise the roles and associated responsibilities, e.g. any building related problems were viewed not as a project issue, but as the responsibility of Estates and Facilities. A major aspect of the transition from commissioning to regular ongoing maintenance was how NHS GG&C dealt with the results of the Water Risk Assessment (WRA), conducted at handover (April 2015) which we discussed in Chapter 6.

7.5.11. The external contractor who undertook the WRA rated the risk as 'high' and recommended the major concerns identified be dealt with within three months. However, the report was received by a senior estates manager who handed it to a less senior member of staff to action.[68] [69] There is no documentation to confirm whether or not action resulted in respect of the report. However a follow-up report in 2017 contained most of the same recommendations which would indicate little or no progress since the 2015 report. It should be noted that this was a time of substantial activity at the QEUH; there were over 300 construction workers from various employers on site when the initial WRA was received dealing with snagging and incomplete works (as discussed in Chapter 6).

7.5.12. There was also a lack of clarity over the roles and responsibilities within the Estates and Facilities team at that time, which may explain why the report was not dealt with for two years. Nonetheless, this constitutes a missed opportunity to address significant problems with the water system over that period, during which the risk was 'high'. Fortunately, since new Directors took up posts these issues have been, or are in the process of being, addressed.

7.5.13. There were accounts of pigeons nesting above intake vents of the Air Handling Units (AHU) and evidence of pigeons in at least one plant room. Animals of this type carry micro-organisms on their bodies and in their droppings, which means they can be a source of infection (SHFN 30). This was the source of much speculation and media coverage since the opening of the QEUH specifically in relation to Cryptococcus infection. The Review gives its view on the matter in Chapter 8.

7.5.14. Computer simulations of air movement around the helipad (as discussed in Chapter 4) discounted this as a root cause or factor that propelled pathogens into the ventilation system. Some gaps in the building structure had allowed pigeons to enter; however these were closed off very soon afterwards and control measures put in place. Early evidence from an NHS GG&C expert working group investigating possible sources of the Cryptococcus infection, seen by the Review, suggests that the possibility of air from plant rooms, via the AHUs, as being the likely source of fungal spores, which were then breathed in by patients, has been reviewed and found to be improbable. This is because the locations of bird sightings and infection sites are too far apart with too many physical barriers between them to realistically link the two.[70]

[68] Witness Statement: A27933816
[69] Review Evidence: A28046651
[70] NHS GG&C Board Paper 20/04

NHS GG&C Maintenance Regime

7.5.15. As mentioned in the previous section, there was a lack of clarity over roles and responsibilities regarding maintenance regimes from 2015 to 2017. This included gaps in the governance structure, risk reduction strategy, operational arrangements, water testing, and reporting and monitoring requirements in respect of the management of water safety.

7.5.16. Two separate independent reports into the water system in 2017 also identified gaps in the training and knowledge of the person placed in the role as 'Authorised Person' (AP) for water at NHS GG&C. The AP had received no training in relation to standard tasks set out in HSE guidance, such as L8 (Legionnaires' disease: the control of Legionella bacteria in water systems), HSG 274 (Legionnaires' disease Technical Guidance) and SHTM 04-01. Both reports also identified gaps in maintenance records, as a consequence of the lack of a fully functioning PPM. The appropriate appointment of an AP was not formally done until 5 June 2018.

7.5.17. Information gathered by the Review suggests that the Estates and Facilities function at the QEUH was (until recently) under-resourced.[71] During the construction project, members of the Estates and Facilities team were asked to estimate the resource that would be required to service the new hospitals. This involved calculating the resource needed to implement the PPM, statutory undertakings, and lifecycle costs.

7.5.18. In the end, the Directorate were simply allocated a head count based on old hospital facilities that were being transferred to the QEUH.[72] This approach did not acknowledge adoption of the single room design, overall floor space, and new technologies and procedures that had been developed in the intervening period.[73] More recently, significant investment has been undertaken in this area with the base line revenue budgets augmented in the past 2 years. A revised asset management system is being implemented which will align resource requirements to asset tracking and allow for historical trends to be monitored.

7.5.19. The impact of defects, snagging and incomplete works on the maintenance regime was also a subject during witness interviews.[74] This could have been foreseen, given the number of contractors on the site post-handover, and several accounts were given of high levels of dust during this period.[75] [76] NHS guidance states that there is a need to assess the infection risks during construction and how construction activity itself may be a mechanism for infection; for example, environmental airborne contaminants and infectious agents are closely related to water and moisture conditions and figure prominently in construction activity (SHFN 30).

[71] Witness Statement: A27920684; and A28153165
[72] Witness Statement: A27920684; and A28153165
[73] Witness Statement: A28153165
[74] Witness Statement: A27920684
[75] Review Evidence: A28046651
[76] Witness Statement: A27871832; and A27996988

7.5.20. Although the Review does not identify links between post-handover works and any HAIs, these works were perceived as uncoordinated, uncontrolled and without NHS GG&C management oversight. One set of documents that supports this observation is the number of 'As Built' drawings that do not match what was installed.[77] [78] All of this constituted additional work for Estates and Facilities staff, essentially distracting them from implementing the PPM.

7.5.21. The early stages of PPM for the hospital could have been made easier if the contract had made allowance for a collaborative approach to maintenance. The Chartered Institute of Building Services Engineers (CIBSE) and the Building Services Research and Information Association (BSRIA) have developed an approach known as 'Soft Landings' whereby the contractor works closely with Estates and Facilities teams to develop building services in collaboration. This collaboration continues into the early maintenance phase with an 'aftercare' service, typically lasting from six months to one year.

7.5.22. This approach is being adopted across the UK public sector as a means of improving operation of buildings and was first developed in 2009, so could have been adopted in a more formal manner than was done.

7.5.23. Evidence gathered by the Review identified a number of occasions when this approach was suggested to NHS GG&C by their advisors, but was rejected on cost grounds.[79] [80] The Design and Build contractor provided resources beyond commissioning to undertake and coordinate minor snagging and 'on boarding' for a period of about two years.[81] But this is not the same as the Soft Landings approach.

Remedial Works Carried out During the Maintenance Phase

7.5.24. The mechanical ventilation system to Ward 4B of the adult hospital (for Bone Marrow Transplant) was upgraded in December 2015. These works included reduced air permeability of the rooms by installing metal frame plasterboard ceilings (MF ceilings), applying sealant to various areas, and replacement of sealed lighting units. This improved pressure differentials between the rooms and corridors, and current tests show that, as of the time of publication of this report, between +8 Pa and +12 Pa is being achieved. Air changes remain at 6 ACH, when 10 is recommended, due to capacity limitations of the AHUs. However, additional measures, including upgraded HEPA filtration had been added. The original airlock design between the ward and the rest of the hospital has not been installed, but the current installation has been accepted as tolerable.

[77] Review Evidence: A26435388
[78] Review Evidence: A27920684; and A28153165
[79] Witness Statement: A27920684; and A28153165
[80] Witness Statement: A28308555; and A27871832
[81] Witness Statement: A27871832

7.5.25. Fundamental works took place in December 2018 to insert a chlorine dioxide plant, sensors and dosing stations in the water system supplying the Royal Hospital for Children (RHC); in March 2019, the system was installed by NHS GG&C for the whole QEUH complex. The installation of chlorine dioxide dosing to the entire hospital's water supply without interruption of the clinical service over the autumn and winter of 2018-19 stands out as an operation of sizeable ambition and without precedent – those engineers and managers who carried out the task deserve credit.

7.5.26. At the time of publication, the Review has been informed that there are no outstanding items from the previous DMA water risk assessment reports and steps have been taken to ensure that ongoing problems with the energy centre no longer affect the domestic hot water system, despite having substantial efficiency problems. It is remarkable that the hospital achieved the Building Research Establishment Environmental Assessment Method (BREEAM) Excellent rating (per the BREEAM website), considering the efficacy problems with the energy centre.[82]

7.5.27. A Health Protection Scotland (HPS) Report issued in January 2018 (Ward 2B NHS GG&C SBAR Final HPS/HFS January 2018) determined that the appropriate design to provide a protective environment for hematopoietic stem cell transplantation (HSCT) patients should be HEPA filtered, positively pressurised patient bedrooms with a pressure cascade control regime designed to SHTM 03-01 Ventilation for healthcare premises Part A – Design and validation (2009). Work to achieve this continues on systems in Wards 2A and 2B of RHC which remain closed at the time of writing.

7.5.28. The use of PPVLs as an alternative to negative pressure isolation was assessed by HPS and HFS to be unsuitable as discussed in previous chapters. Remedial works were undertaken in July 2019 to make two rooms in the adult hospital critical care unit negative pressure and several others are either being converted or considered for future conversion. At the time of publication, four rooms in the adult hospital and three in the children's hospital have been redesigned as negative pressure rooms.

7.5.29. General single rooms still operate with 2.5 ACH instead of the recommended 6 ACH. However, filters have been installed in rooms where risk assessments by IP&C staff warrant it. The current plant capacity does not allow any upgrade without significant redesign of the whole system, however in its current state the risk is considered tolerable.

7.6. Summary Findings

7.6.1. The building is likely to require long term investment in monitoring and fault correction which is in excess of that one might reasonably expect of a new building.

7.6.2. The budget for maintenance did not acknowledge the increased workload following adoption of the single room design, the overall floor space, and new technologies and procedures that had been developed during the life of the project.

[82] https://tools.breeam.com/projects/explore/buildings.jsp

7.6.3. The level of isolation for local maintenance is not achievable due to the complex design of both the ventilation and water systems. This problem has also had consequences for remedial works.

7.6.4. The design of the QEUH ventilation and water systems has resulted in restricted access for maintenance staff to inspect areas of ducting, piping and other plant. As a result, critical maintenance activities cannot be completed without major plant removal.

7.6.5. A lack of clarity over the roles and responsibilities within the Estates and Facilities team, combined with overwhelming workloads, due to defects, snagging and incomplete works, meant there was a missed opportunity to address the significant problems with the water system over a period of around two years, during which the risk remained 'high'.

7.6.6. Of significant importance was the absence of a formally appointed and suitably trained Authorised Person for water.

7.6.7. A 'Soft Landings' (or similar) approach was recommended to NHS GG&C but not adopted on cost grounds. But this approach would have incentivised the contractor to consider maintenance issues through their contract.

7.6.8. The risks relating to IP&C have been minimised to a tolerable level by the various alterations and mitigating works undertaken to the water and ventilation systems.

7.7. Recommendations

7.7.1. NHS GG&C should allocate and sustain resources that reflect the QEUH building's continuing need for maintenance above expected levels.

7.7.2. A re-evaluation is needed of resources specifically to service single rooms, taking account of the increased workload, impact of new technologies and procedures for Infection Prevention and Control (IP&C), and new guidance issued. For future projects, resource based on analysis of the requirement rather than solely historical cost should guide decisions on facilities and estates. New buildings contain sophisticated systems and require requisite skill in monitoring, problem assessment and correction.

7.7.3. Those involved in decision making around the design and specification of building services for healthcare buildings need to have (or be able to access) the knowledge and understanding to allow them to make sound judgements on how the design will facilitate access for maintenance.

7.7.4. HFS should have, as part of the new National Centre for Reducing Risk in the Healthcare Built Environment, a gateway function for construction projects; it should review the criteria for occupation and, post-operational commissioning, to ensure a demonstrable level of PPM undertakings are in place before patients occupy the hospital.

7.7.5. An Authorised Person for water safety must be trained and competent as per HSE guidance (L8) and NHS Boards must have sign off for the appointment.

7.7.6. Detailed and explicit guidance on a 'Soft Landings' approach for healthcare should be developed, and this guidance be adopted as mandatory for large-scale projects.

7.8. References

1. **HFS.** Scottish Health Facilities Note 30 Infection Control in the Built Environment: Design and Planning Version 3. s.l. : NHS National Services Scotland, 2007. SHFN 30.

Chapter 8

Infection Prevention and Control

Part 1: Design, Build and Commissioning

8.1. Introduction

8.1.1. This chapter reviews the contribution of IP&C advice and services throughout the timescale of the QEUH Review's remit and is structured in seven parts:

- Part 1 – Design, Build and Commissioning to the point of occupancy;
- Part 2 – Healthcare Associated Infection (HAI) and Incident Management Teams (in the Hospital, within the Maintenance phase of the Review's Remit;
- Part 3 – Management and governance of Infection Prevention and Control (IP&C) in Queen Elizabeth University Hospital and Royal Hospital for Children
- Part 4 –Ventilation – investigation of links with incidents of disease;
- Part 5 – Management and governance of Infection Prevention & Control (IP&C) in NHS Greater Glasgow & Clyde (NHS GG&C);
- Part 6 – Appointment, training and skill set of Infection Control Team (ICT), site project team;
- Part 7 – Health Protection Scotland (HPS).

8.1.2. The accounts presented are based on documents from independent reviews and based on documents from other independent reviews and inquiries together with papers provided by:

- NHS Greater Glasgow and Clyde (NHS GG&C);
- Infection Prevention and Control (IP&C) leads;
- Whistleblowers;
- Health Protection Scotland (HPS);
- Health Facilities Scotland (HFS);
- Healthcare Improvement Scotland (HIS) reports;
- Peer reviewed publications;
- NHS guidance and standards;
- Third party reports; and
- Information from formal interviews.

We are grateful to external advisers who have commented on our findings.

8.1.3. Every significant infectious disease incident or cluster generates lessons. Over the past two decades, well established policies and systems have developed to record events as they happen, and infection control leaders are committed to learning lessons on completion of incidents.

8.1.4. Most incidents and outbreaks attract public attention and scrutiny; modern significant incident management mandates the requirement for public disclosure and consequence management. These matters are normally the task of the local NHS Board, with suitable assistance from national agencies such as HPS, since April 2020 integrated within Public Health Scotland. Government also determines the instigation of independent review or public inquiries where public concern warrants such scrutiny.

8.2. The Key Issues

8.2.1. The key issues related to IP&C covered in this part are as follows:

- The recent history of outbreaks, review and inquiry, HAI policy development;
- Framework of guidance and key documents;
- Involvement of the IP&C team through the stages of the QEUH project until handover of the hospital for operation;
- Professional roles for IP&C advisers;
- Handover – from being a construction project to becoming a fully functioning hospital.

8.3. Context, Background and Relationship to other Matters

8.3.1. Two outbreaks of infectious disease within the past 20 years took place in hospitals in the Greater Glasgow and Clyde area and resulted in the independent review that led to the Watt Group report (2002) and the Vale of Leven Hospital Inquiry (events of 2007-08, published 2015). (1)

8.3.2. The Watt Group report followed the independent review of an outbreak of Salmonella infection. It occurred in the Victoria Infirmary, Glasgow during December 2001 through to February 2002.

8.3.3. There were three deaths linked with the outbreak. Themes in the findings and recommendations included nursing practice and basic hygiene, effectiveness of the Outbreak Control Team and the support it received, communications and use of the media, and various features of the ageing building, which QEUH in part replaced.

Relevant recommendations with respect to infection and the built environment included :

13. That a scientific meeting be organised at which experience and ideas relating to the specific infection control challenges of old buildings be shared and that following this the Scottish Executive Health Department should issue guidance on the upgrading and maintenance of such buildings.

16. (a) That the Scottish Executive Health Department should reinforce the good practice contained within the Scottish Health Facilities Note 30, “Infection Control in the built environment – design and planning,” January 2002.

16. (b) That the NHS in Scotland develops, as a matter of urgency, standards relating to new builds and refurbishment projects incorporating, where necessary, the Scottish Health Facilities Note 30 guidance as best practice and requires Trusts to produce action plans for compliance with Note 30.
From: Watt Group Report, 2002

8.3.4. The report and those recommendations were influential in several strands of policy and professional work, not least the Scottish Patient Safety Programme, as well as encouraging the replacement of the Victoria Infirmary urgently with new building facilities. There was updating of guidance as mentioned in Recommendation 16; the Note 30 update in 2007 (HFS, 2007), and its successor HAI-SCRIBE documents (2015) still provide a central framework for infection control practice with respect to the built environment.[83]

8.3.5. The Vale of Leven Hospital Inquiry followed an outbreak of Clostridium difficile at that hospital. NHS Greater Glasgow had, in 2006, taken on responsibility for the hospital when it expanded to become NHS Greater Glasgow and Clyde.

8.3.6. The outbreak took place between December 2007 and June 2008. Thirty-four deaths were linked to this outbreak. The Inquiry started in 2010 and published in 2015. Throughout this period, NHS GG&C both responded to early lessons and to the formation of policy and guidance on many matters, chief of which was further strengthening of the infection control function. Policy with detailed guidance for implementation of single rooms as the sole planning unit for in-patient accommodation was published in 2010, (2) although the intent was known in time for the planning and design phase of the QEUH. [84]

8.3.7. The Public Inquiry covered a range of matters relevant to the hospital and outbreak. The greater part of the report was given over to IP&C matters. Several of the key individuals who had close involvement with the outbreak and subsequent investigation have taken leading positions in implementing the lessons of the Inquiry. This time period coincided with the build, commissioning and early operation of the QEUH.

We highlight here IP&C recommendations relevant to the QEUH Independent Review:

- ***Recommendation 43:*** *Health Boards should ensure that Infection Control Nurses and Infection Control Doctors have regular training in infection prevention and control, of which a record should be kept.*
- ***Recommendation 62:*** *Health Boards should ensure that senior managers accompanied by infection prevention and control staff visit clinical areas at least weekly to verify that proper attention is being paid to infection prevention and control.*
- ***Recommendation 66:*** *Health Boards should ensure that the healthcare environment does not compromise effective infection prevention and control, and that poor maintenance practices, such as the acceptance of non-intact surfaces that could compromise effective infection prevention and control practice, are not tolerated.*

Extracts from the Vale of Leven Hospital Inquiry, 2015

[83] Review Evidence: A25359878; and A25359907

84 Scottish Government. Provision of single room accommodation and bed spacing. 2010 Available from: www.sehd.scot.nhs.uk/mels/CEL2010_27.pdf

8.3.8. Under the leadership of the Chief Nursing Officer (CNO) for Scotland, a detailed framework for IP&C has developed, together with a reporting system for an escalating series of incident severities that are closely defined in guidance and manuals. (3) (4) (5) (6)

8.3.9. The Vale of Leven Hospital Inquiry report commented positively on measures that NHS GG&C had taken to address lessons of the outbreak in advance of publication of the report. Nonetheless there were themes within the report that merit our attention and which are discussed later in this chapter. These include variable approaches across the NHS GG&C Board area and the persistence of behaviour that hampered effective team performance in the practice of IP&C.

8.3.10. Nonetheless, it is worth reflecting that, in the intervening 18 years since the Watt Group report, the incidence of HAI has fallen steadily and then stayed low across NHSScotland; systems and practices now in place have achieved sustained improvements in health risk for HAI. This, as the Inquiry's recommendations state (above), requires continued investment and vigilance, effectively to design out the risk of infection in hospitals, sustain the profile and engagement of ICTs in clinical areas, and ensure training meets the requirements of the task.

8.3.11. In this chapter, the prime focus is stewardship of the IP&C function within a modern built environment. Unlike previous inquiries, the practice of basic hygiene, ward clinical routines, and evidence for transmission of disease between patients via healthcare staff is not the primary concern of this report; nor is the outbreak of closely linked diseases with the same organism, matchable to a source or to each other in most cases, the focus of this report.

8.3.12. This is an account of unusual infections in a new hospital environment, their investigation, and factors that may have raised the risk of incidence of such infections. There remains uncertainty about the origins of an important number of cases of serious infection; several reasons may be behind this set of events; and clinical and care practice may still be factors for scrutiny.

8.4. What was the Aim, Expectation or Standard?

8.4.1. The aim of the IP&C function is set out in a number of texts mentioned earlier, both in Chapter 4 and this chapter. Scottish Health Facilities Note 30, Infection Control in the built environment – design and planning, January 2002, updated in 2007 contains the guidance relevant to advice in the early stages of the QEUH project.

8.4.2. The framework of guidance that accompanied and followed the Vale of Leven Hospital Inquiry provides a clear framework for the structure, function and performance of IP&C in a fully functioning hospital. The guidance places an expectation that infection control will be an important factor in design and planning and the client, in this case NHS GG&C, would provide resource and expertise to meet that requirement.

8.4.3. In 2002, The Association of Medical Microbiologists developed and subsequently published a framework of professional practice on the topic of building new hospitals. The article summary reads as shown in Figure 8.1. Throughout the article, the authors set out recommendations and action points for the ICT (Infection Control Team).

‘Infection control input is vital throughout the planning, design and building stages of a new hospital project, and must continue through the commissioning (and decommissioning) process, evaluation and putting the facility into full clinical service. Many hospitals continue to experience problems months or years after occupying the new premises; some of these could have been avoided by infection control involvement earlier in the project.

The importance of infection control must be recognised by the chief executive of the hospital trust and project teams overseeing the development. Clinical user groups and contractors must also be made aware of infection control issues. It is vital that good working relationships are built up between the infection control team (ICT) and all these parties. ICTs need the authority to influence the process. …..**ICTs need training in how to read design plans, how to write effective specifications, and in other areas with which they may be unfamiliar [our emphasis].**

The importance of documentation and record keeping is paramount. External or independent validation of processes should be available, particularly in commissioning processes. Building design in relation to infection control needs stricter national regulations, allowing ICTs to focus on more local usage issues. Further research is needed to provide evidence regarding the relationship between building design and the prevalence of infection’.

Figure 8.1: Association of Medical Microbiologists framework of professional practice on building a new hospital

8.4.4. The publication coincided with another article – in effect, a worked example of the framework. Drs Wilson and Ridgway’s article ‘illustrates the paper’ by Stockley et al. and describes the seven year experience of engagement of infection control expertise on the construction of a hospital of similar scale and complexity to QEUH, University College London. This hospital opened in June 2005. (7) (8) (9) (10)

8.4.5. In our dealings and interviews with NHS GG&C IP&C staff, they were familiar with the Building Notes and guidance although unfamiliar with the work by the Association of Medical Microbiologists (now part of the British Infection Association), whereas external experts were familiar with both bodies of work, originating as they do from professional organisations closely related to the specialty. The work describes many facets of infection control work within a new hospital development.

8.4.6. One striking message from the notes, guidance and both publications is the depth of engagement, not only in its scope and rigour but also the relationships required to have influence at critical stages.

8.4.7. The Scottish Health Facilities Note 30, "Infection Control in the built environment – design and planning," 2007, described also in Chapter 4, does not set out a list of practice standards, as it focuses on the roles of the combined disciplines of the advisory team:

'all those involved in the provision of new or refurbished facilities' (paragraph 1.3). They include five specified disciplines – an architect, building services engineer, a risk manager, an estates/facilities manager and 'an Infection Control Specialist with experience /knowledge of the built environment', (8.3) The note sets out as 'Important – always consult the Infection Control team at an early stage' (5.19) and that any such project 'requires the involvement of a multi-disciplinary team from planning to completion and must include input from Infection Control Specialists throughout the project.' (3.7).

8.4.8. The note is very broad ranging, covering all parts of a healthcare building's function and systems. One would not expect detailed reference in this note to matters of specific interest to this Review with respect to the design and installation of water and air ventilations systems – the (S) HTM portfolio of guidance offers that, referenced in earlier chapters. Nonetheless, there is early mention of water and ventilation systems (page 16) including several references in an early list in the Note about 'Common errors' (5.5 page 21) – the majority entail characteristics of air and water systems. And there is general and specific mention of specialised areas, vulnerable patients, isolation rooms, air ventilation and water systems, and isolation rooms with negative and positive pressure throughout the text.

8.5. What Happened?

8.5.1. At the design stage from March 2009 to March 2010, NHS GG&C made significant investment in IP&C advice for the project. The Board appointed a full time Consultant Infection Control Nurse (ICN), allocated support to that lead nurse, and designated extra medical consultant infection control sessions to advise the design team working on the 'New Build', in drawing up the document termed the Employer's Requirements (as discussed in Chapter 4). This was consistent with the guidance on Infection Control and the Built Environment and followed recommendation 16a in the Watt Group report mentioned earlier. The Vale of Leven Hospital Inquiry report would follow.

8.5.2. In her review of the ICTs involvement in a paper dated 1 October 2014, the project nurse outlined the role and quoted from the statement of aims within the Employer's Requirements for the IP&C element: [85]

[85] Review Evidence: A25634443

The Board wish to procure Works which shall enable it to carry out its clinical functions to combat health (sic) acquired infection and to maintain physical assets and clinical and non-clinical functionality with ease; and it shall be the responsibility of the Contractor to deliver a design and construction solution that optimises these requirements.

Prevention and control of infection shall remain a primary consideration of the Contractor in the design and construction of the Works. The Contractor will be required to demonstrate to the satisfaction of the Board's Infection Control Team that the design and construction of the Works fully reflects and incorporates the following key infection control challenges:

Paper to NHS GG&C Board Infection Control Committee, October 2014

8.6. Design and Build - Infection Control Nurses

8.6.1. Accounts given to the Review from several nurses and the lead Infection Control Doctor (ICD) described the process.[86] The consultant nurse was formally recruited and appointed to the role. She had a team of nurses drawn from other clinical duties to assist in the design process. Relationships were good; senior managers were willing to dispatch nurses to take part, aside from their usual clinical roles.

8.6.2. Nursing advice was listened to and treated with appropriate weight; they were involved at all meetings, including times when concurrent design processes were running. Nurses visited other new hospital sites, including in the London area; visited and discussed with other disciplines ward layout and room mock-ups; they liaised effectively with nursing and infection control colleagues, and referred up problems and unresolved issues to senior colleagues, both in the local sector and the Board's lead ICT.

8.6.3. Activities are listed as a table of information in the October 2014 paper mentioned previously – it includes advice on single room design, ward layout including the exceptional areas where it was open plan – critical care and renal dialysis. Advice on sink positions and adjacent facilities within rooms and within ward areas and specific clinical departments were all part of the role. There was specific medical input into the number of isolation rooms (March 2010), single room provision for critical care (July 2010); later when the decision to incorporate the Infectious Diseases (ID) service into the adult hospital was made, there was medical IP&C input into arrangements for infectious disease patients (September 2014).

[86] Witness Statements: A27825389; A27500136; A27950064; A27927667

8.6.4. In 2012, the project team dispensed with a full-time role for an IP&C Nurse adviser. The Employers Requirements were then becoming a building under construction. From the nurses point of view:

'…to be honest, when I left, …., I know that there was still a lot being thrashed out, there was a lot that hadn't been decided.'[87]

8.6.5. There was still engagement on matters such as shower curtains, care tray trollies, sinks, decontamination units and location of bins. There was also specific work, as the hospital neared handover, on the siting and fixing of several thousand soap dispensers.

8.6.6. ICNs employed by NHS GG&C stated that air ventilation and water systems were not within their competence; their expertise lay in the knowledge and interpretation of guidance, of their own clinical experience of efficient design in consultation with other nurses and domestic services colleagues[88].

8.6.7. It would be a matter for NHS GG&C's leads on the ICT to take on and manage unresolved issues, and for ICDs to deal with specialist technical matters such as water and air ventilation systems. Nonetheless, nurses did take part in offering advice on the positioning of sinks in standard ward rooms; placement of sinks in some clinical areas that had alternative options such as psychology; tap designs and their replacement if advice had changed or the taps supplied were non-compliant or not appropriate.

8.7. Design and Build – Infection Control Doctors

8.7.1. Medical input was primarily the province of the Board lead ICD. One other doctor was listed as the advisor in 2010 on a single topic, at the design stage. There was no mention of advice in the October 2014 paper relating to air ventilation and water systems from the ICT until September 2014.

8.7.2. We interviewed ICDs about the air and water systems design and their involvement. Unlike the collaborative nursing effort, the doctors' inputs to the process of design and build was that of individuals and not a team.

8.7.3. The lead ICD took on the role of advising the project; he had complementary clinical and infection control responsibilities for the children's service which was to move to the New Build and the future integrated laboratory service on the site.[89] In addition to these clinical laboratory roles, he also had management and academic leadership roles too. This lead ICD for the New Build project was assigned to the role; there was no recruitment process, or deputy. Other senior microbiologists re-assigned local management responsibilities in South Glasgow, whilst the north sector's arrangements for microbiology and IP&C were unaffected.

[87] Witness Statement: A27500136
[88] Witness Statement: A27500136
[89] Witness Statement: A27500136 and A27950064

8.7.4. However, at least one consultant medical microbiologist who normally practiced in the north of the city had been closely involved in hospital design and others were interested and experienced in the matter of infection control and the built environment. One such doctor had advised on the design and commissioning of the adult Bone Marrow Transplant (BMT) unit as it moved first within Glasgow Royal Infirmary in 2001, and then to the Gartnavel Hospital site in 2006.[90]

8.7.5. Other colleagues who had interests in infection control and the built environment may have been sensitised to the issue by the Watt Group Report and the events that were taking place relating to the Vale of Leven Hospital and its fitness for purpose in providing acute healthcare.[91]

8.7.6. The microbiologist who had the BMT unit design experience was not at that time assigned to an infection control role, having resumed other clinical, laboratory and management responsibilities.[92]

8.7.7. He was specifically excluded from involvement in the New Build design.[93] His skill set included expertise in isolation rooms and the care and support of very vulnerable patients with immunosuppression and whilst the adult BMT unit was not, at that point, a part of the move to the New Build (that decision was taken in 2013) other very vulnerable patients with immunosuppression for other reasons were due to have a place in the QEUH, along with children undergoing a number of interventions including BMT and management of ID. As we conclude in Chapter 4 also, these patient groups would have benefitted from the scrutiny, expertise and attention to detail that would have come with that skill set.

8.7.8. There were consultations amongst medical colleagues within and out with NHS GG&C about aspects of the hospital's design for vulnerable patients; several consultations appear to have generated variable advice, and results were inconclusive. The SHFN 30 (2007) document concedes that evidence is lacking in this respect (section on Ventilation from paragraph 11.37); it would have been prudent to have taken a precautionary approach when faced with such uncertainty and variability in advice.

8.7.9. The lead ICD did source advice from experts in such areas of design in England but their advice was inconclusive also.[94] There was little or no contact with the national agencies relating to HAI, HPS, or technical buildings guidance, HFS. Their function, in the perception of both NHS GG&C staff and the agency staff themselves, for purposes of design and build knowledge relating to health and built environment, is widely seen as the repository of expertise behind the written information and not consultancy on that information or clarification where there is uncertainty.[95]

[90] Witness Statement: A27867258
[91] Witness Statement: A28121926; A27912320; A27825389; and A27927667
[92] Witness Statement: A27825389; and A27867258
[93] Witness Statement: A27867258
[94] Witness Statement: A27865960; A27969615
[95] Witness Statement: A27969615; A27969651; A27868908; and A27913933

8.7.10. Where NHS GG&C's microbiologists sought highly specialist external advice, both at the design stage and later when unusual infections clustered and were possibly linked with the building, they sought advice directly with sources outside Scotland.
8.7.11. It is a feature of HPS (now Public Health Scotland) that the HAI function is primarily nursing, with some microbiological and epidemiological input. Nurses who take up appointment there, drawn from local NHS Boards, acquire knowledge and expertise in key systems such as water and air ventilation that they did not possess or deploy in their local NHS Board roles. Public health medical input for highly specialist advice from HPS, either directly or signposting to professional networks, is a feature that is largely missing from the service.

8.8. Design and Build – the Infection Control Team

8.8.1. In 2012, the laboratory block opened on the QEUH site. This development occurred three years before the clinical services moved in. The microbiology laboratory service came together on one site with all sites south of the River Clyde, the Renfrewshire hospitals joining with hospitals from the north of the river including the Western Infirmary and Yorkhill Hospital for Children.

8.8.2. Medical microbiologists provide the ICD role as well as their laboratory and clinical responsibilities. Those with defined ICD roles have assigned Programmed Activities in their job plans reflecting their commitment; all microbiologists take on IP&C responsibilities out-of-hours to ensure an emergency service on nights and weekends. In bringing together the laboratories in 2012 before the hospital opened in 2015, microbiologists moved between sites to cover their roles.

8.8.3. We have heard from management and clinician sources during the Review that the integration of services together on one site was a challenge, professionally, culturally and interpersonally[96]. Laboratory integration was no exception. It is apparent from accounts of laboratory clinicians from several disciplines that microbiology practices did not effectively integrate during this time.

8.8.4. The other effect of moving laboratory services onto the QEUH site ahead of clinical services was creation of distance between ICNs and their ICD colleagues. By and large, practice had been co-location in hospitals, with ICNs having office facilities close to laboratories, and plenty of informal interaction and transaction. Relationships within ICTs locally and at Board level during that time were generally described as good. However with the relocation of laboratories onto two sites across the whole Board area – Glasgow Royal Infirmary and the site that became QEUH – these close ties were no longer possible.

8.8.5. When ICNs did move to QEUH, their office facilities were located in the administration block. Consequently as they leave the wards where they spend much time, they head in the opposite direction from the path that medical microbiologists take to their laboratories. This distance is physical and operational, and may contribute to difficulties in sustaining the close integrated team working that was a more straightforward proposition in former working arrangements.

[96] Witness Statement: A27331409; A27717518; and A27902746

8.8.6. It is not clear what influence the lead ICD had at the design stage. Nurses did describe discussions when they referred issues to medical colleagues and they left them at that point for onward transmission and further action. The main element of the lead ICD's work sought to align guidance and known standards with design drafts. The Board ICT that comprised the lead ICD, nurse, manager and consultant nurse did discuss build issues and each reported that there were few disagreements.[97]

8.8.7. When the decisions were taken to incorporate the adult BMT unit and then the ID service into the hospital, team members mentioned specific issues that needed change, adjustment, re-specification and assurance[98]. These issues were left with the lead ICD to address with the project team.

8.8.8. Detailed documentation of these actions has not been available to us. Toward the time of opening the hospital the Chair of the Board Infection Control Committee (BICC), over the course of all meetings from late 2013 to the opening date in 2015, articulated concerns and issues for which they sought assurances. This set of interventions was the principal reason for preparation of the report of October 2014, mentioned earlier.

8.8.9. In an annex, it lists infection control specialist involvement. The list of activities did not include infection control advice on the air ventilation and water systems until, in October 2014, when there arose the need for advice relating to 'Plans for Ebola patients' with 'Ventilation – Lobbied room specification – MDRTB patients' following in the 2 page list.[99] That is the documented extent of ICT involvement in advising on ventilation systems up to one year prior to the hospital opening.

8.8.10. Overall, the account we heard from NHS GG&C Infection Control staff and the documentation of concerns and issues on which the Chair of the BICC wished assurance suggests strongly that the involvement of, at least, the medical advice in the project from its inception falls short of the rigorous engagement with 'experience /knowledge of the built environment' described in the Note 30 guidance, the Stockley et al article and the illustration in the University College Hospital article.

8.9. Commissioning phase: Infection Control Doctors Before Handover of the Hospital

8.9.1. The previous section describes the involvement of nurses in the months approaching the handover of the building to the NHS Board, their problem solving involvement and detailed contributions on many practical details.

8.9.2. At this time, toward the close of 2014, concerns amongst microbiologists surfaced by two routes, the infection control and laboratory routes. The concerns were about friction between colleagues and the quality of leadership of the infection control and microbiology services.

[97] Witness Statement: A27825389; A27500136; and A27950064
[98] Witness Statement: A27868908
[99] Review Evidence: A25634443

8.9.3. The Board's Deputy Medical Director embarked on a process, in collaboration with Human Resources advisers, to explore these concerns, and produced a report. The process did not apparently involve the lead ICD although aspects of the problem concerned him.

8.9.4. It was against this backdrop that the hospital opened. The time of handover was the end of January 2015 and the first patients were admitted in May the same year. The operation, named 'On the Move', to bring patients, staff and whole integrated clinical services was complex, successful, and a substantial achievement.

8.9.5. In the chapters on Build and Commissioning (Chapters 5 and 6 respectively) we describe the decision not to appoint an Independent Commissioning Engineer to check the completion and adequate performance of systems in the hospital before handover. Instead the client, NHS GG&C, relied on the Design & Build (D&B) contractor (the contractor) to assure them that the hospital was ready to operate and fit for purpose, with systems performing to expectation.

8.9.6. There was a single initiative by the lead ICD to test water quality, over and above the assurances that the Board expected to receive from the contractor.[100] Following that limited intervention, when a sample of water outlets were tested, there was a very brief communication stating that any water quality failures were remedied, and affirmed on repeat testing.

8.9.7. ICNs had the opportunity to visit the new hospital as it was near to completion, and they participated in advising on detailed fixtures.[101] ICDs, although located on-site for their laboratory element of their work, did not assume responsibility for their assigned services until June 2015, as the patients arrived. The initial assignment of ICD roles aligned with previous arrangements, by three management Directorates – children and women, regional services (which included some children's services and several adult departments), and acute adult services.

8.9.8. The arrival of ICDs who were new to the hospital coincided with summer holidays for some. At a vital time, there was an urgent need for information by which to understand the hospital's operation, seek assurance and to base decisions; the information was not readily available.

8.9.9. As we discuss in Chapter 7, there was a water risk assessment report about water systems' compliance with Legionella prevention requirements in the months before the hospital opened, but it was not available to ICDs.[102] The lead ICD regarded it as a matter for the Estates staff to address, although he had contributed to it.

8.9.10. A second issue arose; there were particle readings indicating that the isolation rooms intended for – indeed already occupied by – adult haemato-oncology patients and including potential BMT patients on Ward 4B were unsatisfactory and showed evidence of potential risk for future patient infection by the airborne route.

[100] Review Evidence: A28567751;
[101] Witness Statement: A27500136
[102] Witness Statements: A27868908; A27920684

8.9.11. This finding prompted the urgent transfer of the patients to the Beatson West of Scotland Cancer Centre, Gartnavel Hospital, where non-transplant patients remained for several weeks, and transplant patients remained for over two years before returning.[103]

8.9.12. From the outset, the three ICDs who, between them, had IP&C responsibilities for the whole hospital complex, did not work successfully as a team. Distrust mounted; distrust in the capability of management to listen to and address concerns and issues, and distrust of outside sources of support to management[104]. There was extensive and inconclusive correspondence between ICDs, with Estates and Facilities management, and general management of the hospital. Management and technical information was not forthcoming that was needed to inform ICDs' decision-making.

8.9.13. There were differences in the ICDs' perception of their scope of interest – some doctors asserting that Legionella-related issues were the province of Estates and Facilities professionals, whilst others felt it was their duty to know the data, the content of relevant reports, and their right to access the information. The ICDs new to the hospital were unwilling to accept any assurances about the design and its implications, and the state of the hospital systems' performance in ways relevant to infection prevention and control.[105]

8.9.14. A series of visible defects in the building's fabric, such as ill-fitting ventilation grills and pipe-leaks, did not encourage them. Outside, there was extensive demolition work, and the attention of at least one ICD turned to efforts to re-route vulnerable patients away from dust. The ICDs who were new to the hospital, very soon after taking on their responsibilities, wished to resign their ICD responsibilities, reverting to microbiology roles alone; one did so, and another who re-considered opted to continue in the role.[106]

8.10. Commissioning continues – After the Hospital Started to Function

8.10.1. The dysfunctions in the newly integrated microbiology team, highlighted above, persisted. The process of investigating the causes of friction between microbiologists prior to the hospital's opening proceeded to an investigation and a report; in response, management initiated further consultation and an organisational development process.

8.10.2. A senior laboratory consultant and manager agreed to take management control of the microbiology and infection control service leadership for a brief period.[107] During that time, she discovered that the process of solving the friction and addressing the content of the report had not engaged or involved the doctor against whom some allegations had been made, either during the information gathering or resolution stage. She addressed this matter. Apparently as a separate process, the lead ICD resigned and left in the early part of 2016.

[103] Witness Statement: A27877340
[104] Witness Statements: A27331409; A27717518; A27969648; A27969615; A27969651; and A27796503
[105] Witness Statements: A28309484 and A27969615
[106] Witness Statements: A27969615; A28121926 and A27825389
[107] Witness Statement: A28177333

8.10.3. The senior laboratory consultant and manager sought to improve the professional atmosphere, engaged with the ICDs who had wished to resign their responsibilities, appointed a successor as lead ICD, and relinquished her duties of leadership back to the new lead.[108] There was an expectation that matters would improve. They did, temporarily, but not in the longer run.

8.10.4. The ICDs who remained in post still did not have confidence in the flow of environmental monitoring and air ventilation system performance information they were receiving about specific parts of the building, and continued to lack trust in the ability of management to address their concerns.

8.10.5. Doctors' concerns were joined by ICNs. Although there was distance professionally and physically between the professional groups in the hospital, there was no evidence that there were tensions sufficient to erode the quality of service at that time. Nonetheless, doctors expressed concern about the reach and quality of leadership of the ICN in several respects. Where they were united was the perception that the building was not performing as a new building should. To quote one ICN:

'……there's been a lot more in the way of maintenance required than I would have expected since the build opened.'[109]

8.10.6. The hospital ICTs shared this perception with Estates and Facilities staff[110]. The practical effect on ICNs' work has been that their case load swelled. Over and above their conventional practice of ward-based clinical problem solving and advice, their work was continually augmented by calls to advise on building problems, such as the risks associated with leaks and the reasons behind stains on ceiling tiles and walls. This pattern of additional work continues.

8.11. Findings

8.11.1. The QEUH hospital project developed around the time of two Inquiries into significant outbreaks of communicable disease in the NHS GG&C area, the Watt Group report (2002) and the Vale of Leven Hospital Inquiry (events of 2007-08, published 2015). These reports formed the backdrop to the changing and developing function of IP&C in the city's hospitals and across Scotland.

8.11.2. The stated involvement of Infection Prevention and Control (IP&C) expertise was substantial; nonetheless, the presence of expertise in meetings was predominantly nurse specialist input, and the key role was knowledge and application of SHTMs (Scottish Health Technical Memoranda) and Building Notes. The nurse specialist role was in the interpretation, input and influence of the design in terms of infection control.

[108] Witness Statement: A28177333
[109] Witness Statement: A27500136
[110] Witness Statements: A27500136

8.11.3. During the Build phase – the involvement of IP&C expertise in the build stage was as above – nurse expertise focused on the application of guidance. As there was a presumption that the guidance was sufficient as a specification, the contract specification assuring compliance was deemed sufficient, containing all the necessary elements and with no further need for adjustment or interpretation.

8.11.4. The lead infection control nurse (ICN) was assigned to other duties mid-way through this phase, while the lead ICD continued to hold the role, responding when called upon. After completion of the Employer's Requirements the main effort then went into choice of taps, revision of that specification, location of soap points and many other detailed practical tasks.

8.11.5. The ICD input was at a high level. We heard from the lead ICD and nurses allocated to the project that there was medical representation in design discussions although the practical effect or influence of this representation to the project was unclear. There was liaison with medical infection control colleagues (ICDs and microbiologists) but no accounts of discussion.

8.11.6. Compared to the input of ICNs there was much less resource allocated to the task, and through one person. The amount of liaison of the lead ICD with ICD colleagues was limited although the general impression was that the ICT (lead ICD, nurse and manager) worked together and did not differ significantly in their outlook; so, perhaps discussion and debate was not deemed necessary.

8.11.7. Specifically the lead ICD did not draw on the experience of other doctors who had previously fulfilled very similar roles, although in hospital refurbishments rather than a major new-build project such as this. Nonetheless, it would have been reasonable to expect the lead ICD to draw on the experience of the available people who had been very closely involved with builds in 2001 and 2006 respectively. This is particularly the case for highly specialist areas where patients vulnerable to infection would be treated, where the SHTM guidance specification required interpretation, and where evidence to inform decisions was lacking.

8.11.8. Different guidance can often conflict or lack information on specific scenarios. Previous experience strongly suggested that construction contractors in these circumstances will seek to interpret the guidance to suit their own needs, such as standardisation of design for practical and financial reasons. In the event, those doctors who were excluded are now providing expert advice on investigation and remedial measures.

8.11.9. Unlike microbiologists with an interest in the built environment who liaised with highly specialist colleagues elsewhere in the UK and North America, there was apparently little effort or heed taken by the lead ICD of the learning that was forthcoming. Where there was variation in advice or dispute about the evidence for a particular form of construction, the lead ICD opted to take his own counsel and did not affirm or reconcile his decision with others. NHS GG&C carried the risk for late design approval, meaning that it was desirable that the advising doctor provided input rapidly, affirming decisions.

8.11.10. We found that the role definition of IP&C was clear through the design and build stages, modelled on extensive guidance and the ICT leadership's interpretation of the task. Throughout the latter stages challenge came from the Medical Director through a series of interventions at the BICC meetings. Challenge was not apparent from fellow ICDs until the opening of the new hospital.

8.11.11. Relationships with the project team throughout the design and build stages were effective.[111] The project team received input, and made adjustments in response to influence from the infection control experts. ICNs were extensively involved as the building took shape, with changes in standard fixtures such as taps, and in the placement of fittings to facilitate infection prevention, such as the placement of soap dispensers in clinical areas.[112]

8.11.12. The standards infection control experts sought to deploy were known standards in published technical documents, primarily in the Health Technical Memoranda and Building Notes portfolio.

8.11.13. Management information sharing with respect to the nursing contribution was adequate, whereas information sharing between ICDs prior to the hospital opening was lacking, as the lead ICD role until then was held largely through one person.[113]

8.11.14. The Review considers that quality of infection control advice relating to vital systems and standards, specifically with respect to both the water and air ventilation systems, was not sufficient to underline the importance of quality design and high standards of building practice. The available advice did not reconcile conflicts or uncertainties in guidance, areas for interpretation and missing guidance in the case of isolation rooms. The advice did not address effectively the implications of alterations to the plans with respect to Bone Marrow Transplant unit and Infectious Disease clinical services.

8.11.15. ICDs' relationships with the group of microbiologists in South Glasgow were under strain prior to the opening of the hospital.[114] [115] Those with new responsibilities for the hospital as it opened reported a lack of information on which they could make, or seek explanations for, decisions. There was alleged withholding of reports containing information, which gave rise to further mistrust and a perceived lack of responsiveness of those in management positions to concerns and issues expressed by ICDs.[116]

8.11.16. The scope of the ICD's role was contested by the newly arrived doctors who took up responsibilities from the point of patients first arriving in the hospital. These doctors did not accept assurances that their predecessor on the project had agreed, they lacked the management information they needed to inform their IP&C decisions and advice. Mistrust grew.

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[111] Witness Statement: A27500136; and A27950064
[112] Witness Statement: A27500136; and A27950064
[113] Witness Statement: A27825389; and A27500136
[114] Witness Statements: A27969615; and A27969651
[115] Review Evidence: A28559866
[116] Witness Statement: A27825389; A27969651; and A27969615

8.11.17. This picture formed part of a more general over-reliance on contractor assurances, client lack of scrutiny and assurance at the point of commissioning the building (see Chapters 6 and 7), data availability and sharing to support assurance, and confidence in knowledge about the operation of building systems at handover.

8.11.18. From the stage of Commissioning, ICNs shared an implicit definition of their role. However their assumption, shared with Estates and Facilities staff, was that they would be advising and working to support a fully functioning building, accepting snagging and teething problems but without systemic construction problems. Their job role adjusted to the reality of coping with construction-related difficulties alongside their core clinical role.

8.11.19. Despite the continuing presence of the contractor's representative on-site for two years after opening, those who operated the facility from an IP&C and engineering perspective felt that NHS GG&C lacked critical assessment of the building at handover; there should have been no presumption of adequate building system performance until responsible persons could see and substantiate the performance of the building and the data on which it is founded.[117]

[117] Witness Statement: A27796503

Part 2 Healthcare Associated Infection and Incident Management Teams in the Hospital, Within the Maintenance Phase of the Review's Remit

8.12. Background

8.12.1. This section describes the events relating to IP&C and the many responses of Incident Management Teams (IMTs) to address infection primarily amongst children in the haemato-oncology service that contributed to prevention, control and management of future infection. It covers the period of time after the opening of the new hospitals, in the 'Maintenance' phase within the Review's remit.

8.13. The Key Issues

8.13.1. These are:

- The conduct of IMTs;
- Particular features of the patients and their vulnerability;
- In 2016, infections with unusual organisms attributed to clinical practice and central venous line care;
- In 2017, continuing concerns with unusual infections and their culmination with a 27 point plan in October of that year;
- In 2018, infections centring on Ward 2A & 2B of the Royal Hospital for Children, their management, the closure of the ward and move to adult wards, major investment in the water system;
- In 2019, a cluster of unusual bloodstream infections, contested theories;
- Lessons from these incidents, clusters and events surrounding their leadership and management.

8.14. Context, Background

8.14.1. This narrative between 2016 and autumn of 2019 is a summary of events that occurred, focussing particularly, but not exclusively, on paediatric haemato-oncology patients. Detail is contained in reports and papers, and extensive correspondence; we have reviewed the documentation and sought perspectives about these matters in the course of interviews.

8.14.2. They link with a selection of concurrent developments that we describe on construction, Estates and Facilities management in Chapter 7; then proceed to discuss governance, leadership and management, whistleblowing and communications in Chapter 9.

8.14.3. The events focus around incidents that merited the establishment of IMTs; these teams tackle hospital-based, infection control events and are normally chaired by an ICD, sometimes a Consultant in Public Health – as such, this is an account of medical leadership in many respects.

8.14.4. Whilst the early occupation of the hospitals in 2015 accompanied concerns about the state of the buildings, abnormal particle counts giving rise to concerns about the operation of air ventilation systems, missing information particularly about water quality and management, and infection risk, there were no reports in the first months that gave rise to possibilities that actual infection had resulted, shown by routine HAI monitoring and key performance indicators. Indeed, as we shall come to see, the difficulty of demonstrating successful prevention, forming strong links between system problems and consequent infection when other candidates for causative links are numerous, typifies this matter.

8.14.5. Several infection matters and the first outbreaks of infection during the period, on the wider hospital site, took place in buildings of the 'retained estate' – in the Neonatal Intensive Care Unit and the Neurological Sciences building. This gives rise to the second general point – the role of IP&C in QEUH/RHC was not solely confined to the new hospital, haemato-oncology patients and the events we describe here.

8.14.6. Neither were unusual infections occurring solely in QEUH; other hospitals in the NHS GG&C area were isolating unusual organisms, often of a similar nature to those reported in QEUH. The general profile of infection control in terms of recorded incidence of key infections and outbreaks in the 'New Build' hospital complex was as good as, or better than other comparable data, both in other hospitals and compared with the hospitals that QEUH/RHC replaced and also when compared with other hospitals across Scotland.

8.14.7. The final aspect of background is the nature of the patient population that forms the focus of the infection clusters whose management we will proceed to review. Predominantly the patients who suffered from these infections were patients who would be susceptible to infection, including unusual infection – patients with haematological ('blood') cancers like leukaemia and lymphoma; in one or two cases, the patients had several concurrent conditions that weakened their immune system, although not a haematological cancer per se.

8.14.8. Such cancers, though, 'immuno-suppress' patients – that is, they predispose patients to infection through weakening the immune system's blood and plasma cell production. Furthermore, patients with such conditions require to undergo treatment that causes even more profound immunosuppression, destroying healthy as well as unhealthy cells that make up the immune system.

8.14.9. All such patients and their families have these matters carefully explained to them by the clinical team responsible for their care. The families of patients undergoing treatment whom we met were clear about the risks involved.

8.14.10. These risks include the possibility of life-threatening infection; they recognise that, sometimes, the patient succumbs to such complications.[118] Unusual infections may be the main cause or are linked to deaths, but they are rarely the sole contributory factor. Patients are most at risk during treatment cycles, or when treatment options have run out and palliation is the mainstay of care.

[118] Witness Statement: A28366984

8.15. What Was the Aim, or Standard of IP&C?

8.15.1. The aim of IP&C in this context is the initiation, establishment and use by the IP&C Team of the IMT to mount a consistently effective response to incidents, appropriate to the level of the incident, involving the correct disciplines and suitable levels of internal and external support.

8.15.2. Standards and accepted practice are contained in the Scottish Infection Prevention and Control Manual, Management of Public Health Incidents: Guidance on the Roles and Responsibilities of NHS led Incident Management Teams (2017) and accompanying documents.[119] The CNO's National Support Framework mechanism, a protocol of incident escalation, is the product of work following reports on the Victoria Infirmary (Watt Group) and the Vale of Leven Hospital outbreaks. The portfolio includes assessment tools and reporting templates.

8.15.3. Given that the patient population and the nature of several of the infections are exceptional in several ways, as outlined above, it is not unusual for there to be a number of special features within the management of such outbreaks:

- Several meetings, often in quick succession;
- Invoking higher 'flags' (green, amber, red) that signify the seriousness and significance of the incident, according to established criteria;
- Several versions and updates of Healthcare Infection Incident and Outbreak Reporting Template (HIIORT) documents, within the Healthcare Infection Incident Assessment Tool (HIIAT), used by the team to assess every healthcare infection incident;
- Inclusion of a wider circle of interests including internal staff, external expertise, and senior management as the incident investigation progresses;
- A senior management support group as an adjunct to the IMT, when there is added complexity and particular severity of the incident;
- Alternative chairing arrangement when the position of the chair as both leader and main investigator of a protracted and complex incident mandates this change.

8.15.4. All these features are contained as provisions in the Management of Public Health Incidents: Guidance. Additionally, NHS GG&C has its own Prevention and Control of Infection Manual that contains policies, operating procedures and guidelines for the use of practitioners in support of Incident Management.[120]

8.16. What Happened?

8.16.1. On each occasion we describe, the IP&C Team set up an IMT**.**

[119] See CNO(2012)01-update: https://hpspubsrepo.blob.core.windows.net/hps-website/nss/1673/documents/1_shpn-12-mphi-21062017.pdf
[120] See www.nhsggc.org.uk/your-health/infection-prevention-and-control/prevention-and-control-of-infection-manual-policies-sops-guidelines/

8.16.2. Following outbreak management in other parts of the hospital (the retained estate), the first incident of unusual infection in the new hospital, affecting a child patient in Ward 2A, was in February 2016, due to the microorganism *Cupriavidis pauculus*. Investigation linked the infection to the aseptic pharmacy suite – that is, the area where parenteral drugs and nutrition that was infused into very sick patients was prepared. The incident was traced to a tap in a sink in the aseptic suite. The tap and sink were replaced. Such an infection did not recur in that year, and the incident came to a close.

8.16.3. In July 2017, two cases of infection arose inside eight days with the microorganism *Stenotrophomonas maltophilia* in the paediatric intensive care unit. There was one associated with a death; there were several other factors that contributed to the death. The IMT took account also of several other serious gram-positive infections occurring in patients at that time. The IMT decided that central venous line clinical care was the most likely factor that was common to the incidence of the infections. There followed a focused response that has yielded sustained falls in infection of this type over the succeeding three years.

8.16.4. A second case of *Cupriavidus pauculus* occurred in September 2017, 17 months after the first case.

8.16.5. Later in September 2017, the SBAR document that gave rise to a 27 point action plan detailed five main categories of concern:

- Building design including isolation rooms for patients with infectious disease, apparent flaws in construction and their relationship to patient placement in appropriate rooms;
- Specific building problems and infections in Ward 2A of RHC;
- In the light of recent water test failures and the vulnerable population, water quality in Ward 4B of the adult hospital;
- Standards of cleaning; and
- The skill set and leadership of the Board Infection Control Team (IC Team).

In essence there was continuing concern not only about incidents of reported infection but also risk and safety factors that predispose to future infection. This event cross-refers to the whistleblowing process that we describe in Chapter 9.

8.16.6. In 2018, between 29 January and 26 September there were 23 cases of blood stream infections involving 11 different organisms. *Cupriavidus pauculus* was the first organism identified in a young patient. Testing of the water supply was undertaken across both hospital sites early in the investigation. This testing identified widespread contamination of the water system with other organisms, not confined to the children's ward 2A & 2B.

8.16.7. Three IMTs took place throughout this period. Details of the entire set of episodes is set out in the HPS/HFS report, "Summary of Incident and Findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children water contamination incident and recommendations for NHSScotland," the main findings of which have been discussed in Chapters 4 – 7.[121] [122]

8.16.8. The three incidents (IMTs) lasted less than one month each in the first two cases, and less than two months in the third case (September to November). The investigations sparked a series of radical measures to control the outbreak and prevent a recurrence.

8.16.9. The IMTs' attention initially was devoted to the clinical cases associated at that time with the water system; it then broadened from the water and taps to take in the drainage system.[123] HPS's view in its report was 'the environmental contamination and subsequent associated clinical cases (were) occurring as a result of the contaminated drains and the impact caused by the fitting of point of use filters'. For this and consequent operational reasons, NHS GG&C took the decision to close the ward in RHC on 13 September; the actual move took place on 21 September 2018.

8.16.10. Although there was significant disruption to cancer treatment regimens and additional antibiotic treatment to clear infection, no deaths resulted from these infections.

8.16.11. Fundamental works took place in December 2018 to insert a chlorine dioxide plant, sensors and dosing stations in the water system supplying the RHC; in March 2019, the system was installed by NHS GG&C for the whole QEUH complex. [124] [125] Work continues on systems in Wards 2A & 2B of RHC, which remain closed at the time of writing.

8.16.12. Analysis of four years (June 2014-18) of paediatric bacteraemias in a report from a hospital microbiology and pharmacy group demonstrated the issue well.[126] Following a drop in bacteraemias amongst child and young people's haemato-oncology patients after clinical services moved to the new RHC over the period 2015-16, there was a rise in gram-positive bacteraemias attributed in the main to intravenous line infection – see above – and then a steady rise in gram-negative bacteraemias.

8.16.13. These microbes were of many types, and more often bacteraemia results showed multiple microbes in the same sample. The most likely explanation was that the pattern of infection could be linked to environmentally derived sources.

[121] Review Evidence: A2850832
[122] Review Evidence: A28046651
[123] Review Evidence: A28046651
[124] Review Evidence: A28046651
[125] Witness Statement: A28153165
[126] Review Evidence: A28559866

8.16.14. Meanwhile, two cases of Cryptococcus emerged within several weeks at the [redacted], affecting one adult and one child patient with [redacted] cancers. An IMT was established for this event. Both cases were reported in [redacted]; one [redacted] in [redacted], and the other in [redacted].

8.16.15. In January 2019, a patient elsewhere in the adult hospital died with a diagnosis of [redacted], although a rare [redacted] organism had been isolated from the patient during their final illness. At the time the Review was established [redacted] was considered to be a cause of death; this position changed after further review, and [redacted] ceased to be a recorded cause of death.

8.16.16. These latest three death reports, in the context of the foregoing infection clusters, gave rise to the establishment of this Review. We deal with these matters further in Part 4 this chapter.

8.16.17. In 2019, and following the announcement of the Review, a series of gram negative bacteraemias were the focus of a prolonged IMT, starting in the spring until the autumn. 15 patients were affected. [127] At first, our Review team did not envisage that the episodes that were taking place as the Review set off would be part of our remit. Nonetheless the events are material to the Review as they formed a backdrop to the atmosphere in which interviews took place with witnesses. This set of IMT meetings – prolonged in individual duration in many instances and also over many weeks – were marked by sustained and unresolved conflict about the likely hypothesis that explained the infection cluster.

8.16.18. There were reports of increasing tension that several participants perceived at the meetings, and unauthorised disclosures of discussions afterward. Pre-meetings of senior management began to be held, without the involvement of the chair, and without clear explanation of their function to IMT participants. In the late summer, the chair was replaced by a senior public health consultant. The IMT was stood down in the following month.

8.16.19. In November 2019, HPS published its commissioned Review of NHS GG&C paediatric [redacted]-oncology data covering this period including the analysis and interpretation published the year before by the hospital group.[128]

8.16.20. The key issues were reconciliation of varying ways to collect and categorise microbes, and whether there was a clear single source for the microbes. It also compared experience in this patient set with two other Scottish hospitals that treat similar patients. It:

- Validated the study of 2014-18 and extended the run to 2019;
- Confirmed that the way of recording the microbes offered the same or similar result;
- Noted the proportion of multiple isolations of organisms (one-third of all samples, a total of 18 different microbes according to one of the four categorisations used);

[127] Review Evidence: A28046651
[128] See www.hps.scot.nhs.uk/web-resources-container/review-of-nhsggc-paediatric-haemato-oncology-data/

- Did not dispute whether the sources were environmental but questioned the probability of a single source.

8.16.21. Comparison with other [redacted]-oncology centres in Scotland shows variation over time but no clear pattern – there are problems over direct comparison, given the case mix differences within this very small population.

8.16.22. In conclusion, there is currently no agreed source of the cluster of infections that took place in 2019 although environmental sources remain a possibility at least for a proportion of the cases. The case series review currently underway, commissioned separately by Scottish Government via the Oversight Board chaired by the CNO, may shed further light on this series of adverse events.

8.17. Discussion

8.17.1. The scale and persistent nature of this set of events is exceptional. For any large hospital to deal with this number of events may not be unusual, particularly where the number and type of vulnerable patient groups is high. One aspect of the hospital and its size is that there few comparators for the hospital, and so experience of the scale of the challenge is unusual, and rested largely on the shoulders of one person in this case – the lead ICD. It is little wonder that strains showed, although the quality of healthcare for patients in the face of waves of new events did not waver.

8.17.2. The conduct of these investigations complied with guidance as set out in the manual, and was by and large impressive. The response to the events of 2018 that led to the closure of Ward 2A & 2B was particularly so, despite the amount of uncertainty about the nature of the problem, changing focus, the number of extremely ill children, the mounting resource implications as systems were taken apart and major modifications planned and implemented, pressure to attend to other matters connected with the building as set out in the 27 point action plan, and the inevitable public profile and need for communications.

8.17.3. The installation of chlorine dioxide dosing to the entire hospital's water supply without interruption of the clinical service over the autumn and winter of 2018-19 stands out as an operation of sizeable ambition and without precedent – those engineers and managers who carried out the task deserve credit.

8.17.4. One unanswered matter is the placing of the water system on the IP&C risk register in 2018, and not at the point of first raising concerns – at the time of opening of the hospital when the Legionella report was submitted by the outside contractor.

8.17.5. The accounts we have received from the proceedings and the outcome of the IMT series of meetings in 2019 relating to gram negative bloodstream infections vary and, in several respects, are irreconcilable.

8.17.6. What is clear is that the establishment of the IMT followed IP&C Manual guidance. However, the prolonged nature of the incident should have alerted first the Infection Control Committees (ICCs), then senior management to problems. In the circumstances there should have been escalation of the incident and review of its leadership.

8.17.7. There is no excuse for the 'extreme behaviour' as reported by one witness, and expressed by a large number of others in several ways, or the resultant intimidatory atmosphere that built around the IMT process during 2019. Amongst the accounts were reports of intolerance and lack of respect, for expertise and the integrity of the views of others.

8.17.8. Each member who played a part in that process needs to reflect on their role in making future IMTs managing complex and serious clusters of infection a constructive solution-finding process that offers the best opportunity for expertise to have impact and for the best patient outcome. Focus has to be on the subjects of the incident, future prevention and to ensure there are lessons to learn for wider application.

8.17.9. IMTs have to remain an open-minded and constructive business-like experience where participants act as a team, and where patient wellbeing prevails over notions of the moral high-ground and uniqueness and correctness of one view to the exclusion of others.

8.17.10. NHS Boards have to recognise when risks are rising in building-related systems where are potential links with disease, complex and prolonged IMTs need to be escalated, and to recognise a crisis for what it is.

8.17.11. A further point is that, amidst the turbulence of these events, the scale, complexity and newness of such a set of incidents contains a great deal of learning, not least about investigatory methods, the type of disciplines required to tackle the incident effectively, and the knowledge that is missing that demands further investigatory research to answer. There is a wealth of wider learning and knowledge to disseminate from this exacting and protracted set of events.

8.18. Explanations About These Events

8.18.1. Several points have arisen during this account that we proceed to consider further in later parts of this chapter:

- The link between three deaths from Cryptococcus and [redacted] infection and environmental factors;
- The water and ventilation systems – relevant to each stage;
- The Management and Governance of the IP&C function;
- The contribution of HPS.

At this point, we summarise the impact of the events so far, the links between building system problems and infections, and the human and wider costs.

8.19. Impact – Healthcare Associated Infection and IMTs in the Hospital

8.19.1. The water system of the hospital became, from within one year of admitting patients, the emerging source of infections that entered the bloodstreams of a substantial number of child patients with haematological cancers. The HPS report (2018) states that they were investigating a 'contaminated water system'; the entire new hospital was affected and, after immediate local action in the vicinity of the affected patients, the remedy became a new system of additional chemical disinfection for the hospital water supply.

8.19.2. Medical microbiologists predicted this risk in their SBAR document of October 2017, identified the likely places where they would have impact, and a number of associated and relevant matters. They were correct.

8.19.3. The Review takes the view that, in the design, construction and commissioning of QEUH, the client and construction contractors set out to comply with standards consistent with a more conventional hospital; they should have taken greater account of the needs of all potential patients including those in the high risk groups such as severely immuno-compromised patients.

8.19.4. The remedies required to tackle the serious infection clusters, systemic shortcomings and sub-optimal design and operation, have come at great cost. They have had substantial impact on patients' and families' wellbeing although without directly attributable deaths, and substantial public expense that extends from pharmacy costs through to capital investment in water systems. The effect on staff, the displacement of patients, and very careful planning that has resulted in order to meet patient needs and minimise delays in treatment, are also amongst indirect but immeasurable costs.

Part 3 - The Management and Governance of the IP&C Function in QEUH/RHC

8.19.5. This part of the chapter reviews what we know about the IP&C function in the new hospital once it opened, and draws lessons and findings that lie behind these events in managing the incidents.

8.20. Key Points

8.20.1. These are:

- Leadership of the IMT, and the roles of participants;
- Generating hypotheses as to what has caused incidents;
- Methods of investigation;
- The importance of relationships and role clarity;
- Accountability for management and professional performance;
- Problem solving capability.

8.20.2. Leadership of the IMTs throughout the period 2015-18 was effective. The internal frictions within the IP&C Leadership team, and the medical microbiology community, served to undermine its own effectiveness and influence of the Chair in the difficult circumstances that they encountered in 2019. There should have been the opportunity to resolve differing clinical perspectives and build consensus, aside from formal meetings. Senior management should have picked up the need for escalation and review of team leadership, as the IP&C Manual sets out.

8.20.3. The Review heard polarised views expressed by groups of microbiologists and clinicians, backed by evidence on either side. One group portrayed the cluster of gram negative infections as representing significant clinical risk borne of a likely external influence, probably from an environmental source or sources, and possibly linked to problems with the building such as the lower than expected number of air changes per hour (ACH).

8.20.4. The other group believed that the gram-negative contaminants causing a variety of serious infections were inevitable but clinically manageable consequences of the standard hospital environment and patient population in question; any external factors were multiple and possibly unalterable, and the risks were acceptable.

8.20.5. The Review is not in a position to pass judgement on the definitive interpretation of the views expressed or the supporting data (due to inconclusive scientific evidence) but is concerned that there appears to have been no functioning process to consider the data in the round nor to reconcile the clinical differences. Amongst the microbiology department of NHS GG&C there has been no capacity to agree to disagree.

8.20.6. Nonetheless, blood stream infections caused by a variety of organisms have occurred to a degree that concerns decision-takers to search very hard for a common cause; the design, construction, stewardship and early maintenance of the water system is of sufficient concern to make strong enough links, merit decisions and actions that have resulted in taking substantial precautionary measures to repair and replace parts of the water and drainage systems, maintain the water system with extra chlorination.

8.20.7. Similarly, findings relating to the air ventilation system where it was not compliant with published guidance necessitated action. The isolation of unusual organisms that may have links to human disease heightened concern, and resulted in a series of actions following the opening of the hospital to ensure the protection of patients, to address the system's known shortcomings and maintenance breaches, then to maintain the ventilation systems to a high standard, particularly high in the case of systems supplying very vulnerable patients.

8.20.8. The contribution of HPS was, at both NHS GG&C's and Scottish Government's request, to deliver two key reports and consultancy in support of the clusters.[129]

8.20.9. Its role and authority has been contested by hospital microbiologists at several points though the process – specifically following the report of the 2018 outbreak, and during the IMT process of 2019. It has also developed guidance on water systems and air ventilation systems in response to the events associated with this Review, published in 2019.

8.20.10. Perhaps there was a skill or role deficit that HPS did not fill – it was not clear from the accounts we heard. If that is the case, then we discuss elsewhere the clarity of roles of a future new National Centre for Reducing Risk in the Healthcare Built Environment in which the skill sets available to local boards and the national centre should and must relate effectively.

8.21. What Lessons or Learning can we Draw?

8.21.1. The *Management of Public Health Incidents: Guidance*, Scottish and NHS GG&C Prevention and Control of Infection Manuals, associated policy and guidance, together form an effective framework. We consider elsewhere the convention and requirement to report a standard set of common and important infection conditions that may skew attention away from the diligent investigation and governance of unusual infections when they occur.

8.21.2. Each one of the elements in the 4 October 2017 meeting responding to a problem-defining SBAR document from the week before – bringing together concerns about the building, cleaning, water quality and clusters of infection – has substance and several proved to be predictive of problems that followed.

[129] Review Evidence: A2850832

8.21.3. This document initiated the whistleblower process. Management action from that point was steady, systemic and methodical; they acted in good faith, even though some elements may have been delayed. We have to accept that each main actor in the action plan had also a role in addressing the events that engulfed the IMTs of March 2018 onward.

8.21.4. There should have been more urgency to correct the key defects and manage the consequent risks from the opening of the hospital until the end of 2017 in response to reports and emerging trends. Strong advocacy was not sufficient to alert new facilities managers to flaws in a building that, they were given to understand, was in good working order in every respect at the time of opening. We discuss elsewhere why that might have been.

8.21.5. Incident management was proficient. One can conjecture that the stress and learning of successive IMTs in 2018 resulted in two tendencies for practice in 2019 – first, to keep the incident management alive pending new cases arising – in 2018, three separate IMT processes dealt with the emerging problems. Second, there was a set of contested theories – that a single cause, a single source indeed, would again become apparent in the investigation of the blood stream infections of 2019, as they had in 2018 (the water and drainage system).

8.21.6. Examination of the data, in the view of the November 2019 report by HPS, did not support that theory. Several causes and sources remain a possibility, a phenomenon that typifies apparent outbreaks where candidate causes include environmental factors.

8.21.7. Leaders within the hospital did try to benchmark their experience with other similar hospitals. The NHS GG&C review of clinical performance made an overall assessment of the hospital's infection record in its first years, with historical and cross-Scotland data.

8.21.8. The Review has already identified in Chapter 2 that the singular nature of large hospitals means that like-for-like comparison is challenging. We discuss later other factors that impede open learning and sharing of experience. Nonetheless, more effort is required to benchmark the hospital's infection record with other very large general and highly specialist hospitals. In addition, however, successful prevention of infection does not rest on recording and reporting the incidence of infection, but the assurance of preventive systems and safety factors.

8.21.9. Typing of microbes does not link firmly the environmental samples with consequent infection, other than in a very few instances. We await the case series review to determine the precise proportion of instances where investigators established a match.

8.21.10. The first unusual microbe to be isolated in the series, in 2016 – *Cupriavidis pauculus* – was one such occasion where investigators found a perfect match, but it was followed and documented by few others, despite extensive environmental testing.

8.21.11. We judge that microbiological typing, as a precise method of linkage, is a useful tool that can be used to investigate outbreaks but not a definitive approach. As in this more recent cluster of infections, involving a variety of organisms, sometimes with several different organisms isolated from single patients, the problem is of much greater scale and complexity, and requires a combination of approaches.

8.21.12. There is a great deal of learning and experience that has resulted from these complex and unusual events. Few IP&C teams internationally will have encountered the scale and complexity of the incidents we have described. We encourage those who took part, and the new National Centre to collate and disseminate the experience that QEUH has provided for IP&C. We deal further with research and learning in Chapter 9.

8.22. Lessons that Relate to Management and Governance of the IP&C Function:

1. Conscientious advocacy from ICDs and microbiologists, backed by empirical risk-based evidence and then supported by data, are important and their work deserves attention and concerted management response;
2. A team approach to professional colleagues working with common purpose, with both effective leadership and followership – a properly recognised first (Infection Control Lead) amongst equals who are willing to be led – is essential to gain and sustain respect and influence amongst colleagues from other disciplines acting in good faith;
3. Clinical science and epidemiology skills, in addition to medical and nursing skills, are fundamental elements of an effective IP&C Team and IMT. Where necessary, they should be augmented when theories are unclear, difficult to support or contested. We now add to this skill set expertise in the design and construction process;
4. IMT chairs and IP&C Leads need the requisite skills and support to be effective. Management of risk and prevention measures, as well as management of incidents involving very sick people and concerned clinicians, requires particularly high levels of blended talent. IP&C Leads need to be collaborative, forge consensus amidst uncertainty where possible, possess reserves of personal resilience, and draw on accumulated experience backed by responsive management and personal reflective opportunities. Colleagues must let the Infection Control Lead be the person that she or he is appointed to be. We discuss in Part 6 of this chapter the needs for assured leadership and skill set in that respect, and continuing professional development in this and other roles;
5. The role of senior management in keeping channels to governance open, escalating incidents, recognising crises, marshalling additional skills and resources to incidents are also fundamentally important elements of an effective response. Management should be responsive to infection prevention concerns before it is necessary to deploy control measures;
6. Clinical professionals need to appreciate the role of management; both parties need to explain and accept the importance of their roles to each other;

7. Strategic communications capability is a sophisticated resource available to IMTs, and there should be adequate investment and reserve in this function of the NHS Board.

8.23. Findings

8.23.1. The role of IP&C in QEUH/RHC was not solely confined to the new hospital, haemato-oncology patients and the events we describe here. Neither were unusual infections occurring solely in QEUH; other hospitals in the NHS GG&C area were isolating unusual organisms, often of a similar nature to those reported in QEUH.

8.23.2. The general profile of infection control in terms of recorded incidence of key infections and outbreaks in the QEUH hospital complex was as good as, or better than other comparable data, both in other hospitals and compared with the hospitals that QEUH/RHC replaced and also when compared with other hospitals across Scotland.

8.23.3. Leadership of the IMTs throughout the period 2015-18 was effective. The internal frictions within the IP&C Leadership team, and the medical microbiology community, served to undermine its own effectiveness and influence of the Chair in the difficult circumstances that they encountered in 2019. There should have been the opportunity to resolve differing clinical perspectives and build consensus, aside from formal meetings. Senior management should have picked up the need for escalation and fresh leadership.

8.23.4. The Review considers system and thematic issues later, and makes further recommendations. The following are general matters relating to the IP&C Team role in respect of a building project of any scale.

8.24. Recommendations

8.24.1. The scope of the roles of ICD, ICN and IP&C Team involved in a major construction project should conform to the scope and style of engagement laid out in guidance and good practice documents.

8.24.2. The IP&C Team should be appropriately involved throughout the life of a project.

Part 4 – Air Ventilation – Investigation of Links with Incidents of Disease

8.24.3. In Part 2, we describe three deaths that were linked at points in [redacted] and [redacted] to unusual organisms. The two organisms in question are [redacted]. This part of the chapter considers several issues and challenges relating to the characteristics of air ventilation systems and related potential infection risks, and then takes a view on links with the building and these deaths.

8.25. Key Points

8.25.1. These are:

- General matters relating to air ventilation, air quality, and airborne pathogens;
- The challenge of investigating infections with a possible environmental cause;
- Underlining the role of ICDs and ICNs in preventing infection with respect to the built environment;
- The Review's comment on the links between the infections, and the deaths.

8.26. Context, Background, and Relationship to Other Matters

8.26.1. Three deaths of patients – child and adult – took place in [redacted] and [redacted] and are included in the chronological account of serious infection events earlier in this chapter. Two were linked to infection with [redacted] – both are unusual infections, although neither is confined to this hospital group or the patient group.

8.26.2. These deaths were widely reported in the media and several links to cause were discussed and advanced as explanations – pigeons, their remains and excrement located close to an air inlet to the ventilation system in the hospital in particular, in the case of Cryptococcus.

8.26.3. Before we turn to these specific matters, we consider broader matters in the field of air quality, air ventilation systems, and the investigations of infection that seeks to understand causes of environmental airborne infection. We have described in earlier chapters on construction – design, build and commissioning – and the early part of this chapter on IP&C advice and expertise in this area, aspects of potential prevention that relate to air ventilation systems. This part addresses matters of clinical and epidemiological investigation in dealing with issues over air ventilation and construction.

8.27. What Was the Aim, Expectation or Standard?

8.27.1. There is no well-established set of standards for investigation of unusual infections with a possible environmental cause, over and above conventional investigatory guidelines mentioned earlier – pathways and observations that are assured to isolate unusual airborne pathogens, or surveillance to detect possible hazard levels.

8.27.2. The pathogens are extremely variable; their natural history is diverse; methods of entrapment and growth and identification are all challenging. Legionella is perhaps the most well-known and researched airborne pathogen; even in this case, often the best epidemiological investigations only reach an empirical rather than firm microbiological link. In the case of Legionella, there are a limited number of possible routes of transmission, mainly through the air and in water aerosols.

8.27.3. One indicator of such a limitation reflecting risk rather than a specific pathogen was the closure of the adult haemato-oncology unit soon after opening the hospital in 2015. The decision was based on a raised particle count indicating a general risk, rather than a particular pathogen.

8.27.4. Within the science of air and risk is the exacting set of sciences that characterise air quality – be it chemical, biological, temperature, odour, humidity or other qualities such as particles and particle size. In any investigation, context and the right approach to investigation are key – these require specialist knowledge, careful analysis and interpretation of findings.

8.27.5. At the current time, there is a lack of scientific consensus about issues such as the level of risk posed by the reduced number of air changes per hour (ACH) in certain clinical environments.

8.27.6. Despite the great uncertainties in evidence we can say that available knowledge shows that there is an inverse relationship between infection risk and air change rates; risk falls with progressively higher air change rates. [130]

8.27.7. Critical points (specifically 2, 2.5, 3, 6, 10, or 12 ACH in guidance and performance reports) are quoted in guidance documents but without evidence to justify these values as specific thresholds. The air change rates quoted in guidance are higher than those in QEUH in general terms for areas that were expected to host vulnerable patients, accepting that context and circumstances are important.

8.27.8. So we can conclude that guidance provides tangible thresholds for satisfactory functioning of an air system, although they may not correspond to specific thresholds for risk to patients in scientific study. That element of risk very much depends on the patient, their clinical context, and other factors.

8.27.9. Air pressure is also an important matter; again, context is important. Pressure differences between the location of a patient and their surroundings may protect the patient, or those in the vicinity, and depend on the circumstances. With ID of the kind that, normally, a small number of infectious patients harbour – such as drug resistant types of TB or all types of Ebola infection – protection of those in the vicinity is the priority.

8.27.10. For a BMT patient, their protection from potential disease pathogens carried by themselves or others, through invasive procedures such as intravenous catheters, or carried through the air or in the water, is the key objective.

[130] See Chapter 4, specifically section 4.5.24

8.27.11. The required air systems – generating negative or positive pressure respectively – call for very different hospital patient isolation designs. SHFN 30 (2007) states that an isolation unit should not be designed with the intention of serving both pressure characteristics.

8.28. What Happened?

8.28.1. The IP&C team that took on responsibilities for the operation of the new hospital, and for offering informed advice on where to site patients, was unable to locate and subsequently to have confidence in the data they had to hand to know whether the air ventilation systems were adequate to lower risks to, or protect patients effectively from, hazards; and in addition protect carers and surrounding patients from being infected.[131] [132]

8.28.2. These concerns were based on empirical and performance data, not on actual infection, and persisted though the early years of the hospital's operation, sometimes resulting in the transfer of patients whose infections posed a risk to others to other hospitals with appropriate facilities.

8.28.3. Therefore, ICDs who are likely to be the most skilled members of staff in understanding the clinical significance of such risks are entitled to advocate with supporting evidence for their patients on the basis of the characteristics of a system's performance to prevent infection. This is preferable to resorting to investigation of incidents, when the results are often inconclusive and potential harm has already occurred. Nonetheless, they face the reality also of having to balance risk, considering alternative options to ensure patient treatment continuity, and to consider additional measures to reduce risk where alternatives are viable. Examples would be extra air filtration, extra bio-security and hygiene measures for staff and visitors, or anti-microbials that prevention infection (anti-microbial chemoprophylaxis).

8.29. Three Deaths From Unusual Infection Occurring in [redacted] and [redacted]

8.29.1. We turn now to the link between three deaths associated with [redacted] infection and environmental factors. In the specific instance of the pigeon and excrement found in the hospital near an air inlet, we understand that where the pigeon remains were found does not match the air systems supplying specific parts of the hospital where certain patients affected by one microorganism (Cryptococcus) spent much of their in-patient care.

8.29.2. The presence of pigeons within or in the vicinity of the hospital, or defects on the building that would allow the entry of a pigeon or other bird carrying a specific organism capable of causing a serious infection in a vulnerable person are not sufficient to establish a strong association or causative link.

[131] Review Evidence: A28559866
[132] Witness Statement: A27969615; and A27969651

8.29.3. There has been a series of investigations; it is prudent to propose and then investigate an association between a series of infections at certain times and the possibility of contamination linking to consequent infection. However, this association in this investigation falls short of a firm link between the events in the built environment and specific infections.

8.29.4. On the reports we have reviewed and advice we have heard, therefore, we judge that the link between pigeons, pigeon guano or excrement, and air inlets in the vicinity of these finds providing contaminated air through high quality filters towards the patients involved, is not a sound theory on its own. [133]

8.29.5. The link between the patient who died and who was associated with [redacted] infection has been explicitly discounted. The link between two patients with [redacted] infection and bird-borne carriage of the organism does not have a sound evidential basis. Other potential explanations and matters remain under review by an expert group commissioned by NHS GG&C. [134] [135] [136]

8.30. Conclusion

8.30.1. It is not within our remit to reach a conclusive judgement of the cause of infections, or on aspects of individual patient management, but to take a view on the stewardship of the service that dealt with them. We have taken a view on the three cases of infection that gave rise to the establishment of the Review. We note that, in the case of isolation of [redacted] in a patient and their subsequent death, further case investigation has ruled out a firm link with the two events. In the case of the two people with [redacted] infection, there is not a sound evidential basis on which to make a link between their infection, subsequent deaths, and the presence or proximity of pigeons or their excrement.[137]

8.31. Lessons

8.31.1. There are a number of lessons on the investigation of infections with possible environmental causes:

- Engage specialist help early – sampling, engineering, epidemiology and clinical science. The National Centre for Reducing Risk in the Healthcare Built Environment should act as a key source of decision support and access to expertise;
- There is acknowledged difficulty of linking infection to root causes where the strength of linkage and number of plausible hypotheses are several. Data are never perfect and are open to interpretation. Infections with potential environmental causes are particularly difficult to manage and investigate – there are many contemporary references to fighting an invisible enemy. Understanding of that difficulty is part of the communications plan for all stakeholders, governance bodies, public, media and politicians;

[133] See Chapter 4, specifically section 4.5.10-12 and Chapter 7 at 7.5.13-14
[134] Witness Statement: A27867258
[135] Review Evidence: A28567791
[136] See www.nhsggc.org.uk/media/258569/item-03-nhsggc-m-19_06-tbr.pdf
[137] Witness Statement: A27867258

- There is procedural and scientific learning from every incident. Reporting should aim to add to wider knowledge, especially about unusual and serious infections, where experience may be of benefit in hospitals not involved in the incident concerned. Scientific and professional networking and communication is a key component of future prevention.

8.31.2. Where we are not in a position to draw firm conclusions - nor are we within our remit to comment on individual care of people with bloodstream infection – we look ahead to the work that follows from the Oversight Board's case review exercise.

8.32. Findings

8.32.1. Microbiological typing, as a precise method of linkage, is a useful tool that can help to investigate outbreaks but is not a definitive approach. Investigation of unusual infections with a possible environmental cause requires a bespoke approach to problem solving, given the array of possible environmental and patient characteristics, and potential pathogens. As in this more recent cluster of infections, involving a variety of organisms, sometimes with several different organisms isolated from single patients, the problem is of much greater scale and complexity, and requires a combination of approaches.

8.32.2. We have taken a view on the three cases of infection that gave rise to the establishment of the Review. We note that, in the case of isolation of [redacted] in a patient and their subsequent death, further case investigation has ruled out a firm link with the two events. In the case of the two people with [redacted] infection, there is not a sound evidential basis on which to make a link between their infection, subsequent deaths, and the presence or proximity of pigeons or their excrement.

8.33. Recommendations

8.33.1. ICDs are entitled to express their concerns and have them taken seriously on matters of infection prevention and the built environment. They should work with other stakeholders to develop effective solutions.

8.33.2. All hospitals need to plan and have in place assured air ventilation systems that perform in the way they are intended or designed.

8.33.3. Without knowing the thresholds for air quality that would quantify and minimise infection risk, we look to general measures: there should be continuing efforts to ensure the performance of the systems in place, assuring air quality for all patients, particularly patients vulnerable to airborne pathogens, and make specific provision for positive and negative pressure facilities for specific groups of patients and nearby patients and staff.

Part 5 - Management and Governance of IP&C in NHS GG&C

8.33.4. Previous sections have described the events over time with the IP&C service as it related to the various phases of the new hospital. This section sets out the management and governance issues as they relate to NHS GG&C as the accountable organisation.

8.33.5. This is an account about how the IP&C service coped with the critical task of advising the client (NHS GG&C) about infection control in the built environment of a large hospital with specialist elements and dealing with important changes throughout the building project. The opening of the laboratory block and then the main hospital brought about fundamental change of working patterns and environment. Severe challenges followed as clusters of infection emerged amidst continuing concerns about the quality and finish of the new hospital's fabric and vital systems.

8.34. The Key Issues

8.34.1. These are as follows:

- The appointment of the lead ICT and its effectiveness;
- Changes over the period – after the Vale of Leven Hospital Inquiry and beyond;
- Changes to the Board and former Trust management structures and hospital infrastructure within the geographical area covered by Greater Glasgow and Clyde;
- Relationships between the ICT and the wider service;
- The management structure of the laboratory Microbiology service, and IP&C service;
- Governance of IP&C, related to Clinical and Care services;
- Reviews, investigations and remedies within the Infection Prevention and Control service;
- Leadership and followership;
- Problem solving, ownership and resolving differences;
- Coping with the impact of successive stresses on the service.

8.35. Context, Background, and Relationship to Other Matters

8.35.1. Previous sections have described, the role of ICNs and ICDs in the design and build phase; the move of laboratory services in 2012 followed by clinical services to the New Build site in 2015; friction between microbiologists in South Glasgow that preceded the move and exacerbation of these relationships when the hospital opened. We have described management review and action over the period 2015-16, staff turnover and change in leadership, a series of clusters of unusual infections that have come in waves to the hospital in succeeding years, and responses to these incidents and clusters.

8.36. What Was the Aim, Expectation or Standard?

8.36.1. The aim of the IP&C Team is to lead the IP&C function within the Board, effectively prevent and control infection associated with healthcare, and account for that service to the NHS Board, to the public and to Scottish Government with ultimate responsibility for stewardship of NHSScotland. Policy has developed in every respect since 2000, with reform and substantial framework building for IP&C in the first decade. From the start of the period since the hospital project began in earnest in 2008, policy, practice and organisation has been in stages of development rather than reform.

8.36.2. Standards for the outcomes of the service are integral to the framework for IP&C as set out in a series of core documents listed at the start of this chapter. There is a policy framework with guidance, and with key supporting documents including the National Infection Prevention and Control Manual for Scotland. There are professional standards inherent in IP&C work that adhere to frameworks of Good Medical Practice (General Medical Council - GMC), good management practice (also GMC), standards developed by professional associations and colleagues, and common law duties such as confidentiality.

8.36.3. Doctors and others are under a professional obligation to raise concerns in a number of circumstances including those where there are apparent risks to patient safety. The routes and mechanisms by which concerns can be raised include whistleblowing policies, which are a formal requirement for all NHS Boards. The impact this had in relation to QEUH is covered elsewhere in this report.

8.36.4. In the modern era, NHS clinical and laboratory practice, in keeping with other areas of clinical practice, tends to be less a community of clinical professionals regulating their own service and circumstances, and more a managed arrangement with accountabilities in meeting agreed objectives, job planning for individuals that reflect team and organisational requirements, and clinical governance - accountability for clinical performance.

8.37. What Happened?

IP&C Leadership and Management

8.37.1. During the design and build phase, the ICT leading the Board's IP&C service comprised a manager, a lead ICD and ICN, with a nurse consultant.[138] [139] The nurse consultant had been recruited to the New Build project through a competitive process. The lead ICD assigned some of his programmed time to advise the project. The nurses functioned as a team, bringing colleagues into the advisory process; the lead ICD functioned largely on his own, although there was input from at least one other ICD in the early stages.

[138] Witness Statement: A28121926; A27950064; A27825389; and A27868908
[139] Review Evidence A28121926; A27950064; A27825389; and A27868908

8.37.2. Relationships between the lead ICD and the nursing team, the project cross-disciplinary nursing team, other ICNs and clinical colleagues in other nursing disciplines appeared effective.[140] [141]

8.37.3. Involvement of nurses in formal positions with the project team ended in 2012, although there were regular professional inputs from several ICNs in the ensuing construction period. The Infection Control Manager (ICM)'s main task was the handling and implementation of guidance that sought to develop the IP&C service during and following the Vale of Leven Hospital Inquiry. He liaised with the Medical Director as Board lead for infection control (see Appendix A for diagrams illustrating management relations). The IP&C nursing complement enlarged to over 30, and related to the Nurse Director for professional matters.

8.37.4. Accountability for the performance of the IP&C service with respect to the New Build was through reports to the NHS GG&C Board from the project. [142] This arrangement was considered satisfactory, in that there was no apparent need to disclose exceptional occurrences that had been escalated beyond the project. To all intents and purposes, leadership and governance relating to the IP&C function and the New Build was problem-free. We will come to see later that concerns that surfaced through the BICC that IP&C influence has not properly tackled issues as the hospital comes close to opening.

8.37.5. Meantime friction was growing amongst the medical microbiology community. They had apparently adjusted to the challenge of the Vale of Leven Hospital Inquiry. There was praise in the way NHS GG&C Board had responded[143], but also criticism of individuals and organisation of the IP&C service. However, the lead ICD and those he led were distant at best.[144] Meetings were either operationally focused or not held with frequency, and challenge was not welcome. Attendance at meetings led by others was variable.

8.37.6. Colleagues appear to have gone their own ways, solving individual clinical problems and drawing on each other's' experience in local groups, with liaison across the NHS GG&C area on an ad-hoc basis.[145] The co-location of laboratories on to two sites across the entire NHS GG&C Board area went ahead, the South Glasgow reconfiguration taking place in 2012.

8.37.7. The integration of departments (see earlier in this chapter) was not successful for microbiologists, owing to a lack of investment in the process, and may have served to create a more volatile atmosphere when the service changed further as the hospital neared opening time, and came under pressure thereafter.[146]

8.37.8. Management of the microbiology service is as part of the laboratory services directorate; there is service leadership which associates with other laboratory leads and they solve problems within that block of related services.

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[140] Witness Statement: A28121926; A27950064; A27825389; and A27868908
[141] Review Evidence A28121926; A27950064; A27825389; and A27868908
[142] Witness Statement: A27950064; and A27868908
[143] See Vale of Leven Hospital Report www.nls.uk/scotgov/2016/9781784128449.pdf
[144] Witness Statement: A27825389; A27969615; A2796965; and A27969648
[145] Witness Statement: A27865960; A27969651; A27969615; and A27825389
[146] Witness Statement: A28177333; and A27969651

8.37.9. A parallel management process has emerged in IP&C; in contrast to medical leadership for microbiology, the IP&C workforce is predominantly nursing with over ten times as much resource in staff time (31.5 WTE in January 2020) devoted from the nursing profession compared with medical input (25 programmed activities equivalent to 25 x four hour sessions, spread across eight doctors' job plans in January 2020).

8.37.10. There is a small scientist workforce. The IP&C service reports through its manager (who has a nursing background) to the Board Medical Director (see Appendix A) who represents the function corporately, and nurses report on professional matters to the Board Nurse Director.

8.37.11. This arrangement appears to work when there are few problems; it began to show overt strain from 2015 when problems that needed attention were addressed through both routes (the microbiology and IP&C management lines), with little clarity about how to sustain problem solving. In turn these attempts at resolution affected relationships between doctors as microbiologists, and led to deteriorating relationships within IP&C services.

8.37.12. The IP&C nursing workforce, a substantial professional group in its own right, continued to function in their clinical professional roles in the hospital and with colleagues in other disciplines in other parts of the NHS GG&C area. In the main ICNs are employed full-time in IP&C, and therefore function in only one management system. By contrast, ICDs who are in the main part-time in IP&C, have two management lines, one as a microbiologist and one as an ICD.

8.37.13. One overt sign of that friction was the process whereby microbiologists on the new hospital site took part in a listening exercise followed by organisational development in 2015. The exercise achieved neither an inclusive approach in its process, nor execution of the findings.[147] There was involvement in this process primarily of laboratory based colleagues, although corporate management commissioned and oversaw the exercise.

8.37.14. Temporary senior clinical leadership for the IP&C service to address problems came from the laboratory services. That leadership did stabilise the IP&C service. The lead ICD changed in 2016. From then on, the IP&C leadership team did not function well as a unit. [148] Despite the ICM, as a senior colleague, taking part in the appointment of the new lead ICD, the incumbent ICN and ICM did not form an effective team with the new lead ICD.[149]

[147] Witness Statement: A27969651; and A27825389
[148] Witness Statement: A27969615
[149] Witness Statement: A27969615; and A28177333,

8.37.15. The new lead ICD had previously clashed with her predecessor when taking up her responsibilities in the new hospital, and did not feel bound by the practice and decisions of her predecessor and his influence on the team she now joined. There was a legacy of mistrust of the leadership team by the medical microbiologists who staffed the IP&C service, and its ability to solve problems effectively.[150] But the new leadership neither engendered a followership, nor demonstrated their own cohesion as a team.

8.37.16. Effectiveness of the IP&C team in the new hospital was sufficient to address the first incidents of infectious disease. However, at that stage both doctors and nurses experienced, through their own practice, concerns about the building that did not diminish.

8.37.17. To nurses, this was the continuing additional workload created by building-related problems over and above their routine clinical work; to microbiologist colleagues with and without formal IP&C responsibilities (all microbiologists provided medical IP&C advice as part of their microbiology on-call responsibilities) who perceived that their concerns about the building failed to be addressed adequately by management – IP&C management, Estates and Facilities management, and more senior general management. As a consequence, the resilience of IP&C leadership eroded, and it was not capable of addressing adequately the series of further adverse events that then arose.

8.37.18. In 2017, there was an emerging picture of very unusual organisms causing bloodstream infections, with few common microbes, no particularly strong links between cases, several possible explanations, and weak connection to environmental sampling. In the middle of the year, the lead ICD who had been just over one year in post, took ill and was absent for a prolonged period. Temporary leadership from a senior colleague was in place. In late September, three microbiologists then wrote to the Medical Director with a detailed list of concerns, covering a range of IP&C related matters. This communication became the material that constituted Stage 1 of the whistle-blowing process.

8.37.19. This initiative prompted a confirmatory SBAR document, an urgent response starting with a meeting chaired by the Medical Director on 4 October 2017; a list of 27 actions resulted, assigned to a range of people as appropriate for the type of action required.

8.37.20. Also in October 2017, the ICM described the ‘partial separation’ of management arrangements in a paper that aired the possibility of management change to align microbiology with IP&C.[151] Similar changes were being considered by other Scottish Boards, but no further action has been apparent in NHS GG&C.

[150] Witness Statement: A27865960; A27331409; A27969615; and A27969651
[151] Review Evidence: A28046651

Governance

8.37.21. The management accountability for IP&C and microbiology is as set out above and diagrammatically in Appendix A, along with a description of the problems that have arisen with two parallel lines for potential resolution – through the laboratory services route, and the IP&C stewardship of the Medical Director. The governance of IP&C is also a matter for scrutiny.

8.37.22. In line with guidance, the Board operates a Board Infection Control Committee (BICC); this committee is chaired by the Medical Director (see also Appendix A). Amongst other groups reporting to the BICC is the AICC, chaired by the Deputy Medical Director with oversight of acute services.

8.37.23. Most of the AICC's business focusses on performance reporting of key infections, as required by the Scottish Government – for instance surgical site infection, incidence of *C.difficile* and *S.aureus*, and issues that arise in reporting within the HIIAT system (see also 8.2.13).[152] The AICC also oversees the implementation of strategy.

8.37.24. The BICC has oversight of that Committee but also a range of community and other matters. It was the BICC that raised concerns, initially from the Chair, about the involvement and influence of IP&C in the New Build project in the years surrounding its opening. This committee meets every two months.

8.37.25. The Clinical & Care Governance Committee (CCGC) has oversight of clinical performance, a slightly different proposition to the activities of the ICCs but nonetheless it is an overseeing body for accountability for clinical performance. It is chaired by a Non-Executive Director of the NHS Board. The Medical Director took the 27 point action plan first to this committee, and it was then remitted back for discussion to the BICC. The CCGC continued to receive updates on progress with the plan's actions.

8.37.26. At the point of presentation and comment on the action plan to the BICC (January 2018), the lead ICD had returned to work. Actions continued to be addressed, although the lead ICD did not perceive it as a document that she adopted, owned or sought to implement.[153] [154] Concurrently, a series of IMT processes began that absorbed much of the lead ICD's attention, and led to the closure of Wards 2A & 2B of RHC in September 2018.[155] [156]

8.37.27. The action plan was still under active review in March 2018 at the time of work carried out to address Stage 2 of the whistleblowing event. The action plan was next considered in correspondence in December 2018.

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[152] See Scottish National Infection Prevention and Control Manual www.nipcm.hps.scot.nhs.uk/
[153] Witness Statement: A27969615
[154] Review Evidence: A28559866
[155] Witness Statement: A27969615
[156] Review Evidence: A82567791; and A28046651

8.38. What Was the Discrepancy Between Good Standard Practice and Events That Took Place?

8.38.1. The events as described above offer a factual timeline of events, the contributions of various committees, and the routes that scrutiny took through these committees. It interprets a great deal of documentary information, and draws inference from the core events and concurrent events during the years leading up to and including the whistleblowing episode.

8.38.2. Management of IP&C was liable to lack of clarity because of the escalation of problems through both the microbiology and laboratory service management route and the IP&C corporate route. This eroded the clarity and authority assigned to each; a series of efforts to solve problems, none of them ultimately successful, laid the ground for weakened resilience of management when serious problems subsequently emerged.

8.38.3. Uncertainty of a different type overshadowed the governance of IP&C. The Acute Committee (AICC) was a reporting group rather than a governance group in the way it conducted its business. It was not a committee that looked ahead, or behaved strategically.

8.38.4. The Board Committee (BICC) was essentially a reporting committee but had elements of foresight and sought assurances. It was not particularly successful in securing assurances as, despite a paper describing past work in October 2014, many issues that arose subsequently in minutes relating to the ‘New Build’ as it opened, did not return to the Committee for closure.

8.38.5. Examination of BICC agendas, minutes and papers, and HIIAT reports to the Board evidence an IP&C function that is operationally focused, with its agenda and activities largely generated by the requirements and metrics determined by the HAIRT.

8.38.6. Consequently the majority of the information pertaining to IP&C that is considered by the NHS GG&C Board relates to the reporting requirements set by Scottish Government, who draw assurance from the levels of compliance. NHS GG&C practises in this way in common with most territorial NHS Boards.

8.38.7. While incidents are reported this is largely done on an exception basis and does not feature prominently in the relevant papers or minutes. There is little evidence in the BICC or Board papers of a strategic approach to IP&C but rather of a responsive approach to exceptions that otherwise demonstrates good compliance with activities and standards.

8.38.8. The full Health Board has oversight for governance matters; the Scottish Government, through the office of the CNO, oversees the HAI system across all NHS Boards. These higher levels of governance and assurance, generally speaking until the serious incidents of 2018 and subsequently, received reports of problems after solutions were in place, rather than work in progress.

8.39. Management of a Professional Service – Analysis and Continuing Challenge

8.39.1. NHS GG&C has a general management arrangement for IP&C with strong functional and professional links to the Board Director of Nursing. The tripartite general management model of a manager, nurse and doctor is not unique to NHS GG&C and is widely adopted in NHSScotland.

8.39.2. The large number of doctors and nurses with formal IP&C roles is unusual although understandable in the context of the size and complexity of the Board area and estate. The lead executive responsible for reporting to the Board is the Medical Director. This has also created difficulties with varying perceptions and understandings of the managerial/professional line between the Board lead ICT, and in particular the lead ICD, and the Board Medical Director.

8.39.3. Leadership and management structures for IP&C have been reviewed several times in recent years but they remain divergent. They sit uncomfortably alongside the microbiology service, aligned with laboratory functions and clinical services.

8.39.4. The net result has been two management lines, microbiology and infection control. Escalation of concerns and problem solving within the medical microbiology community could go in either direction.

8.39.5. There has been no clarity about the utility of one or the other. Both have been used, but neither consistently successfully, to resolve and improve sustainable working relationships within the medical microbiology consultant community across NHS GG&C, with specific and unfortunate results that undermine the effectiveness of the IP&C service in QEUH.

8.39.6. The whistleblowing episode beginning in 2017, lack of resilience of management arrangements and instability of the lead IP&C Team's relationships set the scene for contested leadership into a particularly turbulent period, when the microbiologist community could not find the capability that would have enabled them, when it was important, to be able to agree to disagree respectfully. The IP&C team continued not to function as a leadership team.

8.39.7. The reasoning behind this deterioration is not confined within the leadership team; they clearly bear responsibilities; nonetheless, in a community of highly autonomous yet interdependent professionals, it is a joint responsibility to ensure an effective service for the population it serves, and to help to agree and implement remedies when matters go wrong. This is the task that is in progress now.

8.40. Findings

8.40.1. In practical terms the failure to address and resolve differing clinical opinions relating to IP&C has resulted in confusion that does not serve the clinical community, management or patients in the hospital well. Managers, directors and contractors all reported problems with inconsistent and sometimes contradictory IP&C advice.

8.40.2. The Lead IP&C Team has focused primarily on operational matters and reporting requirements, and can function where there is no need to reconcile differences or solve problems; it lacks resilience, strategic leadership and connectedness to its local teams, to the external IP&C community and to sources of expertise.

8.40.3. The lines of accountability for microbiology and infection and prevention and control doctors (ICDs) go in different directions for the same cadre of people. This divergence has served to perpetuate problem-solving difficulties with the service.

8.41. Recommendation

8.41.1. There should be a fully integrated management structure for microbiology and infection control services, bringing together team leadership, management and accountability.

Part 6: Appointment, Training and Skill Set of IC Team, Site Project Team

8.41.2. Of the IP&C Leadership team, the nurse leadership has higher specialist training in infection control. This comprises both taught and learned knowledge and experience. There is a career ladder and professional accountability line as well as a management line to senior colleagues. More recently NHS Education for Scotland has developed an extensive portfolio of on-line learning materials for all disciplines, and nurses are prominent within the target groups.

8.41.3. The ICM, a role that was given greater prominence following the Vale of Leven Hospital Inquiry, had a nursing background and some project management experience. He was appointed without a recruitment process and had no specialist training in infection control.

8.41.4. ICDs are drawn predominantly from the medical microbiology workforce, although some leadership positions have been taken by senior doctors from other branches of the profession, as was the case until 2006 in NHS Greater Glasgow. With the exception more recently of NHS GG&C's lead ICD, most take on designated IC responsibilities as part of their clinical and laboratory blend of roles; they have been assigned rather than recruited.

8.41.5. All microbiologists who participate in on-call in NHS GG&C cover infection control responsibilities when on-call whether or not they hold infection control 'Programmed Activities' as part of their core job plan. Some express great interest in their job as ICD, although they feel pressure in the role at times. Several also have taken interest and acquired expertise in the built environment and there are examples of doctors developing that interest to a very high level of knowledge and academic study.

8.41.6. More recently, standard setting bodies have specified infection control training as part of overall specialist training in infection. However, employment to demonstrate competence in the topic of IP&C is not mandatory.

8.41.7. At interview, microbiologists say that they acquire experience as part of their higher professional training, but it is an assumed competence rather than a required competence.

8.41.8. We judge that the job role of an ICD has both a very distinct knowledge set and requires a particular skill set and experience. It is workable for a microbiologist to belong to an environment that orbits around laboratories and specific clinical settings, interacting with laboratory and fellow clinical colleagues.

8.41.9. The effective ICD requires a much broader grounding in public health skills, multi-disciplinary clinical engagement, risk assessment, communication and balance of risks, but crucially the skills and ability to influence a circle of people outside the clinical realm, not least general management, engineering and facilities management. As a clinician-manager, they hold responsibilities to take and to implement decisions for the organisation.

8.41.10. One characteristic that microbiologists in the ICD or other leadership role have in common with the rest of the medical profession is the ‘haphazard progression’ involved in taking on such roles. This is the term used by the General Medical Council (GMC) (11) in its regular review of medical education and practice, most recently published in December 2019. It is a theme that the professional organisations and employers of ICDs need to address urgently.

8.41.11. There are several elements towards solving the increasing reluctance we sense of doctors in Glasgow and further afield to enter the world of IP&C. Encouragement, recognition and according of status will help ensure competence and confidence in practice.

8.41.12. The formalisation of this professional arm is one where we would like to see much greater engagement to achieve this theme by outside bodies in Scotland and UK. This direction of travel for the medical microbiology profession, to become an expert and with explicit accredited expertise in IP&C, may be at odds with the clinical service direction that the medical profession is taking the specialty.

8.42. Professional Requirements of Infection Control Expertise

8.42.1. In contrast to nurses who have prescribed training and expected know-how, expectations of microbiologists to gain specific expertise and personal skills as ICDs in training are a recent element as a part of overall specialist professional development. We have learned that the specialty of microbiology is in a state of change, and the skill set and job responsibilities vary markedly across the UK and even within an NHS Board area.

8.42.2. As described above, all microbiologists participate in infection control rotas out of hours and would therefore be expected to be competent and confident in offering advice on the subject for current and newly emerging problems whether or not they hold IP&C responsibilities as part of their core role.

8.42.3. In addition, the Academy of Medical Royal Colleges and Faculties (UK) has overseen the integration of microbiology, which until now has been a laboratory-based speciality, with clinical ID into the combined clinical specialty of Infection.

8.42.4. There is core training in Infection; trainees can follow either single or dual accreditation paths in a number of permutations of General Medicine, ID, Medical Microbiology or Medical Virology. The role/s they adopt as consultants may also be single specialty or cross specialties.

8.42.5. In practice, dual accredited Infectious Disease / General Internal Medicine consultants spend much of their time as physicians in General Internal Medicine, whereas dual accredited ID / Microbiology consultants will function mainly as microbiologists. The emergence of a robust and recognisable ICD role from this evolving picture is not a prime consideration.

8.42.6. We anticipate a tension between clinical and laboratory roles with infection control focus, where a distinct skill and experience set is necessary. We also anticipate difficulties in recruitment influenced by the range of services provided by individual hospitals or health boards. There will be particular challenges for hospitals which have laboratory-based microbiology services but which do not provide ID services as a clinical specialty. This will have knock-on effects for recruitment to ICD posts in such hospitals.

8.43. Findings

8.43.1. In contrast to ICNs who have prescribed training and expected know-how, expectations of ICDs to gain specific expertise and personal skills as microbiologists in training are a recent development as a part of overall specialist professional development. The specialties of microbiology and infection are in states of change, and skill sets and job responsibilities vary markedly across the UK and even within an NHS Board area.

8.43.2. We judge that the job role of an ICD has both a very distinct knowledge set and requires a particular skill set and experience. The effective ICD requires a much broader grounding in public health skills, multi-disciplinary clinical engagement, risk assessment, communication and balance of risks, but crucially the skills and ability to influence a circle of people outside the clinical realm, not least general management, engineering and facilities management.

8.43.3. Leadership preparation and development for ICDs is a professional need that they share with all other parts of the medical profession.

Part 7: Health Protection Scotland

8.44. Introduction

8.44.1. This section describes the role of HPS through the various phases of the QEUH. Looking forward, we draw lessons and make recommendations for the function of the organisation as it forms a part of the new National Centre for Reducing Risk in the Healthcare Built Environment in a separate section.

8.45. The Key Issue

8.45.1. We describe the function of HPS as a national agency and focus of highly specialist expertise that contributes to written guidance. In relation to the events we are reviewing, HPS has been in a position largely on the margins of developments in Glasgow, specifically the QEUH/RHC hospitals, drawn in to conduct analysis and provide advice only when things go wrong.

8.46. Context, Background, and Relationship to Other Matters

8.46.1. HPS was Scotland's national agency for health protection matters, until April 2020, when most of the organisation was integrated within Public Health Scotland.

8.46.2. The HAI function will form a new unit with HFS in order to strengthen their joint approaches to healthcare hazards in the built environment, following a decision that formed part of the Programme for Government, 2019. Options for the future role and shape of that new body are still under active consideration, and this Review has kept in regular contact with the leadership team for that new venture.

8.46.3. HPS was, until April 2020, a Division of NHS National Services Scotland (NSS). Under previous names (Communicable Diseases (Scotland) Unit then the Scottish Centre of Infection and Environmental Health), it has grown a capability for expertise in HAI, closely allied to the development of policy and performance monitoring in this area. At most points in the past 25 years, it has been housed in offices in Glasgow adjacent to HFS and, before that the Buildings Division, within the same organisation, NSS and before that, the Common Services Agency (CSA).

8.46.4. The HPS HAI workforce is predominantly senior specialist nurses, ranking as consultants in one of several sub-specialities in HAI.[157] There is administrative, scientist, and part-time or sessional microbiology and public health medical input. The nurses are usually recruits from local NHS Boards, often NHS GG&C which is the host city of the agency.

8.46.5. These nurses bring their own experience from local practice and often acquire, through university courses and coursework, higher training and develop areas of expertise within HPS, for instance in water systems and associated infection, air and ventilation systems and design features relevant to infection prevention and control.[158] The nurses work with and advise HFS on related work with joint interest. HFS does not itself employ nurses or other clinical disciplines.

[157] Witness Statement: A27913933
[158] Witness Statement: A27913933; and A27717518

8.46.6. The clinical advice includes consultation on the SHTM series and similar publications, although the flow of new documents has been very slow in recent years, owing to disinvestment in the source co-ordinating agency, NHS Improvement, now part of NHS England.[159] More recent documents relating to water and air ventilation systems, published by HFS last year, have benefitted from HPS-HAI input.

8.47. What Was the Aim, Expectation or Standard?

8.47.1. The aim of HPS with respect to the QEUH at the design stage was as contributing author of guidance, with HFS as the main publisher of the Scottish HTM and/or Building Note series. HPS was not regarded by NHS GG&C as a consultant on the guidance as the client drew up its Employer's Requirements; with three documented exceptions, NHS GG&C or the project team neither sought support in interpretation of guidance issued by HFS/HPS, nor did HPS offer support. [160] [161]

8.47.2. At the build and commissioning stages, HPS had the same general role; acknowledging that the SHTM series offers detailed guidance through to commissioning and operation of building systems.[162] HPS offered its view on the installation of taps and flow straighteners according to guidance that was in place at the time of the design stage.

8.47.3. HPS became involved when problems started to arise.[163] It did so in two ways. CNO's National Support Framework mechanism (12) invokes HPS's involvement, when the escalation of reporting reaches a stage of disclosure to Scottish Government. In consequence, HPS would be expected as the national expert agency to be involved with incident management, particularly investigation of serious or unusual incidents.

8.47.4. The second role would be that the local NHS Board would call on HPS for support. This was the process of involvement of HPS when NHS GG&C compiled its action plan in 2017 and, together with Scottish Government, when the cluster of bloodstream infections emerged in 2018, then again in 2019.

8.48. What Happened?

8.48.1. HPS senior staff became involved by these two routes of referral.[164] NHS GG&C does not regard HPS as the 'go to' organisation for all types of expertise, however, preferring to source highly expert advice direct from contacts and through networks that it already knows. Such a set of arrangements is not a formal matter, although HPS accepts this state of affairs.

[159] Witness Statement: A27996988; and A27913933
[160] Witness Statement: A27500136; and A27913933
[161] Witness Statement: A27500136; and A27913933
[162] Witness Statement: A27913933, and A27913933
[163] Witness Statement: A27913933; A27717518; and A27913933
[164] Witness Statement: A27913933; A27717518; and A27913933

8.48.2. NHS GG&C likewise accepts that HPS becomes involved automatically when an incident escalates, although it tends to perceive the organisation more as an agent of Government rather than a source of decision support to the Board in its incident management plans.[165] [166]Some witnesses to this Review described a closer relationship between IP&C in NHS GG&C and HPS, but this is based on personal ties rather than the corporate relationship that the two organisations might have as parts of NHS Scotland.

8.48.3. One nurse summed up the role of their HPS colleagues:

I would say HPS have done what was expected of them ……And ….., from what I'm reading from the minutes, HPS have given a lot of guidance, 'have you thought about doing this, why don't you look at that, can you give us this information'. From that point of view, they seem to have steered us very well. [167]

Until 2018, this has been the prevailing view from nurses.

8.48.4. Others describe a more distant relationship. Glasgow colleagues assert that practice-based experience weakens when senior people leave the clinical front-line, and prefer to source and act on their own expertise on implementation.[168] They question, therefore, the added value of HPS expertise; doctors in NHS GG&C especially who are looking for higher levels of expertise on epidemiology and knowledge of the more unusual problems from an infection control perspective will tend to look elsewhere.

8.48.5. HPS was commissioned to make a report of the cluster of bloodstream infections in young patients of Wards 2A & 2B of the RHC entitled HPS/HFS report, "Summary of Incident and Findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children water contamination incident and recommendations for NHSScotland" – one of the source documents on which this Review was founded. It is a detailed analysis of the year's events until September 2018.

8.48.6. Thereafter, relationships have become more strained. The report was subject to review and detailed criticism by hospital microbiologists. Throughout the 2019 Incident Management series, tension built. This was perhaps not surprising given the important and gradual development of events in that year and the previous year.

8.48.7. However, and in similar fashion to several of those who were present at the IMTs through 2019, HPS nurses felt less welcome as contributors; their advice was challenged to the extent that they felt intimidated. The HPS representative, a senior and experienced nurse, opted to go to several meetings with a colleague for support.

[165] Review Evidence: A28046651
[166] Witness Statement: A27950064; and A28121926
[167] Witness Statement: A27500136
[168] Witness Statement: A27913933; A27717518; A27950064; A28309484; A27912320; and A27865960

8.49. What Was the Gap/Discrepancy Between the Ideal and the Actual Events?

8.49.1. Part of the issue with HPS is one of self-perception and remit – it is a group of specialist experts, an author of expertise and not a consultancy, with respect to its contribution to the preparation and publication of guidance. HPS's work is published and that has been the extent of its remit for buildings in the design and build stages.

8.49.2. Its operational role with respect to NHS GG&C was as problem solver, provider of analytical expertise and decision supporter on commission from Scottish Government primarily, the NHS Board senior management secondarily. Latterly other participants challenged their role, contested its analysis, and questioned its role and legitimacy in the IMT series of 2019.

8.50. Possible Explanations

8.50.1. HPS's role is for the most part unexceptionable. It has maintained its integrity for sound and timely work, and most onlookers respect its skills. The Lead IP&C Team within NHS GG&C and medical onlookers have been more lukewarm. They question the value that HPS adds to the specialist nursing and medical input of locally based colleagues, as a centre for expertise for highly specialist topics, and their capability to offer more sophisticated analysis.

8.50.2. Several witnesses suggest capacity constraints lie behind this perception, although priority setting by senior decision-makers within HPS about allocation of its resource is bound to be a factor as well.[169] This is a perception that the planners and consultees of the new National Centre for Reducing Risk in the Healthcare Built Environment will wish to consider.

8.50.3. One other view voiced by observers of GG&C's culture and practices, from within and outside, is that the organisation tended to see itself as a self-contained, very large health system, and do not regard outside attention from agencies as welcome unless it requested help on its own terms.

8.50.4. NHS GG&C's IP&C function relates infrequently to expertise outside the Board area. This may be due to the wide range of expertise available, and training opportunities and experience for career development within the Board area. When ICDs wish to source external expertise, they do so largely as individuals and not through common consensus or through HPS (now Public Health Scotland), as they do not perceive the expertise hosted there as adding value.

8.50.5. When incidents are escalated and HIIAT reports mandate disclosure to Health Protection Scotland, the national agency is involved as a matter of course; this relationship seems still to be an uneasy arrangement.

[169] Witness Statements: A27996988; A27912320; A28121926; and A28309484

8.51. Findings

8.51.1. Those who lead NHS GG&C's IP&C service, and its practitioner and specialist staff are in a key position to define the relationship they wish to have with external agencies and expertise. Until now, the total between HPS and the NHS GG&C IP&C service has been less than the sum of its parts. This should change with the emergence of a new leadership for IP&C in NHS GG&C and a new National Centre for Reducing Risk in the Healthcare Built Environment.

8.51.2. One other view voiced by observers of NHS GG&C's culture and practices, from within and outside, is that the organisation tended to see itself as a self-contained, very large health system, and does not regard outside attention from agencies as welcome unless it requested help on its own terms.

8.51.3. IP&C practitioners in NHS GG&C have established new knowledge and expertise following the experience that is the subject of this Review. That knowledge and experience is valuable to colleagues in NHSScotland and more widely through active involvement in the development of the National Centre for Reducing Risk in the Healthcare Built Environment.

8.52. Recommendations

8.52.1. The National Centre for Reducing Risk in the Healthcare Built Environment will wish to consider the views expressed in this report toward the scope and involvement of national and local IC Teams in projects on the healthcare built environment, and benchmarking good practice.

8.52.2. The National Centre will also wish to review the content of this report, reflecting on national agency skills, experience and capability matters in the recent past.

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Chapter 9

Themes

9. Introduction, context, and relationship to other matters

9.1.1. This chapter draws together different strands that have emerged during the course of the Review and through engagement with the various stakeholders and groups that have formed the core of this Review's work.

9.1.2. The detailed examination of matters that lead to collation of these themes are set out earlier in the report. Whereas the accounts so far have been in chronological order, this chapter assembles subjects that draw from the different accounts. Most of the subjects relate directly to the original Remit of the Review, whilst a number of matters have arisen in the course of the Review that deserve comment; they occupy sections later in the chapter.

9.2. What was the Aim, Expectation or Standard?

9.2.1. The relevant standard or benchmark for assessing these matters belongs to the context that earlier chapters lay out. The tests we apply in this chapter are those that apply throughout the report and are described in detail in Chapter 1, in the section on evidence. We hold to the principle of fairness, and endeavour to highlight learning from the events that we describe.

A. Infection Prevention and Control (IP&C) technical expertise, standards of professional work.
B. Changing patterns of Healthcare Associated Infections (HAI) and implications
C. Governance and assurance
D. Behaviour and relationships
E. Communications
F. The National Centre for Reducing Risk in the Healthcare Built Environment
G. Research, evaluation and learning
H. Whistleblowing
I. Duty of Candour

A. INFECTION PREVENTION & CONTROL TECHNICAL EXPERTISE, STANDARDS OF PROFESSIONAL WORK.

9.2.2. This section considers information we have gathered in the Review. The reflections relate to the work of the IP&C function in NHS GG&C both in the QEUH/RHC and across the Board area and to more general matters for the future. These have wider application in the professions and disciplines that make up the IP&C team and closely related associates.

9.3. Appointment, Expertise and Professional Standards

9.3.1. Appointment of the IP&C leadership team was part formal recruitment, part selection and assignment without recruitment.[170] Members of the leadership team for a critical function that spans the clinical, managerial and corporate elements of an NHS Board should all be recruited on the basis of merit, values and skills. Any deficit at appointment or subsequent review should be part of a development programme.(2)

9.3.2. Appraisal and professional accreditation should be consistent with the professional background of the post-holder, and there should be assurance that their performance in post will be as a leader, as part of a leadership team, and in the exercise of a specialist knowledge skill set including influencing skills that ensure personal effectiveness. For post-holders in large Boards such as NHS GG&C the team would be expected to have a role in determining the future shape and influence of the function nationally, in close association with the National Centre for Reducing Risk in the Healthcare Built Environment.

9.3.3. The IP&C expertise available to project teams working in built healthcare environments should be appropriate for the purpose. For routine tasks the HAI-SCRIBE system assures that the right issues are in clear sight. However, major projects that include facilities for specialist clinical use require specific skills and expertise, and the personal effectiveness of members of the IP&C team need to meet the requirement and provide the capability to influence and inform good decisions. IP&C experts include those from both clinical and engineering backgrounds (Health Protection Scotland (HPS), 2007).

9.3.4. The regulation, standards setting, training and education bodies which set standards for professional work are well established for medicine, nursing, clinical science, public health, architecture and engineering. We assess that, while individual contributions of professions are becoming increasingly clear, their joint and integrated contributions have still some way to go. We will ask the relevant professional bodies to examine the shared professional issues that have surfaced that would underpin expertise and continuing professional development in the area of the built environment for healthcare, and recommend measures that meet the modern requirements of governance in this area.

[170] Witness Statement: A27825389; and A27950064

9.3.5. The planned National Centre for Reducing Risk in the Healthcare Built Environment, together with educational and standard-setting organisations in the professions, will be key parts of standards development and the sharing of learning amongst practitioners across disciplines in this area. We envisage that they will link with their counterparts across the UK and internationally.

9.4. Appraisal

9.4.1. Regardless of their professional background, those with Infection Control as part of their job role should undergo regular performance appraisal. This should include enquiry about challenges and problems encountered in the role, including team effectiveness.

9.4.2. Enhanced professional appraisal must, similarly, encompass critical appraisal and reflection. Critical incidents where Incident Management Teams (IMTs) present dilemmas and challenges should provide candid and confidential material for discussion with a view to continuous improvement.

9.5. Management and Leadership Preparedness and Performance in the Professions

9.5.1. The selection of Infection Control professionals in management positions such as the leadership team should be by competitive recruitment with the possibility of extension or reappointment. Appointees should be given every opportunity to address areas where assessment shows room for growth and learning. Effective team work must be an element. We make a recommendation about leadership preparedness and development in Chapter 8.

9.5.2. Incident management and problem assessment inevitably involves hypothesis development and testing; governance must ensure that hypotheses are sound, contestable and the debate that strengthens or removes hypotheses is respectful and transparent.

B. CHANGING PATTERNS OF HAI AND ASSOCIATED IMPLICATIONS, IP&C REFORMS, KEY PERFORMANCE INDICATORS

9.5.3. This section reflects significant progress with the IP&C agenda across Scotland, and a fresh challenge to monitoring, reporting and learning in relation to HAI. Findings and recommendations relate to policy and professional matters in national and local organisations.

9.5.4. The construction of the hospitals coincided with the conduct of the Public Inquiry into an outbreak of infection at the Vale of Leven Hospital (2007-08), also in the Greater Glasgow and Clyde area. The report of the Public Inquiry was published in 2015. [171] It complimented NHS GG&C on steps it had taken to respond to lessons from the outbreak in advance of the publication of the report.

9.5.5. We asked what effect this had on the development of the IP&C function. We heard that much of the internal development and investment had anticipated the outcome of the Inquiry and that there was substantial organisational development in the function across the Board area. [172] [173] At the same time, the IP&C function adjusted to significant managerial and physical restructuring across the Board.[174] The main task throughout the period of construction of the new hospital with respect to IP&C management was the implementation of a steady flow of guidance and new requirements coming out from the Chief Nursing Officer's Directorate of Scottish Government in response to the Vale of Leven Hospital Inquiry.

9.5.6. Over that period, the reduction of HAI incidence and prevalence in NHS GG&C, in common with the rest of NHSScotland has been substantial. As stated by the Cabinet Secretary for Health and Sport, Jeane Freeman, in the Scottish Parliament proceedings that gave rise to this Review's formation:

"Since 2007, there has been an 85 percent fall in cases of *Clostridium difficile* infection in over-65-year-olds and a 94 percent fall in levels of MRSA, in line with the national average. The national point prevalence survey record shows that the Queen Elizabeth University Hospital has an overall rate of hospital-acquired infection of four percent;" [175]

9.5.7. The national level at the time was 4.9 percent. The investment in IP&C and the framework of infection standard setting and review have seen real gains in patient safety.

9.5.8. This Review identifies competence in the supervision and management of HAI for established, still regularly-occurring and important infections; but our focus has been toward a significant set of clusters of HAI that involve new and unusual organisms that are very complex to characterise, to investigate, and have stretched professional knowledge, resources and relationships.

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[171] See The Vale of Leven Hospital Inquiry Report: www.nls.uk/scotgov/2016/9781784128449.pdf
[172] Witness Statement: A28121926; A27969648; and A27912320
[173] See The Vale of Leven Hospital Inquiry Report: www.nls.uk/scotgov/2016/9781784128449.pdf
[174] Witness Statement: A27912320; A28121926
[175] See Meeting of the Parliament Official Report, Column 8, www.parliament.scot/parliamentarybusiness/report.aspx?r=11903&mode=pdf

9.5.9. This experience underlines that HAI is a dynamic area for clinical and laboratory practice. Communicable disease also remains a key strategic risk, and both policy and practice need to adapt.

9.5.10. The concentration on standard measures of HAI key performance such as the reporting of specific preventable infections, has clearly been the focus of monitoring and progress in Scotland in acute health sector organisations in particular. It was the prime focus for NHS GG&C's Acute Infection Control Committee (AICC). That Committee did not focus on the 'New Build' before the hospital opened, nor on unusual infections after it opened. This keen focus on establishing the IP&C structures and processes contributed to the progressive improvement in performance against standard measures of HAI incidence; it had less impact on the management of infections involving unusual organisms or new patterns of infection.

9.5.11. Unusual infection has become an established part of a changing environment and the next horizon and challenge for infection control in hospitals. Undoubtedly, in NHS GG&C there were voices highlighting that unusual infections were mounting in number and rate over short periods of time. [176] [177] The issues were addressed not in the Acute Committee but in the Board Infection Control Committee (BICC).

9.5.12. We find that there have been very important advances in infection control since the framework of IP&C came into effect. Many lives have been saved by sustained and co-ordinated action; NHS GG&C and NHSScotland hospitals deserve credit for this achievement. It is, however, an opportune time to turn to focus on the rising proportion of less common infection alongside conventional and still-important HAI monitoring. This requires more sensitive and sophisticated problem assessment, more involvement of disciplines and technologies that add intelligence to current levels of analysis, network expertise nationally and internationally, and use of evidence to inform technical advice that crosses the building, engineering and clinical disciplines.

[176] Review Evidence: A26441192
[177] Witness Statement: A27969648; A27969651; A27331409; A27865960; A28121926

C. GOVERNANCE AND ASSURANCE

9.5.13. This section addresses governance of matters within our remit, primarily centred on QEUH/RHC. It involves NHS GG&C as a corporate and accountable organisation, and other accountable organisations such as contractors. Findings and recommendations encompass professional work, standards and policy and include such matters as records management and retention that lie outside the NHS Board and contractors' remit.

9.6. Governance and Decision-making During Design and Build Phases

9.6.1. Governance processes for site selection, and the design stage were strong and ensured wide stakeholder engagement. Those with infection control expertise were heard and their views taken into account. The process of planning and executing the move of clinical services, On The Move, was complex, careful and well executed.[178]

9.6.2. Leaders were frank with us about the scale of the challenge in the integration of clinical teams onto one site, from four different sites, each with their own cultures and practices.[179] In 2012, when laboratories came together on a single site south of the River Clyde, work was undertaken to integrate teams. However there was limited progress toward integration of the microbiology teams in contrast to other departments.[180] The reasons for this are not entirely clear.

9.6.3. Within the construction phase, despite the appointment of a supervisor team, the emphasis of quality assurance was on self-rating by the contractor.[181] Remarkably little investment was placed in the function of assurance by, or for, the client.

9.6.4. Alterations necessary to ensure that QEUH Ward 4B was fit for purpose to host adult haemato-oncology patients was a case in point. Originally this service was to remain at the Beatson West of Scotland Cancer Centre on the Gartnavel Hospital site and no suitable clinical facilities were included in the planning for QEUH. The decision to include the service at QEUH was taken in the course of the project and followed clinical representations.

9.6.5. A note of change and additional financial resource to carry out alterations were agreed, with acknowledgement that the conversion would be a compromise, limited by the capacity of the already installed plant and equipment.[182] The compromise was considered appropriate because of the benefits it would bring in reducing clinical risk for certain high-risk patient groups. [183] The Review considers that, on completion, NHS GG&C did not have proper assurances that the work that resulted was to a sufficient standard to compensate for the compromises.[184]

[178] Witness Statement: A27500136; A28309484; A28121926; and A27912320
[179] Witness Statement: A27331409; A27865960; A27969615; and A28121926
[180] Witness Statement: A27331409; A27865960; A27969615; A27969651; and A27969648
[181] Witness Statement: A27331339; A27871832
[182] Witness Statement: A28121926; A27331339; A28309484; A27877340; and A28308555
[183] Witness Statement: A28121926; and A27877340
[184] Witness Statement: A28121926

9.6.6. NHS GG&C as clients opted not to engage an Independent Commissioning Engineer to seek and obtain assurances more generally about the satisfactory completion of the building at the time of handover.[185] Opinions vary between interviewees about the significance of this decision, whether it was an accepted process that the contractor would self-assure, or whether the decision was highly unusual.[186] We view it as extraordinary, given the scale and complexity of the venture and the implications for the operator if assurances were unsound.

9.7. Governance and Decision-making from Commissioning to the Present Day

9.7.1. At various crucial points throughout the progression of the building project, its handover and subsequent operation, there has been a lack of transparency in decision-making. At times of challenge, there has been a lack of information sharing. Amongst microbiologists in QEUH, who make up the cadre of Infection Control Doctors (ICDs), there was progressive erosion of confidence in their relationship with management and specifically its willingness to listen to and address their concerns.

9.7.2. The management figures included some of their own professional peers. This progressive picture that dates back several years led to events in 2017 and subsequently undermined trust within the group of doctors; in turn, it undermined the effectiveness of the service overall. The ability of professional groups, especially self-regulating professional groups, to function as a team is a matter of good governance. Management systems find it difficult to seek and receive assurances if the links between professional group activity and accountability for clinical performance are not strong.

9.7.3. The operation of the AICC was founded on the reception and ratification of nationally prescribed key performance indicators (KPIs) and did not focus on exceptions such as atypical single incidents or unusual clusters of infection. It was left to the Chair of the BICC – the Board Medical Director – to articulate concerns and highlight risks about the 'New Build', seeking a stream of assurances about IP&C colleagues' involvement in decisions about the building.[187] Answers to requests for assurances were not forthcoming on several important issues at the time of completion of the hospitals.

9.7.4. When microbiologists raised concerns that initiated the whistleblowing event in 2017, NHS GG&C management compiled an action plan of 27 items, and these were presented to the Clinical and Care Governance Committee (CCGC) at an appropriate level of detail.[188] Discussion resulted, and we understand from those the Review met that the committee is still monitoring the implementation of the action points.

[185] Witness Statement: A27331339; and A27871832
[186] Witness Statement: A27331339; A27871832; and A28308555
[187] Witness Statement: A28121926
[188] Witness Statement: A28121926; A27969648; and A27969651

9.7.5. The amount of business conducted by the Infection Control Committees (ICCs), not least standing items, was very substantial. The pattern of reporting of Infection Control matters to Boards and the Scottish Government is of attainment of national performance targets and problem solving, much less commonly problem identification and working towards solutions before completion. There was limited disclosure of alerting information to the Board; primarily reports were of completed episodes. These observations are consistent with criticisms made in the Vale of Leven Hospital Inquiry.

9.7.6. The routes of governance of IP&C remain unclear – indeed, there is a question whether programme management is the core function of the ICCs, relating primarily to the reportable KPIs for infection control and not the scrutiny of wider matters. The CCGC was the route of response for the whistleblowing event and, after that, it was remitted to the BICC. More recently, governance and oversight scrutiny and assurance have tightened as clusters of serious illness have become the focus, rather than risk management and safety factors that were designed to ensure effective prevention.

9.7.7. The Board was briefed on regular occasions throughout the time of the construction project and into the life of the new hospital. The content of such reports comprised assurances of progress and management of major developments in the course of business. Until the spring of 2018, in the context of IP&C, when the first major cluster of blood stream infections associated with water contamination became apparent, there was documentation that noted only routine reports. From that point there were briefings and, principally, minuted responses to steps that NHS GG&C Board's leadership had put in place.

9.7.8. There appears from NHS GG&C Board papers and minutes to be limited discussion of wider implications of such matters as disruption to patient care. The Board noted reports on ventilation issues. On water safety and decisions to allot substantial capital investment in the face of systemic problems with the hospital's supply, there were assurances only about compliance of water quality with externally derived standards.

9.7.9. There was a mismatch, that was substantial by any yardstick, between the infection events that we perceive as serious, the response of management, the capital investment planning, the operational upheaval for patients and clinical teams, and risks that accompanied the refurbishment of the water system. While hospital management worked their way through the task, it appears that the Board of NHS GG&C was not sighted on several aspects in obtaining assurance on the quality of the management plans and approach to safeguarding patient care.

9.7.10. In order to function effectively a Board must conduct its business by means of appropriate delegation through a hierarchy of governance committees and sub-committees. This allows meaningful apportionment of workload and concentration of expertise but relies on robust reporting mechanisms for seeking and gaining assurance. Inevitably with such a system there can be problems.

9.7.11. These include a perception that reporting is significantly delayed because of the time that it takes issues to be taken through the hierarchy and reporting lacks the detail that is captured in every paper at every level. This can mean that main Board papers in particular can appear high level, lacking in detail and underplaying problems. The knowledge that Board papers are in the public domain also influences how and in what detail they are written. There is a challenge in getting the balance right with such papers.

9.7.12. It is our view that the Board of NHS GG&C did not achieve this balance. With the information available to it the Board was unable to consider matters relating to the QEUH project in a suitable level of detail; the Board was disposed to accept assurance given by the project board. In several instances that we have investigated, these assurances have proved unsound.

9.8. Findings

9.8.1. The Board of NHS GG&C did not have information available to it regarding the lack of performance of the ventilation systems as the hospital opened, and did not track or comment on consequences for patients. Neither did it have information about inaction over a series of compliance problems with the water system until a late stage.

9.8.2. The Board of NHS GG&C did not seek or receive assurances in sufficient detail about the significant actions that Estates and Facilities were carrying out by refurbishing the water system in 2018. The risk register changed to recognise this matter in summer 2018.

9.8.3. With respect to the design and build phases, the findings and recommendations derived from our assessment in Chapters 4 and 5 – the need for impartial, competent and clear advice on the Design and Build Contractor's proposals, those flowing from the Independent Review of Edinburgh Schools, and the issues of principle within Part A of the Infrastructure Commission report – encompass the steps we put forward as learning and positive changes for the future.

9.8.4. The main theme of our findings on governance throughout the phases of commissioning and maintenance – or handover and operation of the hospital – is assurance. This encompasses the challenge to seek assurance, and to ensure that assurance is available.

9.8.5. IP&C within the built environment is a crucial element in decision-making for all investments in health and care buildings.

9.9. Recommendations

9.9.1. While the recommendations that follow relate to findings based on the experience of the QEUH Project, the recommendations have implications from all NHS Boards engaging in capital build projects.

Design and Build Phases

9.9.2. We endorse the recommendations of the Review of Edinburgh Schools as applied to hospital and other healthcare buildings and public sector capital investment. We recommend that they are implemented in full.

Commissioning and Maintenance Phases

9.9.3. The data on which those with responsibility offer assurance must be sharable to ensure transparency, complete with information on context and, where available and appropriate, valid comparison and external peer challenge.

9.9.4. Whilst the arrangements for involvement of stakeholders at each stage was strong, and the complex process of moving clinical services with patients and staff and equipment into the new hospitals was successful, we recommend that:

Stakeholders advising on critical systems such as IP&C are:

- Properly trained, experienced, capable of management and organisation of resource, capable of effective influence and have scoped the highly specialist functions of a healthcare building;
- Capable of escalating problem solving, and networking with evidence providers nationally and internationally when the situation demands it;
- Capable of understanding the implications of derogations, guidance and compliance;
- Diligent in documenting decision-making that is transparent and accountable.

Board and Area Infection Control Committees should:

- Have programme management responsibilities;
- Where they have clear governance responsibilities, have well defined scope and remit in respect of other governance bodies;
- Have the remit and scope of their governance responsibilities clearly defined;
- Be competently supported by the Infection Control Manager, so that secretariat and professional leads pursue matters arising diligently, reporting progress and resolution at subsequent meetings;
- Have clear and well understood interfaces between the CCGC, other sub-Committees of the Board and other governance groups.

The **Health Board** should:

- Retain as formal consultants experienced construction professionals in non-executive positions at times when the organisation is making major investment in estates and facilities. They should scrutinise the project team's performance, critical external relationships with the contractor and assurance systems that include independent verification. They should also provide comment on main developments and changes;

- Expect fuller briefings with problem-orientated records and risk management plans for key adverse events, such as those that are the subject of unplanned capital investment, or sustained and adverse public attention;
- Expect the documentation of more significant critical incidents to address the wider effects on patient care and lessons learned in regular, routine reporting of the Infection Prevention and Control function. This should be in addition to Healthcare Infection Incident Assessment Tool (HIIAT) reports;
- View the Estates and Facilities management function of the NHS Board as central to the Board's work, as NHS GG&C does now, to ensure that stewardship of the built environment and the Board's capital assets receive proportionate management focus.

9.10. Records Management and Retention

9.10.1. Several externally commissioned reports and this Review have been limited by the amount of documentation that is still available to examine. We appreciate the conduct of a project as complex and prolonged as the period and activity covered by this Review generates an immense amount of information. However, management information systems such as ZUTEC were missing substantial amounts of testing and commissioning documentation and an effective computer-aided facility management (CAFM) system capable of interrogation did not replace the project system.

9.11. Recommendation

9.11.1. The documentation and audit trails of key decisions during the time of important projects should be better preserved in order to ensure accountability and clarity of past decision-taking. There should be a review of reasonable timescales for records retention, and this may involve law or regulation to ensure the necessary changes.

D. BEHAVIOUR AND RELATIONSHIPS

9.11.2. This section focuses primarily but not exclusively on matters internal to NHS GG&C. Its interactions with construction partners and external professional organisations and sources of expertise form part of the picture.

9.12. Behaviour

9.12.1. We were influenced by reports published in the year prior to establishing the Review that highlighted behaviour, care and compassion in the NHS workplace (1) (2).

9.12.2. During the course of the Review we were sensitised to the nature of organisational, group and individual behaviour that may have influenced events, affected IP&C risk and affected patient safety. Throughout the section on governance and assurance, there are underlying assumptions of relationships that may or may not have been effective in proposing, receiving, listening to, and acting on, IP&C advice. Questions arose about behaviour within the hospital and IP&C community, and whether we could identify distinct patterns and propose remedies.

9.12.3. We encountered many people within the main organisations – NHS GG&C and contractors - who have acted conscientiously and professionally. We do not have comment to make on organisation-wide behaviour. We do, however, make comment about its general attitude to external professional expertise in the context of NHS GG&C's relationship with HPS at the close of Chapter 8.

9.12.4. Within teams of people who we met or were represented to us, we perceived a spectrum of behaviour. We single out clinical teams working in Wards 2A, 2B of RHC, 4A, 4B and 6A of QEUH who have kept to their prime purpose and delivered consistently high quality of care, supported by their management. Nonetheless, the team behaviours that we have described through sections of this report are variable and at times dysfunctional. The IP&C leadership team, the microbiology doctors and some of the doctors' interactions with other senior staff in management have shown difficulties in relationships that affected performance.

9.12.5. The behaviour of individuals has been, at times, inappropriate.[189] Reports of the conduct of the prolonged IMT through much of 2019 illustrates this point. We heard accounts and allegations of bullying behaviour and intimidating conduct at meetings – 'extreme behaviour' in one account.[190] Our observations relate to the behaviour of individuals; we found no evidence of institutionalised bullying in NHS GG&C.

9.12.6. Over several years and particularly more recently, we have heard of allegations of withholding data, callous remarks that question integrity and motives, and threats about the careers of colleagues.[191] There were several occasions where NHS GG&C staff are alleged to have expressed dismissive attitudes toward staff and teams in other organisations who had a role in scrutiny and external investigation.

[189] Witnesses Statement: A27912320; and A28121926
[190] Witnesses Statement: A27912320; A28121926; and A27331409
[191] Witness Statement: A27331409; A27969615; and A27969651

9.12.7. We heard at several interviews of professional staff who believed that their concerns had not been taken sufficiently seriously and, in the view of some, this was linked to gender discrimination. However, in trying to substantiate allegations and form a view, we found that examples of discrimination or behaviour of one type or another were not confined to a particular gender. We find that inappropriate behaviour, often in a context of high levels of stress and scrutiny, resulted in a lack of focus on the key issues of patient safety and staff welfare, and demonstrated a lack of respect for colleagues.

9.12.8. We documented several examples of inappropriate behaviour, but were unable to detect a consistent pattern. If these instances and patterns are recognisable to main participants, then they are worthy of close attention in order to check such behaviour and define acceptable levels of conduct. It will be difficult to make progress in addressing the wider concerns unless all participants acknowledge and address the issues relating to behaviour and practice, and challenge inappropriate behaviour.

9.12.9. We therefore report examples of team and individual behaviour that were inappropriate. We ask the teams we have identified to reflect on these remarks, and the extent to which the IP&C function has left behind the tendency to focus on the dispute rather than the problem needing to be solved for the benefit of the patients at the centre of the incident. We commend initiatives already underway to address this matter. We direct readers to the recent (2019) reports from John Sturrock QC and Coia and West on inappropriate behaviour, care and compassion for staff, and urge stakeholders to examine and apply the recommendations of these reports in their own context. (1)(2)

E. COMMUNICATIONS

9.12.10. This section focuses primarily but not exclusively on communications within NHS GG&C, with certain groups of patients and with the public.

9.12.11. Throughout our investigations we have encountered examples of excellent communication; but also problems with miscommunication, and blocks to full communication. We acknowledge detailed work on this matter by the Oversight Board with NHS GG&C in recent months.

9.12.12. **Between ICDs and Estates and Facilities Staff** – whilst linkages between the two groups following the opening of the hospital were more distant, latterly the exchange of information has been free-flowing. Availability of information was not sufficient to enable ICDs who were taking up responsibilities in the newly opened hospital to inform their advice, and undermined trust in the process of decision-making. Ultimately the withholding of necessary information contributed to the whistle-blowing episode of 2017 and subsequent events. This channel of communication contrasts with the accounts we heard of very good communication between nursing staff, both IP&C and clinical, and the Estates and Facilities team.

9.12.13. **The IMT and communications** – the conduct of most IMTs have been served by good communication and supporting documentation, but two developments in 2019 where miscommunication has occurred have undermined trust in the hospital's IMT process. First, there was the institution of pre-meetings before IMTs as concern grew over the escalating events of 2019. There was not adequate explanation of this set of events to IMT members, and the flow of information that then shaped decision making at IMTs was not transparent.

9.12.14. Underlying this set of events were, we understand, contested approaches as to the causes of the event clusters and management of the cases. We make findings earlier about the inability of the ICDs to find a way to discuss and resolve contested theories of what causes clusters of serious infections, and miscommunication is one manifestation of this practice. The second example emerging from the series of IMTs in 2019 is the public disclosure of clinical details following these team meetings. IMTs cannot function properly without trust between all participants that the proceedings are confidential. There are no exceptions to this duty and convention in this context.

9.12.15. **With patients and families and the public through the times of clusters of infections in 2018 and 2019** – we have heard from families, staff representatives and clinical staff about the amount of effort that clinical staff and IP&C Teams have made to keep people informed of risks and likely complications of life-threatening disease and treatment, adverse incidents and developments. Channels of communication have been strong and durable during incidents and developments and senior clinical staff have been involved closely with NHS GG&C Board headquarters contacts in translating this information for public disclosure.

9.12.16. We also heard from staff about the challenge of communicating with families who were out-patients and occasional visitors to the hospital during this time, and the success of the innovative ways of using Facebook and other means to keep people updated and in touch with developments.[192]

9.12.17. **Strategic communications support to incident management and adverse events** – the Board is in a difficult position with respect to maintaining the reputation of the hospital in the midst of sustained public, political and media concern and criticism; nonetheless it needs to compose a strategy that reflects the events that, together, contradict and undermine the overall picture of modern, quality healthcare. That requires a more strategic and triangulated approach to communication about the recent escalating series of events. The Review considers that there has been damage to the reputation of the hospital.[193] It would be prudent to acknowledge these problems, and then set out the NHS GG&C Board's commitment to addressing the real and perceived concerns in the hospital's recent past, rebuilding that reputation rather than persisting in the assertion that damage has only taken place to a circumscribed part of its reputation.

9.12.18. Theories, hypotheses and possibilities have been transmitted and discussed in the media and Scottish Parliament in a way that has given them an undeserved provenance. In the case of the reported death of a patient from the fungal infection [redacted], subsequent analysis disproved the link between the event, the pathogen and the patient outcome but there has been little success in retracting or replacing the original and disproven narrative.

9.12.19. **Communications through Government and Parliament** – we recognise the need for accurate and sensitive reporting of clinical events as part of the democratic process. All who contribute to the chain of communication need to understand the need to signal information that is firm and factual, as distinct from information that is tentative and belongs to a hypothesis and is subject to confirmation.

9.12.20. We discuss in section I of this chapter, the discharge of the Board of NHS GG&C's Duty of Candour.

9.13. Finding

9.13.1. We find a mixed picture on communications. The communications between clinicians and patients and their families have been, by and large, of high quality. Transmission of sensitive clinical information from hospital to headquarters was sound. There are learning points for communication within the IP&C professional community, between that community and other disciplines that influence patient safety factors, and strategic communications when a succession of adverse events occur and need explanation.

[192] Witness Statement: A27902746
[193] Witness Statement: A27912320

9.14. Recommendation

9.14.1. We welcome NHS GG&C's recent investment in its strategic communications capability. NHS GG&C's Board needs to ensure political and public messaging that is accurate and sensitive:

- To manage adverse events and atypical public disclosures effectively within an overall plan underpinned by values of accountability and transparency;
- To recognise that modern communications need to acknowledge perceptions as well as facts as the NHS Board sees them;
- To adapt to a changing picture including defensive approaches that could include rebuttal of inaccurate reporting and disclosure that is false or threatens confidentiality;
- To recognise tactically within its internal and external communications that declining public trust may necessitate greater disclosure in justifying its actions rather than tighter control on the flow of information.

F. DEVELOPMENT OF THE NATIONAL CENTRE FOR REDUCING RISK IN THE HEALTHCARE BUILT ENVIRONMENT

9.14.2. This is a promising development, borne of the need for expertise in the specialist areas of infection control and other potential health hazards to be together and bring appropriate influence to the NHS estate. We have followed closely the consultation and development of the new National Centre for Reducing Risk in the Healthcare Built Environment in its discovery and planning phases.

9.14.3. From the perspective of our learning from the Review, and our understanding of the professional groups that will shape the National Centre for Reducing Risk in the Healthcare Built Environment, we make the following observations:

- We support fully the Centre's proposal to play a strong and influential role in the quality assurance of capital investments that NHSScotland and its care partners make in the future;
- We commend the proposed model for engagement which provides expertise and decision support at several distinct points in the life cycle of a building project;
- We support fully the initial capability and collaboration with inspecting bodies that it will develop in compliance and assurance, in line with our wider recommendations in this area;
- The Centre should not restrict itself to major new build projects, but include expert input to the process of design and construction of projects of many scales and dimensions, particularly unusual projects, those where guidance requires interpretation, where novel or complex service support systems (such as air ventilation and water) are part of the plan, and where particularly vulnerable groups of patients or intensive hospital-based treatments are involved. This input and support should also be available to refurbishments and modification of existing facilities;
- The Centre should be truly multi-disciplinary, offer leadership and networking opportunities within a community of professionals, grow specialist expertise that commands the confidence of the professional community, senior design and construction leads in client and contracting organisations; and be connected with wider networks hosting highly specialist expertise that is out-with the skill set of the centre and professional community in Scotland.
- The Centre should make full use of the expertise and experience distributed across local NHS Boards; a complementary approach is that experts in local NHS Boards should seek to bring their learning to a vibrant network of people with common interests;
- The Centre's work should recognise the dynamic field that it will lead. It will need to engage with researchers as strategists and collaborators – reflecting changing shapes of healthcare, developing evidence and methods of evaluation, and addressing urgent design problems and uncertainties;
- The Centre should link with education and standards bodies to develop the professional workforce, with the aim of making IP&C and engineering in the health sector a challenging, rewarding and high-status career pathway;

- The Centre should recognise that the IP&C interface with the built environment is neither the only professional concern nor prime risk in the wider discipline where ICDs, ICNs, infection specialists, scientists and epidemiologists come together. Both health facilities and IP&C expertise should be seen in the context of wider professional disciplines and the range of relevant topics;
- There should be strong linkages with international, national and local agencies in communicable disease, healthcare associated infection, health and safety, research and evidence review – this is not an exhaustive list. Healthcare and the built environment is, so to speak, a congregation within a broad church.

9.14.4. We anticipate that the COVID-19 pandemic will bring further perspectives and learning to influence our shared understanding of the relationship between infection prevention and control, the built environment in hospital design and, indeed, the entire range of care settings. We trust that current learning will build on this contribution.

9.14.5. The Centre should be integral to governance arrangements for local and national level assurance and scrutiny. Lines of accountability should similarly be transparent. This evolving process will require continuing review to ensure that advice, its influence and effectiveness, and decision-making are aligned.

9.14.6. Infrastructure policy makers, construction professionals, budget specialists and engineers should join with people who bridge clinical and facilities disciplines to support work under the auspices of the new National Centre for Reducing Risk in the Healthcare Built Environment to design criteria for successful project management in healthcare construction and capital investment.

9.15. Findings

9.15.1. We support the development of a new National Centre for Reducing Risk in the Healthcare Built Environment and propose aims over a range of its possible functions that we draw from the learning of the Review.

G. RESEARCH, EVALUATION AND LEARNING

9.15.2. One of the main purposes of the Review has been learning and this section returns to that theme in proposing that the learning opportunities identified by the Review extend beyond addressing the problems that we have described. Both the nature of the QEUH building and the possibly unique set of circumstances that have arisen in the incidents under investigation have created a body of knowledge that merits wider appreciation in the IP&C, engineering and construction professions. This section is therefore outward looking and draws on a much broader canvas.

9.15.3. The second matter is the lack of knowledge in important areas where there could have better decision-making but it was hampered by the lack of objective evidence in favour of one course of action or another. The list of possible candidates for further investigation is long, and recognises that knowledge perfectly tailored to a particular set of circumstances is almost never present, especially in complex projects and clinical settings that require non-clinical and collaborative solutions. Of particular value would be the development of a template for recording IP&C decisions relating to design.

9.15.4. Throughout the course of this Review we have conducted a set of mini-evidence reviews to determine what is known about various topics, and sought the advice of experts in several fields about the correct or reasonable course to take. That work has surfaced the existence of gaps in knowledge that we highlight below; filling the gaps should help future construction and refurbishment projects to arrive at better-informed decisions.

9.16. Research and Evaluation

9.16.1. We welcome the intention of the new National Centre for Reducing Risk in the Healthcare Built Environment to take an interest in shaping research strategy and collaborating in research. This approach should encompass evidence review, innovation, and evaluation of existing design and construction approaches. This is essential in influencing better decisions, and bringing the clinical, construction, engineering and public health research communities together in helping to develop solutions. Collaborative work across disciplines is the only way forward for research in the areas of our interest. We are also aware of research interest in the wider fields of climate sustainability and energy efficiency, indoor air quality, and water quality and safety for vulnerable groups; these are complementary topics.

9.16.2. In the realm of construction, there are already important knowledge-driven initiatives that influence policy and practice. The BREEAM programme – Building Research Establishment's Environmental Assessment Method – is one example that focuses on the sustainability of buildings, particularly with respect to energy efficiency and carbon emissions. Nonetheless, applying evidence in context and with appropriate expertise for interpretation and adjustment is vital for buildings such as the QEUH/RHC complex for which there are few comparative projects.

9.16.3. Acknowledging this reality, we would urge evaluation of the implementation of interventions for which there is no agreed course of best practice, whether it is use of materials, water quality and outlets such as taps, or chilled beams to reduce energy consumption in air handling systems - all examples encountered in the course of the Review.

9.16.4. We therefore propose that construction related research and evaluation would be grouped under the following headings:

- Air quality;
- Water quality;
- Sanitary ware;
- Healthcare & BREEAM;
- Microbiology, Environment Health & Public Health;
- Communicating health and risk.

9.16.5. In the realm of clinically-related innovations and interventions, we were struck by the pace of change in treatment options and settings for care – for instance intensive care units without use of mains water for any part of patient care, or use of nearby hotels to support day-case treatment rather than in-patient isolation rooms and facilities for patients undergoing certain immuno-suppressant treatments. These are two examples of changes of practice that could have fundamental influences on hospital design that supports the care of very vulnerable patients undergoing intensive treatment, and that merit structured study rather than trial and error implementation.

9.16.6. We understand the practical challenges in conducting research on relatively small numbers of patients where the treatment variables are numerous, but the cost-effectiveness, balance and opportunity costs for getting it right are substantial if we are to invest wisely in service planning, hospital design and national public health systems in future.

9.16.7. Microbiology and the laboratory investigation of unusual organisms are also dynamic areas for future research. Understanding the significance of findings that are emerging with very sensitive and specific investigations – in other words, the application of laboratory science to clinical practice and outbreak investigation – merits close attention.

9.17. Recommendation

9.17.1. We highlight here three key areas where evidence review and research is urgently needed, so that future technical guidance can be clearer, and project and incident managers can make better decisions:

1. The evidence base for air changes and air quality that protects against infection in a range of hospital settings; we understand that air ventilation systems, the resulting air quality characteristics and their influence on clinical outcomes is an under-researched area.

We are also aware of increasing interest in outdoor and indoor air quality, and its important effects on population health. We further understand that context is very important in discussing the effects of air quality and its various characteristics require careful specification of problems before research and evaluation can solve problems. Therefore, we ask that the research community address this general call rather than wait for a more precise definition of the problem.

2. The need for additional water disinfection for large buildings and little used water outlets, especially where vulnerable people are concerned; several rapid developments are occurring in the realm of modern hospital design, complexity of water systems, microbiological testing relating to water, unusual organisms and vulnerable patients, and the influence of these developments on patient safety and clinical outcomes.

   These changes merit structured study and evaluation to understand their effects and practical measures that will address the risks that are becoming apparent. One fundamental question is whether large buildings and, in particular, acute hospitals supporting the care of people who are vulnerable to infection, should incorporate additional water disinfection as a standard part of design for the entire building or specific parts of the structure.

   A second specific issue is the supply and use of water to intensive care units, whether fewer outlets should be in the design, and whether alternatives to mains supply water should be available.

3. The significance of findings of unusual micro-organisms in patient and environmental sampling: throughout the investigation of clusters of disease that we have described since the hospital's opening, there has been debate about the significance of microbiological findings. The challenge has been compounded by the development and introduction of methods of genetic and molecular-level testing which are capable of isolating and identifying a wider range of organisms than has previously been possible.

   For such a set of sick patients, there is an assumption that almost any finding is significant and presents potential risk to life, necessitating treatment that can be expensive, carry side-effects, the possibility of serious interactions with other treatments and future treatment possibilities.

   To improve patient management, cut risks and improve clinical outcomes, much greater understanding is required of appropriate interventions for specific findings and in particular, the significance of isolations of organisms that are difficult to isolate and culture. We also need to better understand where links cannot be established between isolates and clinical situations.

9.18. Learning

9.18.1. We have deliberately taken an approach in this Review that learning should be uppermost in the work we have carried out. We acknowledge that the evidence base, and experience, is constantly developing, We are also aware of the investment by NHS Education for Scotland, universities and other training and education providers in skills acquisition and dissemination of knowledge.

9.18.2. There are additional matters and means to ensure that new and emerging knowledge flows into policy, designs, and eventually into construction practice and we set out our expectations that a broader set of stakeholders might become involved. Part and parcel of that learning is the accurate identification of problems and faults. So we have made findings earlier in this report that are both positive and critical, to promote achievements and also to prevent repetition of adverse events and so drive improvements in the existing building and for buildings to come.

9.18.3. At times we have heard from people making strenuous efforts to learn from the experience of others, where there were areas of uncertainty.[194] That effort has been apparent in the investigation of infectious disease clusters in 2018 and 2019, and, before that, the design of the Bone Marrow Transplant unit for adults in the Beatson Oncology Centre – but not the QEUH. This is an example where learning was available but there were decisions taken that excluded such experience from consideration. There are other examples of learning – for instance the engagement of IP&C services on a routine basis with colleagues from other parts of the country – where opportunities were missed.

9.18.4. One challenge we have encountered during our discussions on sharing experience is the constraint of learning through benchmarking with experience and performance in other hospitals. Clinical experience in the realm of IP&C, especially in market-driven healthcare systems such as the USA, and systems including our own NHS where reputation is critical, is constrained by reluctance to share data that allow meaningful comparison. The tendency to limit data sharing in the construction industry may be subject to similar drivers, and the absence of data systems to allow understanding of the evidence on which decisions were based in the construction of QEUH/RHC is a matter we have highlighted earlier. We make a separate recommendation about retention of records which is relevant in this area.

9.18.5. So we have a challenge for the IP&C service of NHS GG&C, and for the future National Centre, with NHS Education for Scotland, to encourage and sustain learning.

[194] Witness Statement: A27867258; A27865960; A27331409; A27969615; A27969648; and A27969651

9.19. Finding

9.19.1. The challenge for standard setting bodies for clinical, engineering and construction professions is to collaborate on learning, innovation, evaluation and research that focuses on cost-effectiveness for patient outcomes just as much as for value and time scheduling. The clinical realm does not find it easy to look outside its patient and health professional perspective to collaborations that bring much greater gains; design of systems to enhance patient safety is a part of that endeavour.

9.20. Recommendations

9.20.1. We ask the Academy of Medical Royal Colleges and Faculties in Scotland and the UK, the Royal College of Nursing, together with the Royal Academy of Engineering, The Royal Incorporation of Architects in Scotland, Architecture and Design Scotland and those with interests in the environmental sciences to examine ways to engender a community of practice and scholarship that enhances collaborative work in improving the healthcare built environment. The National Centre for Reducing Risk in the Healthcare Built Environment should facilitate this initiative with its UK counterparts.

9.20.2. The National Centre for Reducing Risk in the Healthcare Built Environment and local NHS Boards should encourage linkages, facilitate robust networks that are cross-disciplinary, build on experience and form part of career and professional development, anticipate the need for expertise in areas where construction projects and novel interventions are in the planning stages.

9.20.3. The National Centre and participants should recognise that lessons are often held in organisations at a distance from host institutions by the very nature of unusual occurrences and occasional projects, and that they should create a ‘safe space’ where experience that is reputationally sensitive can flow more freely.

H. WHISTLEBLOWING

9.21. The Key Issues

9.21.1. Whistleblowing is an important part of the mechanism by which NHS staff in Scotland can raise concerns and is intended to address concerns related to patient safety, malpractice or wrongdoing at work. It is part of the wider process available to employees which would most often start with concerns being raised with local management. Employees have the option to pursue whistleblowing if that route is considered inappropriate, if there has been a failure to address the concern or if the concern is such that normal processes are considered insufficient. In NHSScotland whistleblowing is backed by legislation and policy with administrative arrangements in each NHS Board.

9.21.2. This legislation and these arrangements include the Public Interest Disclosure Act 1998 which amended the Employment Rights Act 1996 by inserting specific rights for workers who disclose information about an alleged wrongdoing in defined circumstances, the Public Services Reform (The Scottish Public Services Ombudsman) (Healthcare Whistleblowing) Order 2020 and the current work including through the office of the Scottish Public Services Ombudsman and the NHS in Scotland to appoint whistleblowing champions for every Scottish NHS Board. From July 2020 the Scottish Public Services Ombudsman is also the Independent National Whistleblowing Officer and has published National Whistleblowing Standards.

9.21.3. Whistleblowing does not explicitly feature in the Terms of Reference or Remit of this Review, but it has undoubtedly had an influence and impact on the events examined by the Review and as such we consider it appropriate to make comment. As a relatively new strand of measures with legislative backing to ensure natural justice in public sector organisations, we intend this reflection on whistleblowing to be a learning matter for policy and practice, in common with the broader approach of the Review.

9.21.4. This section draws on views expressed by a number of witnesses interviewed by the Review together with consideration of statements, formal interviews and supporting documentation provided by two whistleblowers and NHS GG&C's whistleblowing leads.[195] It does not question national or NHS GG&C policy but it offers reflections on the use of whistleblowing and the consequences we have observed. There have been effects on those who raised concerns via the whistleblowing policy, the Board as the subject of the process, the clinical community from which the whistleblowers come and the patients and families being treated by the service impacted on by the concerns which prompted the whistleblowing.

[195] Witness Statement: A27865744

9.22. Background

9.22.1. In recent years there have been adverse incidents within NHSScotland where staff had concerns about situations or aspects of practice but had felt unable to raise these concerns for a variety of reasons. These included not knowing how to, lacking confidence the concerns would be addressed or being worried that by raising concerns they would suffer some adverse consequence. Similarly there have been instances where concerns have been raised but not addressed. Some of these incidents have gained a high profile with the public, politicians and media. NHSScotland's response has been to formalise its approach to whistleblowing. All Boards are required to have whistleblowing arrangements in line with the NHSScotland Partnership Information Network (PIN) Policy.

9.22.2. The NHS GG&C Whistleblowing Policy is incorporated within the Board's Code of Conduct for Staff. The Policy lays out the mechanism by which members of staff can report concerns. Reporting can be done at three different levels, referred to as Steps 1, 2 and 3 depending on a variety of considerations including the nature of the concern and those potentially involved. The three steps can be characterised as via line manager, via designated senior manager or via nominated non-executive NHS Board member.

9.22.3. Concerns can be raised in confidence at all three steps. Regardless of the step at which the concern is raised, the Board undertakes to investigate the concerns and provide appropriate feedback to the whistleblower(s). The different steps are also intended as a mechanism for escalation in the event of persisting concerns. The policy acknowledges that in certain circumstances it may be appropriate to report a concern to the relevant regulatory body. However the policy is quite clear that it does not provide a route or mechanism for dealing with grievances which are dealt with by means of a separate process:

"A Whistleblowing concern is where an individual raises information as a witness whereas a grievance is where the individual is a complainant. Grievances are addressed using the Board's Grievance Policy and Procedure. It should be noted, however, that matters related to bullying and harassment are addressed by the Board's Dignity at Work Policy."

9.22.4. Although it is not a formalised part of national or individual Board policy there have been instances where whistleblowers have raised their concerns directly with politicians or through the media. Such situations are however covered by the Public Interest Disclosure Act 1998.

9.23. Course of Events

9.23.1. Whistleblowers raised concerns via Steps 1 and 2 as detailed above and one individual is now pursuing Step 3 of the process. This was done sequentially and was seen by the whistleblowers as a way of escalating their concerns because they felt they had not been adequately addressed.

9.23.2. In relation to the QEUH situation the Review was also made aware of a whistleblowing event where concerns were raised with the Medical Director of NSS in relation to behaviours at an IMT meeting. This was subsequently referred to NHS GG&C and investigated by the Director of Public Health in her capacity as a designated senior manager for whistleblowing. More recently it came to light that one of the original whistleblowers has raised a further concern via the whistleblowing route, this time in relation to how the original whistleblowing event has been conducted.

9.23.3. The concerns that gave rise to the original whistleblowing event in this case are multiple and complex. Those who initiated whistleblowing held the sincere belief that their concerns were well grounded in evidence, that normal channels of raising concerns were proving ineffective and that they had exhausted all avenues available to them.

9.23.4. Their lack of confidence in established management systems that are in place to listen to concerns and to solve problems appears to be longstanding. It predates the construction and handover of the hospital, and the events that led to the substance of their specific concerns. Arguably there is a perception on the part of some staff, of longstanding reluctance to take concerns seriously within NHS GG&C compounded, with particular respect to infection prevention and control, by the Vale of Leven Hospital Inquiry experience.

9.23.5. Prior to whistleblowing, microbiologists raised concerns about potential infection risk in the new QEUH and RHC buildings and the failure of some of the hospital rooms to meet the required specification for the intended patient groups. [196] In Chapter 8, we report their dissatisfaction about the IP&C structure, function and reporting arrangements. NHS GG&C's new lead ICD, in 2016, questioned some of her predecessor's input to the planning and commissioning of the QEUH building and some of the decisions taken in signing off the specification of clinical facilities.

9.23.6. These concerns reflected those being expressed by microbiologists who had been ICDs. The Lead ICD was attempting to deal with the problems through IP&C structures and managerial routes but her colleagues chose to raise a whistleblowing action. This happened during a period when the lead ICD was absent from work.[197]

9.23.7. The Board's senior managers accept the fact of the whistleblowing process, its necessity and benefits, and the need to address concerns when raised. In this instance NHS GG&C's Directors listened to the concerns and sought to address them.

9.23.8. The Medical Director, when approached, asked that the concerns were detailed in a report and the whistleblowers prepared a report using the Subject, Background, Assessment, and Recommendation tool (SBAR) which was considered at a specially convened meeting held within a week of the concerns being raised.

[196] Witness Statement: A27969648; A27969651; and A27969615
[197] Witness Statement: A27969648; A27969651; and A27969615

9.23.9. In direct response to this a 27 point action plan was developed and taken forward under the auspices of the CCGC and the BICC. NHS GG&C remain of the view that it could and should have been possible to address the concerns raised without those concerned having to formally whistleblow. However their right to do so was respected and in the case of one individual the process remains active.

9.23.10. Matters have been further complicated as the process has progressed. When the matters were taken to Step 2 the whistleblowers expressed new, additional concerns about the way they perceived they were being treated, feeling that they were becoming isolated and that their reputations were being tarnished. As part of the Step 3 action, concerns were raised about the factual accuracy of some of the external communication relating to the original concerns and the actions taken.

9.23.11. In response to Step 2 the NHS GG&C's director of public health, as one of the designated senior managers for whistleblowing, met with the two whistleblowers. By this stage the third whistleblower had stepped back from the process. The Director of Public Health undertook an investigation and was able to reassure herself and the whistleblowers that NHS GG&C acknowledged their concerns, took them seriously, and that progress was being made toward achieving the agreed actions. This investigation was completed by May 2018.

9.23.12. Since then we have learned that one whistleblower still harbours concerns that appropriate actions are not being taken quickly enough while the other, in November 2019, opted to pursue Step 3 and, at the time of writing, a report of the investigation undertaken by the nominated non-executive board member has been sent to the whistleblower for consideration.

9.24. Observations

9.24.1. A striking feature of the whistleblowing process is that the concerns and supporting evidence together with the proposed solutions submitted in the SBAR and then incorporated into the 27 point action plan are not universally accepted within the Board's infection control and wider microbiology community, but it is not clear by what mechanism and at what point colleagues considered the counter views. It appears that this may not have been until late in the prolonged IMT process in 2019 as described in Chapter 8.2.

9.24.2. At the current time it is clear that there is still a lack of clinical consensus about the situation in relation to issues such as the level of risk posed by the reduced number of air changes per hour in certain clinical environments and the significance of the full range of unusual organisms found in the water supply.

9.24.3. The Review heard polarised views, each backed by evidence, which portrayed the reduced air changes as posing significant clinical risk at one extreme, to being acceptable, manageable, informed compromises at the other.[198] It is unclear how the range of views now being expressed was expressed to the CCGC or BICC either at the time the 27 point action plan was drawn up or during its implementation and monitoring.

[198] Witness Statement: A27331409; A27865960; A27877340; A27969648; A27969615; and A27969651

9.24.4. The identification and prediction of risks in 2017, and subsequent events in the following two years led to an unresolved conflict between microbiologists and ICDs about the root causes of the infection clusters.

9.24.5. The gram-negative contamination and infections were seen by some microbiologists as inevitable but clinically-manageable consequences of the environment and the vulnerable patient population in question.[199] The Review is not in a position to pass judgement on the definitive interpretation of these views or the supporting data but is concerned that there appears to have been no process to consider the data in the round or to reconcile the clinicians' differences.

9.24.6. The media or individuals unconnected to the organisation involved, have obligations when approached by whistleblowers. They need to establish the validity and accuracy of the whistleblowers' claims and the previous steps taken to address them. These observations serve not to undermine the policy of whistleblowing but they do seek to ensure that fact, context and perspective are central to the practice of addressing whistleblowing.

9.24.7. There are aspects of the whistleblowing process that, as in this case, have the potential to cause confusion. It is entirely correct that there should be a process by which employees can raise concerns with the expectation that the concerns will be taken seriously, thoroughly investigated and appropriate actions put in place. It is also not unreasonable that as part of this process the whistleblower may offer suggestions as to appropriate remedies to address the concerns they have highlighted. It is also expected that the whistleblower will receive regular feedback at all stages, subject to the Board meeting its obligations in relation to issues of privacy or confidentiality.

9.24.8. A notable feature of this episode is that, as the process progressed and escalated, the levels of discontent and disconnection on the part of the whistleblowers grew. Each escalation was prompted by a feeling that actions were either not being taken or not being taken quickly enough and as the concerns were re-expressed additional concerns came to light.

9.24.9. To ensure that concerns are managed correctly and whistleblowers have appropriate support it is essential that there is regular detailed feedback subject to the caveats outlined above. In this case several witnesses in the Review, including NHS GG&C Board members, have indicated that communication with the whistleblowers could have been better and had it been so, then the course of events may have been smoother.

9.24.10. The Review is concerned that there seems to be no mechanism described or agreed to conclude the whistleblowing process in the event of continued disagreement between the whistleblower and the NHS Board as the accountable body. This is particularly true if continuing discontent is related to the NHS Board not implementing the whistleblowers' recommended solutions.

[199] Witness Statement: A27865960; and A27331409

9.24.11. While, as stated above, it is entirely reasonable, and indeed extremely helpful, for whistleblowers to offer potential solutions there can be no expectation on the NHS Board to be bound by these suggestions. It must be for the NHS Board through its governance processes to satisfy itself that any actions taken are appropriate and adequate. While this concern emerged from the Review's observations of the situation in NHS GG&C the principle has potential application for any NHS Board involved in a whistleblowing action.

9.24.12. Clinical colleagues of the whistleblowers have expressed mixed, often contrasting, views.[200] Some have sympathy with the whistleblowers and their sincerely held views, some dispute the views, while others are unhappy about the manner in which the views have been expressed and pursued.[201]

9.24.13. It has been claimed that the whistleblowers pursued their concerns in a way that others found intimidating and that they were not prepared to listen to the views of others and were trying to make evidence fit a particular hypothesis. Neither were they prepared to allow time for actions to be implemented. The behaviour of one of the whistleblowers was criticised by colleagues.[202] [203]

9.24.14. Senior clinicians have commented about the detrimental effect whistleblowing, and the way it had been conducted in this instance, had on patients and families and their confidence in their clinical management.[204] Some clinicians and managers have remarked to us about their concern that established processes had not been exhausted, that going out with these processes undermined the clinical community's cohesion and that the reputation of clinical care is in some ways tarnished if the senior medical staff cannot resolve their concerns within their own ranks and with their managers.[205]

9.24.15. One senior clinician was concerned that the way one of the whistleblowers raised their concern and presented supporting evidence compromised patient confidentiality and allowed at least one patient to be identified in a meeting.[206]

9.24.16. With respect to the Review, the act of whistleblowing has had significant secondary effects for the whistleblowers, the wider clinical community, the Board and patients and their families.

9.24.17. There were both unintended and unanticipated consequences. Reflection on the views we have heard and observations on the reports of other independent reviews which have commented on whistleblowing, suggest that upstream causes rooted in culture, management style, the actual and anticipated responses to challenges to leadership and followership, and individual personalities are all influences.

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[200] Witness Statement: A27969615; A27331409; A27865960; A27902746; and A27877340
[201] Witness Statement: A27969615; A27331409; A27865960; and A27902746
[202] Witness Statement: A27865960; and A27331409
[203] Review Evidence: A28558080
[204] Witness Statement: A27902746
[205] Witness Statement: A27969615; A27912320; and A28121926
[206] Witness Statement: A27902746

9.24.18. What is clear is that whistleblowing can cause damage to the internal relationships of the organisation and to the whistleblowers' place within that organisation, which is difficult to repair. Processes that have been so conspicuously ruptured do not readily heal – they include the relationships, trust and shared values that underpin the effective functioning of a complex organisation.

9.24.19. There is a need on all sides to recognise that and seek ways of mending the damage as well as restoring stakeholders' confidence in the organisation, while addressing the original reason for whistleblowing effectively. Addressing the wider systemic implications of an incidence of whistleblowing are often as important, if not more so, than addressing the specific concerns.

9.24.20. Ideally the measures of success of whistleblowing would include acknowledgement by the accountable organisation that they listened, understood and investigated the concern, took any remedial action and sought to work with the whistleblower to enable them either to continue in or successfully reintegrate into their role(s) without detriment. In this case this has not yet been achieved.

9.24.21. Despite resolution at Step 2 of the NHS GG&C process being recorded, it was the view of the whistleblowers that the proposed actions were not delivered and the concerns remained. One whistleblower feels their position has been vindicated by the NHS GG&C Board's decision to pursue legal action against the contractor, while another has taken their concerns to Step 3 of the whistleblowing process.

9.25. Conclusions

9.25.1. Following a whistleblowing incident, NHS management, whistleblowers and the clinical community from which whistleblowers come need to recognise the significance of the event and commit to resolving matters on several levels – the matter of concern itself, the relationships and established management processes that were not used to address concerns, and the culture and practices that may have led to the use of whistleblowing.

9.25.2. However damaged and distant the relationships between whistleblower and management, there needs to be an agreed link or contact between the two parties (whistleblower and NHS management) until there is full resolution of the episode. Regular and detailed communication between the organisation and the whistleblowers is essential. At an early stage there should be recognition of the need to explore mediation or other means to resolve any underlying problems that contributed to the event and its handling.

9.25.3. As part of resolving the concerns, a new improved normality may emerge in which lines of accountability and authority are re-established and relationships with clinical and managerial colleagues are enhanced. This requires commitment on the part of all concerned and a willingness to work through and beyond the issues at hand.

9.25.4. These difficulties have been the focus of detailed scrutiny and consideration by Professor Marion Bain and the work she has led as Director of Infection Prevention and Control in NHS GG&C in the early part of 2020. We agree with her assessment that, in this situation, there is a need for expert organisational development input and we fully support the actions Professor Bain has put in place.

9.25.5. As whistleblowing does not fall within the remit of the Review we make no formal findings or recommendations but offer the observations and conclusions above for wider consideration.

I. DUTY OF CANDOUR

9.26. Background

9.26.1. The organisational Duty of Candour provisions require NHS Boards by law to follow set procedures 'when there has been an unintended or unexpected incident that results in death or harm (or additional treatment is required to prevent injury that would result in death or harm)'.[207] Alongside the legal requirements, the Organisational Duty of Candour Guidance issued by Scottish Government in March 2018 outlines the issues organisations are to consider at each point in the procedure; the guidance suggests best practice, and provides a checklist of the steps to be taken to fulfil the duty.

9.26.2. Conventional expectations of the arrangements relate to single episodes of care when complications or adverse events occur, and for prompt disclosure so that patients and relatives are properly in the picture and vital information is shared with them by senior employees of the NHS Board.

9.26.3. NHS GG&C has an operational policy. It complies with the NHSScotland guidance and sets out processes by which they discharge their corporate duty of candour – the duty may be assigned to a clinician or manager with responsibilities but the duty is held by the organisation. The Duty of Candour is to put across factual information, without speculation or conjecture.

9.26.4. In the case of patients undergoing treatment for [redacted]-oncological conditions such as [redacted], their clinical course is normally prolonged, with setbacks and remedies; patients and families should be fully informed of the nature of this clinical course at the outset. The interventions are numerous, come in several episodes and are often subject to delays to plans if events or complications get in the way. The nature of this care is that it is spread over multiple episodes, with the potential for complications and unexpected setbacks.

9.26.5. In relation to the QEUH/RHC situation of individual episodes of infection and clusters of cases affecting [redacted]-oncology patients, clinicians with overall responsibility for the patients' clinical care shared the Duty of Candour with the ICD with responsibility for the area in which the care was provided. There is no specific mention or allowance for such an eventuality in the policy or its operation but the doctor's action was innovative and consistent with the duty.

9.26.6. This is an exacting task, as the very nature of investigation of a setback such as a serious infection with several possible causes is rarely certain. Conveying the uncertainty of the investigation that seeks to find a cause, and its possible outcomes, may be part of the Duty of Candour consultation. This is not a usual part of an ICD's duties, but is one that is part of a holistic service of care and in principle is commendable.

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[207] See Sections 21 to 25 of the Health (Tobacco, Nicotine etc. and Care) (Scotland) Act 2016 and Organisational duty of candour: guidance, Scottish Government 2018
The Duty of Candour Procedure (Scotland) Regulations 2018
www.gov.scot/publications/organisational-duty-candour-guidance/

9.26.7. We have listened to accounts of the process of disclosure, and examined documents relating to the matter.[208] Care is essential in avoiding speculation, and in not losing the main message within a great deal of detail. Associations of events and abnormal findings in a hospital and its surrounding environment, may or may not have a close link with a patient's care and consequences. If an event such as a pigeon or its excrement being found near an air ventilation inlet is one of several possible explanations without substantial evidence to support it, then such detail should be set aside to focus on the nature of the investigation and so arrive at the most likely explanation, with a commitment to provide an update once there is less uncertainty.

9.27. Finding

9.27.1. In common with whistleblowing, the legal provision applying organisational Duty of Candour to NHS Boards is a recently introduced procedure with local application, and has been in use as part of the events that this Review has examined. Neither policy nor guidance envisages the scenario of clusters of infectious disease events with uncertain cause, nor for the specific involvement of an Infection Control specialist.

9.28. Recommendation

9.28.1. Infection Control specialists should reflect as a group on the development of their role in Duty of Candour relating to HAIs. They should share examples in confidence as a learning process, with a view to sharing experience. As these events are unusual, such learning should be on a Scotland-wide basis, in a confidential setting. It may subsequently form a critical event for reporting and discussion in enhanced professional appraisal.

9.28.2. Those responsible for Duty of Candour Policy in NHS Boards and Government may wish to review their operational processes to allow for this eventuality. They should consider how to apply the Duty consistently relating to HAI, encompassing governance to acknowledge events that have triggered a Duty action, along with a review of any learning that might arise from the Duty investigation.

9.29. References

1. **Dame Denise Coia and Prof Michael West**: Caring for doctors, caring for patients, How to transform UK healthcare environments to support doctors and medical students to care for patients (Patient safety depends on doctors' wellbeing) November 2019 www.gmc-uk.org/-/media/documents/caring-for-doctors-caring-for-patients_pdf-80706341.pdf?la=en&hash=F80FFD44FE517E62DBB28C308400B9D133726450
2. John Sturrock QC: An independent review report looking at cultural issues related to allegations of bullying and harassment in NHS Highland, May 2019 www.gov.scot/publications/report-cultural-issues-related-allegations-bullying-harassment-nhs-highland/

[208] Witness Statement: A27969615

Chapter 10

Findings and Recommendations

Introduction

10.1.1 As stated in the Terms of Reference and Remit the approach taken by the Review has been primarily one of learning lessons and not one of retrospective forensic analysis.

10.1.2 In the course of this report we make findings and recommendations which are intended to give an understanding of events and their origins and to offer suggestions about how future capital building projects might be approached with greater confidence.

10.1.3 We believe the potential audience is wide-ranging, including not only those involved in the Queen Elizabeth University Hospital (QEUH) Project which was the subject of the Review, but also a wide range of stakeholders likely to be directly involved in future projects or in positions which will support or influence such projects. This includes territorial Health Boards, relevant Special Health Boards, Government, and the new National Centre for Reducing Risk in the Healthcare Built Environment, professional bodies and in particular those involved in training and accreditation and the setting of standards and guidance.

10.1.2 The findings and recommendations listed span the full range of issues addressed in the course of the Review and include commentary relating to the processes involved in managing and delivering capital projects, clinical practice within infection prevention and control (IP&C), governance, education and training, standards and guidance and communication.

10.1.3 The summarised findings and recommendations from each chapter are collated below and numbered to reflect their chapter of origin. The detail behind each finding and recommendation can be found in the narrative of the relevant chapter.

Chapter 2: Building a Hospital in the 21st Century

Findings

- The healthcare built environment needs to be flexible wherever possible. This work should also include identifying and managing potential risks to new and existing patient groups. The principle applies not only to new builds but also to upgrading existing facilities and to modifying the specification of new facilities in the course of a project. (2.5.1)
- Clinical practice is constantly evolving; this has implications for changing service models and specification of facilities. Consequently, the healthcare built environment needs to be flexible wherever possible while identifying and managing potential risks to new and existing patient groups. The principle applies not only to new builds but also to upgrading existing facilities and to modifying the specification of new facilities in the course of the project. (2.5.2)
- Delivering the QEUH within budget and on time were key achievements for the NHS Board and construction company, but secondary objectives mattered too. (2.5.3)

- Hospitals in the 21st century are significant parts of national infrastructure. The Infrastructure Commission sets out a range of principles and objectives that are broader than the previous era, with more attention to re-use of existing facilities and the overall aim of zero carbon emissions. Policy on energy efficiency, and the requirements of modern healthcare are areas for specific attention. (2.5.4)

Recommendations

1) Altering or upgrading facilities in response to changes in demand, or developments in clinical practice needs a flexible approach to healthcare design taking account of the full range of considerations including infection prevention and control.
2) Success criteria for healthcare construction projects need to reflect a broader and clinically-relevant range of parameters.
3) Infrastructure policy makers, construction professionals, budget specialists and engineers should join with people who bridge clinical and facilities disciplines to support work under the auspices of the new National Centre for Reducing Risk in the Healthcare Built Environment to design criteria for successful project management in healthcare construction and capital investment.
4) We call for much higher profile for evidence generation and use in policy making and practice relating to health, healthcare, infection prevention and control in the built environment.
5) There needs to be continuing investment in evidence based guidance to give design teams clear expectations of good design, build and commissioning practice.

Chapter 3: The Queen Elizabeth University Hospital (QEUH)

Findings

- The decision to build QEUH at the site of the former Southern General Hospital was appropriate in terms of the selection criteria, commissioned reports, public involvement and available options at the time. No evidence has emerged of an increased risk of Healthcare Associated Infection (HAI) associated with the location. (3.7.1)
- Site management of waste water management facilities adjacent to the site complies with regulatory requirements and the site appears well maintained on its published record and on direct inspection. (3.6)
- Site selection for the hospital was the result of careful consideration. Public concerns over the adjacent waste water treatment works related to foul odour, which is not associated with the transmission of infectious disease. This choice of site influenced the decision in favour of sealed windows, and mechanical ventilation systems to supply air throughout the hospital. (3.6.10)

Recommendations

6) NHS Boards should prepare information resources to remind local people about past decisions on siting of health facilities.
7) In light of the public's perception of risks associated with the adjacent waste water site, any future project facing similar public perceptions should sustain a robust communication plan, recognising and addressing any concerns.

Chapter 4 – Built Environment: Design

Findings

- The change in funding model from Private Finance Initiative (PFI) to a capital model, albeit one which sought to retain the benefits of PFI in the Employer's Requirements, impacted on the project. Management of Estates and Facilities issues were not the responsibility of NHS GG&C as the client under the PFI model, but they were under the capital model. That change was not adequately incorporated into the revised project plan when the model changed. (4.6.1)
- There have been unintended consequences of the policy of 100% single rooms; these include the risk of water stagnation associated with low frequency of use of the high number of taps and sinks, and increased staffing requirements for clinical care, cleaning and flushing. These issues require a clear and sustained management plan; otherwise they could pose an increased risk of HAI. Nonetheless, there is no evidence in our Review of a causal link with infections in QEUH. (4.6.2)
- Neither NHS GG&C nor the contractors fully anticipated (or took account of) a number of changes in NHS Design Guidance and Safety Notices which applied to the QEUH project and arose during its lifetime. Some were remediable – for instance taps; whilst others would subsequently prove challenging - e.g. the energy requirements for a critical care environment pose significant challenges for achieving 'BREEAM (Building Research Establishment Environmental Assessment Method) Excellent'. (4.6.3)
- NHS GG&C didn't make full use of the expertise available within its workforce. There was a pattern of individuals with experience offering assistance being declined; specifically, those relating to clinical environments for high risk patients and chlorine dioxide dosing of the water system, although it is acknowledged that GG&C did consult widely on these matters. Consequently appropriate expertise did not influence decisions (with hindsight) about design of the water system, the ventilation system and air quality. This had consequences especially for vulnerable, immuno-suppressed patients. (4.6.4)
- The decision to specify sealed windows, to control the air environment of the hospital (and keep out foul odours), meant all fresh air had to be mechanically ventilated. The mechanical ventilation system does not achieve the number of air changes per hour specified in guidance (although some rooms have been upgraded) and windows do not open to boost air flow. (4.6.5)
- The energy target within BREEAM appears to have been a significant influence in the decision to specify sealed windows, chilled beams, and minimise overall capacity for the mechanical ventilation system. However, achieving the high rate of air changes recommended for critical areas requires plant which consumes greater energy. In turn, the balance shifted toward achieving the "BREEAM Excellence" target instead of air change rates that met NHS guidance standards. (4.6.6)

- We endorse the finding of the Quesada CFD Report that there is no evidence to support the hypothesis that there is a causal link between the helipad and air contaminated with pigeon droppings being forced into the hospital ventilation system. (4.6.7)
- There was – and still is – uncertainty between built environment professions and clinicians as to whether NHS design standards relating to air changes and pressure differentials, are mandatory or recommended guidance (despite HFS stating it is merely guidance). This has resulted in BREEAM taking precedence over these standards. The net effect is that the margin of safety in terms of hospital air quality impacting on routine infection prevention is likely to be slim. Regular monitoring and rapid problem solving is vital. (4.6.8)
- Late changes to room requirements, for adult Bone Marrow Transplant and Infectious Disease, resulted in sub-optimal ventilation systems for these patient groups. Air changes are below recommended levels, positive pressure levels in isolation rooms for immuno-compromised patients, and negative pressure for infectious disease patients, were not adequate when the hospital opened. Fixing these problems has meant service disruption for patients and staff, and additional costs. (4.6.9)
- The large and complex water system relied purely on temperature control to prevent build-up of biofilm and bacteria. From the outset of planning secondary measures, such as chlorine dioxide (now retrofitted), should be a serious consideration for large complex water systems such as that in the QEUH, to ensure water quality at all times. (4.6.10)
- The design of the hot and cold water systems has negatively impacted water quality. The water distribution system was over-sized, which is known to encourage water stagnation. And significant problems with the Combined Heat and Power (CHP) plant have resulted in hot water temperatures below recommended levels for bacterial growth. (4.6.11)
- There was an expectation that Health Facilities Scotland and its UK counterparts would publish the supplement to SHPN04 about detailed design of isolation rooms and associated areas for people with profound immuno-suppression; the lack of this document introduced significant uncertainty to the Project design. (4.6.12)
- The portfolio of Health Technical Guidance for construction and vital systems does not fully cross-refer with other policy driven elements, such as BREEAM compliance. (4.6.13)

Recommendations

8) The implications of major funding changes need to be clear in relation to whole life costs and whole life risks, as the operational phase of a building's life is where such issues have the greatest impact. (4.7.1)
9) The expertise available to the project team must accurately reflect the requirements of the contractual and funding models. (4.7.2)

10) The impact and benefits of single rooms should be reviewed so that future design and management of facilities take full account of this policy in the light of experience at the QEUH. (4.7.3)
11) NHS Boards should set up a specific working group for projects of long duration (more than three years) to advise changes or new guidance affecting IP&C and other key risks. This could be a function of the IP&C team or other dedicated resource, during major projects. (4.7.4)
12) When considering specialist built environment expertise, NHS Boards should make diligent enquiries regarding in-house and national NHS agencies, in addition to external consultants, and ensure they are involved throughout the project. Decisions around water and ventilation systems in particular, when accommodating patients vulnerable to infection, can greatly benefit from those who have experience in such matters, and who understand the impact of design and contractor variations on infection risks. (4.7.5)
13) When considering high-level options, design teams should consider fully the implications for built environment choices on IP&C, seeking specialist expertise early, and link satisfactory IP&C sign-off to release of funds (e.g. NHSScotland Design Assessment Process (NDAP). The new National Centre for Reducing Risk in the Healthcare Built Environment could provide or signpost to such expertise. (4.7.6)
14) NHS building specialists and design teams preparing and reviewing guidance on BREEAM for certain specialist acute treatments should recognise the energy requirement that supports patient care and adjust goals for BREEAM accordingly. (4.7.7)
15) The new National Centre for Reducing Risk in the Healthcare Built Environment should investigate and produce definitive guidance on the status and hierarchy of NHS Design guidance for IP&C and the built environment. Specifically, what is guidance and what should be mandatory. (4.7.8)
16) Governance arrangements for change management, especially major changes during projects need to include input from those with knowledge and understanding of the built environment impact on IP&C. (4.7.9)
17) NHS buildings guidance should make explicit reference to the need for secondary controls (beyond usual thermal control) for large and complex water distribution systems. (4.7.10)
18) Advice and quality assurance on design issues that impact on infection risks – not just the water system but ventilation and others covered in Design Guidance SHFN 30 – should be stronger than it has been. The Design & Build form of contract should, in future, allow more robust design advice to clients. (4.7.11)
19) NHS England and the new National Centre for Reducing Risk in the Healthcare Built Environment, with other UK national agencies with the remit, should produce the supplement for people with profound immuno-suppression, missing from Design Guidance SHPN 04. (4.7.12)
20) NHS England and the new National Centre for Reducing Risk in the Healthcare Built Environment, with other UK national agencies with the remit, should agree and deliver a programme of guidance that reflects modern construction knowledge of good practice, and redress recent lack of investment in the HTM portfolio and associated publications. (4.7.13)

Chapter 5 – Built Environment: Build

Findings

- Without the benefit of explanations from the D&B contractor and their supply chain, the gathering of evidence which would give the Review the complete picture was materially restricted. The overall lack of project documentation was of concern and, while it may very well exist, much of it was not available to the Review team, or previous investigators. This problem was exacerbated by the contractor not participating in the Review. (5.6.1)
- There is a lack of documentation evidencing a robust approach to confirming and recording standards of finish in sealed areas such as behind walls and above ceilings prior to closure. Existing technology should have allowed this to be recorded. (5.6.2)
- There were non-compliances with the domestic water supply including open ended pipes during installation allowing debris to enter the system and corrosion on pipework; and stainless steel pipework in the basement water tank that was not to WRAS (Water Regulations Advisory Scheme) standard. These non-compliances allow contamination to occur and increase the risk of subsequent infection. (5.6.3)
- In general, ventilation systems were installed with air change levels that did not adequately take into account the risk of air-borne infection (in terms of air changes and pressure). IP&C teams could have alerted senior management if they had been involved in site inspections per SHFN 30 (see paragraph 5.6) assuming they had the requisite knowledge and understanding of such “built environment” factors. (5.6.4)
- Ventilation systems to standard isolation rooms have been installed with numerous non-compliances. However, it is not possible, without forensic analysis, to determine if these were agreed design changes. All could have been rectified if spotted. (5.6.5)
- The D&B contractor did not query and resolve confusing/contradicting Employer’s Requirements, which resulted in rooms for immunocompromised patients not attaining adequate positive pressure requirements. (5.6.6)

Recommendations

21) There should be greater use of digital technologies to create, log and store project documentation. This would allow relevant information to be shared with project partners. It would also facilitate governance, and review of project activities and decisions. (5.7.1)
22) There should be a reliable system of retaining major project records, with greater use of digital technologies to record images and other documents, as evidence of critical ‘hold points’ for future checking. (5.7.2)
23) During the process of construction, tasks that do not comply with the specification that the on-site Supervisor identifies must be closed out and

should act as a trigger to challenge the contractor if there are repeated errors. (5.7.3)

24) Suitably qualified individuals from the IP&C team, with knowledge and understanding of the built environment, or someone representing the interests of the IP&C team (either from the NHS Board or the new National Centre for Reducing Risk in the Healthcare Built Environment) should have sight of IP&C-critical works for comment and have the opportunity to raise any concerns throughout the life of a project. (5.7.4)

25) All contractors (including sub-contractors) need to understand the implications of (what might seem inconsequential) deviations from prescribed standards for healthcare projects before undertaking such works. Ensuring this should be a vital part of the site management. (5.7.5)

Chapter 6 – Built Environment: Commissioning

Findings

- The decision, taken in 2013, to allow the D&B contractor to engage their own Independent Commissioning Engineer (ICE) was responsible, in part at least, for the high number of problems identified at handover. The majority of issues related to incompletion rather than defects and the ICE would have had independent responsibility to ensure appropriate tests were completed in a timely manner, including any re-testing for failures, and collation of certificates and documentation. (6.6.1)
- There was a lack of time, planning and coordination for the commissioning work. The D&B contractor's approach to filling, purging and disinfecting the water system did not follow good practice and the Supervisor was not aware of the D&B contractor's activities in continuing to undertake testing. (6.6.2)
- There was a lack of documentation to prove the water and air ventilation systems in Royal Hospital for Children (RHC) wards 2A & 2B and QEUH 4B, were compliant with specification. This problem was evident across the whole hospital, even after handover when commissioning documents, risk assessments and other reports were either not available or withheld from those asking to see them. (6.6.3)
- After opening, systems within the building did not perform to the client's specification because of earlier, unresolved problems with the design and build. This included mainly the ventilation, water and energy systems. (6.6.4)
- Estates and Facilities staff were not prepared for the level of problems they encountered when the building opened. They were overwhelmed by the new workload, combined with dealing with hundreds of contractors undertaking remedial works. (6.6.5)
- There were gaps in the provision of resources by the Supervisor to witness the testing and commissioning, linked to a lower than expected fee for the work to be done. (6.6.6)

Recommendations

26) There should always be an Independent Commissioning Engineer, covering at least water and ventilation systems, to ensure testing and commissioning is undertaken in an appropriate manner and in a timely fashion, and that the contractor responsible for commissioning makes available certification and documentation for future reference. (6.7.1)
27) Commissioning plans should allow a realistic timeframe for testing and commissioning, along with early-warnings to address anticipated problems or non-compliances. (6.7.2)
28) There should be a transparent approach of presumption of data sharing with stakeholders in a way that fully evidences assurances that internal governance and external authorities seek. (6.7.3)

29) Resources for operational commissioning, and migration of services, should be proportionate to the scale of the task, including potential double running of old and new hospitals. (6.7.4)
30) Project Boards should place adequate value and invest resource in verification and smooth handover, in line with best practice and recent reports on testing, commissioning and certification, especially regarding water and ventilation systems; this should be considered separately from the requirements for design advice and on-site supervisor services with a realistic budget for both. (6.7.5)

Chapter 7 – Built Environment: Maintenance

Findings

- The building is likely to require long term investment in monitoring and fault correction which is in excess of that one might reasonably expect of a new building. (7.6.1)
- The budget for maintenance did not acknowledge the increased workload following adoption of the single room design, the overall floor space, and new technologies and procedures that had been developed during the life of the project. (7.6.2)
- The level of isolation for local maintenance is not achievable due to the complex design of both the ventilation and water systems. This problem has also had consequences for remedial works. (7.6.3)
- The design of the QEUH ventilation and water systems has resulted in restricted access for maintenance staff to inspect areas of ducting, piping and other plant. As a result, critical maintenance activities cannot be completed without major plant removal. (7.6.4)
- A lack of clarity over the roles and responsibilities within the Estates and Facilities team, combined with overwhelming workloads, due to defects, snagging and incomplete works, meant there was a missed opportunity to address the significant problems with the water system over a period of around two years, during which the risk remained 'high'. (7.6.5)
- Of significant importance was the absence of a formally appointed and suitably trained Authorised Person for water. (7.6.6)
- A 'Soft Landings' (or similar) approach was recommended to NHS GG&C but not adopted on cost grounds. But this approach would have incentivised the contractor to consider maintenance issues through their contract. (7.6.7)
- The risks relating to IP&C have been minimised to a tolerable level by the various alterations and mitigating works undertaken to the water and ventilation systems. (7.6.8)

Recommendations

31) NHS GG&C should allocate and sustain resources that reflect the QEUH building's continuing need for maintenance above expected levels. (7.7.1)
32) A re-evaluation is needed of resources specifically to service single rooms, taking account of the increased workload, impact of new technologies and procedures for Infection Prevention and Control (IP&C), and new guidance issued. For future projects, resource based on analysis of the requirement rather than solely historical cost should guide decisions on facilities and estates. New buildings contain sophisticated systems and require requisite skill in monitoring, problem assessment and correction. (7.7.2)

33) Those involved in decision making around the design and specification of building services for healthcare buildings need to have (or be able to access) the knowledge and understanding to allow them to make sound judgements on how the design will facilitate access for maintenance. (7.7.3)
34) HFS should have, as part of the new National Centre for Reducing Risk in the Healthcare Built Environment, a gateway function for construction projects; it should review the criteria for occupation and, post-operational commissioning, to ensure a demonstrable level of Planned Preventive Maintenance (PPM) undertakings are in place before patients occupy the hospital. (7.7.4)
35) An Authorised Person for water safety must be trained and competent as per HSE guidance (L8) and NHS Boards must have sign off for the appointment. (7.7.5)
36) Detailed and explicit guidance on a 'Soft Landings' approach for healthcare should be developed, and this guidance be adopted as mandatory for large-scale projects. (7.7.6)

Chapter 8 – Infection Prevention and Control

CHAPTER 8 – PART 1: DESIGN, BUILD AND COMMISSIONING

Findings

- The QEUH hospital project developed around the time of two Inquiries into significant outbreaks of communicable disease in the NHS GG&C area, the Watt Group report (2002) and the Vale of Leven Hospital Inquiry (events of 2007-08, published 2015). These reports formed the backdrop to the changing and developing function of IP&C in the city's hospitals and across Scotland. (8.11.1)
- The stated involvement of Infection Prevention and Control (IP&C) expertise was substantial; nonetheless, the presence of expertise in meetings was predominantly nurse specialist input, and the key role was knowledge and application of SHTMs (Scottish Health Technical Memoranda) and Building Notes. The nurse specialist role was in the interpretation, input and influence of the design in terms of infection control. (8.11.2)
- Compared to the input of ICNs there was much less resource allocated to the task, and through one person. The amount of liaison of the lead ICD with ICD colleagues was limited although the general impression was that the Infection Control Team (ICT) (lead ICD, nurse and manager) worked together and did not differ significantly in their outlook; so, perhaps discussion and debate was not deemed necessary. (8.11.6)
- Specifically the lead ICD did not draw on the experience of other doctors who had previously fulfilled very similar roles, although in hospital refurbishments rather than a major new-build project such as this. (8.11.7)
- The Review considers that quality of infection control advice relating to vital systems and standards, specifically with respect to both the water and air ventilation systems, was not sufficient to underline the importance of quality design and high standards of building practice. The available advice did not reconcile conflicts or uncertainties in guidance, areas for interpretation and missing guidance in the case of isolation rooms. The advice did not address effectively the implications of alterations to the plans with respect to Bone Marrow Transplant unit and Infectious Disease clinical services. (8.11.14)
- The scope of the ICD's role was contested by the newly arrived doctors who took up responsibilities from the point of patients first arriving in the hospital. These doctors did not accept assurances that their predecessor on the project had agreed, they lacked the management information they needed to inform their IP&C decisions and advice. Mistrust grew. (8.11.16)
- This picture formed part of a more general over-reliance on contractor assurances, client lack of scrutiny and assurance at the point of commissioning the building (see Chapters 6 and 7), data availability and sharing to support assurance, and confidence in knowledge about the operation of building systems at handover. (8.11.17)

- Despite the continuing presence of the contractor's representative on-site for two years after opening , those who operated the facility from an IP&C and engineering perspective felt that NHS GG&C lacked critical assessment of the building at handover; there should have been no presumption of adequate building system performance until responsible persons could see and substantiate the performance of the building and the data on which it is founded. (8.11.19)

CHAPTER 8 – PART 2 - HEALTHCARE ASSOCIATED INFECTION AND INCIDENT MANAGEMENT TEAMS IN THE HOSPITAL, WITHIN THE MAINTENANCE PHASE OF THE REVIEW'S REMIT

Findings

- The scale and persistent nature of this set of events is exceptional. For any large hospital to deal with this number of events may not be unusual, particularly where the number and type of vulnerable patient groups is high. (8.17.1)
- The conduct of these investigations complied with guidance as set out in the manual, and was by and large impressive. The response to the events of 2018 that led to the closure of Ward 2A & 2B was particularly so, despite the amount of uncertainty about the nature of the problem, changing focus, the number of extremely ill children, the mounting resource implications as systems were taken apart and major modifications planned and implemented, pressure to attend to other matters connected with the building as set out in the 27 point action plan, and the inevitable public profile and need for communications. (8.17.2)
- The water system of the hospital became, from within one year of admitting patients, the emerging source of infections that entered the bloodstreams of a substantial number of child patients with haematological cancers. The HPS report (2018) states that they were investigating a 'contaminated water system'; the entire new hospital was affected and, after immediate local action in the vicinity of the affected patients, the remedy became a new system of additional chemical disinfection for the hospital water supply. (8.19.1)
- Medical microbiologists predicted this risk in their SBAR document of October 2017, identified the likely places where they would have impact, and a number of associated and relevant matters. They were correct. (8.19.2)
- The Review takes the view that, in the design, construction and commissioning of QEUH, the client and construction contractors set out to comply with standards consistent with a more conventional hospital; they should have taken greater account of the needs of all potential patients including those in the high risk groups such as severely immuno-compromised patients. (8.19.3)
- The remedies required to tackle the serious infection clusters, systemic shortcomings and sub-optimal design and operation, have come at great cost. They have had substantial impact on patients' and families' wellbeing although without directly attributable deaths, and substantial public expense

that extends from pharmacy costs through to capital investment in water systems. The effect on staff, the displacement of patients, and very careful planning that has resulted in order to meet patient needs and minimise delays in treatment, are also amongst indirect but immeasurable costs. (8.19.4)

CHAPTER 8 – PART 3 – THE MANAGEMENT AND GOVERNANCE OF THE IP&C FUNCTION IN QEUH/RHC

Findings

- The role of IP&C in QEUH/RHC was not solely confined to the new hospital, [redacted]-oncology patients and the events we describe here. Neither were unusual infections occurring solely in QEUH; other hospitals in the NHS GG&C area were isolating unusual organisms, often of a similar nature to those reported in QEUH. (8.23.1)
- The general profile of infection control in terms of recorded incidence of key infections and outbreaks in the 'QEUH' hospital complex was as good as, or better than other comparable data, both in other hospitals and compared with the hospitals that QEUH/RHC replaced and also when compared with other hospitals across Scotland. (8.23.2)
- Leadership of the IMTs throughout the period 2015-18 was effective. The internal frictions within the IP&C Leadership team, and the medical microbiology community, served to undermine its own effectiveness and influence of the Chair in the difficult circumstances that they encountered in 2019. There should have been the opportunity to resolve differing clinical perspectives and build consensus, aside from formal meetings. Senior management should have picked up the need for escalation and fresh leadership. (8.23.3)

Recommendations

37) The scope of the roles an ICD, ICN and IP&C Team involved in a major construction project should conform to the specification laid out in guidance and good practice documents. (8.24.1)
38) The IP&C Team should be appropriately involved throughout the life of a project. (8.24.2)

CHAPTER 8 – PART 4 – AIR VENTILATION: INVESTIGATION OF LINKS WITH INCIDENTS OF DISEASE

Findings

- Microbiological typing, as a precise method of linkage, is a useful tool that can help to investigate outbreaks but is not a definitive approach. Investigation of unusual infections with a possible environmental cause requires a bespoke approach to problem solving, given the array of possible environmental and patient characteristics, and potential pathogens. As in this more recent cluster of infections, involving a variety of organisms, sometimes with several different organisms isolated from single patients, the problem is of much greater scale and complexity, and requires a combination of approaches. (8.32.1)
- We have taken a view on the three cases of infection that gave rise to the establishment of the Review. We note that, in the case of isolation of [redacted] in a patient and their subsequent death, further case investigation has ruled out a firm link with the two events. In the case of the two people with [redacted] infection, there is not a sound evidential basis on which to make a link between their infection, subsequent deaths, and the presence or proximity of pigeons or their excrement. (8.32.2)

Recommendations

39) ICDs are entitled to express their concerns and have them taken seriously on matters of infection prevention and the built environment. They should work with other stakeholders to develop effective solutions. (8.33.1)
40) All hospitals need to plan and have in place assured air ventilation systems that perform in the way they are intended or designed. (8.33.2)
41) Without knowing the thresholds for air quality that would quantify and minimise infection risk, we look to general measures: there should be continuing efforts to ensure the performance of the systems in place, assuring air quality for all patients, particularly patients vulnerable to airborne pathogens, and make specific provision for positive and negative pressure facilities for specific groups of patients and nearby patients and staff. (8.33.3)

CHAPTER 8 – PART 5 – MANAGEMENT AND GOVERNANCE OF IP&C IN NHS GG&C

Findings

- In practical terms the failure to address and resolve differing clinical opinions relating to IP&C has resulted in confusion that does not serve the clinical community, management or patients in the hospital well. Managers, directors and contractors all reported problems with inconsistent and sometimes contradictory IP&C advice. (8.40.1)

- The Lead IP&C Team has focused primarily on operational matters and reporting requirements, and can function where there is no need to reconcile differences or solve problems; it lacks resilience, strategic leadership and connectedness to its local teams, to the external IP&C community and to sources of expertise. (8.40.2)
- The lines of accountability for microbiology and infection and prevention and control doctors (ICDs) go in different directions for the same cadre of people. This divergence has served to perpetuate problem-solving difficulties with the service. (8.40.3)

Recommendations

42) There should be a fully integrated management structure for microbiology and infection control services, bringing together team leadership, management and accountability. (8.41.1)

CHAPTER 8 – PART 6 – APPOINTMENT, TRAINING AND SKILL SET OF IC TEAM, SITE PROJECT TEAM

Findings

- In contrast to ICNs who have prescribed training and expected know-how, expectations of ICDs to gain specific expertise and personal skills as microbiologists in training are a recent development as a part of overall specialist professional development. The specialties of microbiology and infection are in states of change, and skill sets and job responsibilities vary markedly across the UK and even within an NHS Board area. (8.43.1)
- We judge that the job role of an ICD has both a very distinct knowledge set and requires a particular skill set and experience. The effective ICD requires a much broader grounding in public health skills, multi-disciplinary clinical engagement, risk assessment, communication and balance of risks, but crucially the skills and ability to influence a circle of people outside the clinical realm, not least general management, engineering and facilities management. (8.43.2)
- Leadership preparation and development for ICDs is a professional need that they share with all other parts of the medical profession. (8.43.3)

CHAPTER 8 – PART 7 – HEALTH PROTECTION SCOTLAND

Findings

- Those who lead NHS GG&C's IP&C service, and its practitioner and specialist staff are in a key position to define the relationship they wish to have with external agencies and expertise. Until now, the total between HPS and the NHS GG&C IP&C service has been less than the sum of its parts. This should change with the emergence of a new leadership for IP&C in NHS GG&C and a new National Centre for Reducing Risk in the Healthcare Built Environment. (8.51.1)
- One other view voiced by observers of NHS GG&C's culture and practices, from within and outside, is that the organisation tended to see itself as a self-contained, very large health system, and did not regard outside attention from agencies as welcome unless it requested help on its own terms. (8.51.2)
- IP&C practitioners in NHS GG&C have established new knowledge and expertise following the experience that is the subject of this review. That knowledge and experience is valuable to colleagues in NHSScotland and more widely through active involvement in the development of the National Centre for Reducing Risk in the Healthcare Built Environment.(8.51.3)

Recommendations

43) The National Centre for Reducing Risk in the Healthcare Built Environment will wish to consider the views expressed in this report toward the scope and involvement of national and local IC Teams in projects on the healthcare built environment, and benchmarking good practice. (8.52.1)

44) The National Centre will also wish to review the content of this report, reflecting on national agency skills, experience and capability matters in the recent past. (8.52.2)

Chapter 9 – Themes

CHAPTER 9 - PART A - IP&C, TECHNICAL EXPERTISE, STANDARDS OF PROFESSIONAL WORK

Recommendations

45) Regardless of their professional background, those with Infection Control as part of their job role should undergo regular performance appraisal. This should include enquiry about challenges and problems encountered in the role, including team effectiveness. (9.4.1)
46) Enhanced professional appraisal must, similarly, encompass critical appraisal and reflection. Critical incidents where Incident Management Teams (IMTs) present dilemmas and challenges should provide candid and confidential material for discussion with a view to continuous improvement. (9.4.2)
47) The selection of Infection Control professionals in management positions such as the leadership team should be by competitive recruitment with the possibility of extension or reappointment. Appointees should be given every opportunity to address areas where assessment shows room for growth and learning. Effective team work must be an element. (9.5.1)
48) Incident management and problem assessment inevitably involves hypothesis development and testing; governance must ensure that hypotheses are sound, contestable and the debate that strengthens or removes hypotheses is respectful and transparent. (9.5.2)

CHAPTER 9 – PART B – CHANGING PATTERNS OF HAI AND ASSOCIATED IMPLICATIONS, IP&C REFORMS, KEY PERFORMANCE INDICATORS

Findings

- There have been very important advances in infection control since the framework of IP&C came into effect. Many lives have been saved by sustained and co-ordinated action; NHS GG&C and NHSScotland hospitals deserve credit for this achievement. (9.5.12)

CHAPTER 9 – PART C – GOVERNANCE AND ASSURANCE

Findings

- Governance processes for site selection, and the design stage were strong and ensured wide stakeholder engagement. Those with infection control expertise were heard and their views taken into account. The process of planning and executing the move of clinical services, on the move, was complex, careful and well executed. (9.6.1)

- The Board of NHS GG&C did not have information available to it regarding the lack of performance of the air ventilation systems as the hospital opened,

and did not track or comment on consequences for patients. Neither did it have information about inaction over a series of compliance problems with the water system until a late stage. (9.8.1)

- The Board of NHS GG&C did not seek or receive assurances in sufficient detail about the significant actions that Estates and Facilities were carrying out by refurbishing the water system in 2018. The risk register changed to recognise this matter in summer 2018. (9.8.2)
- With respect to the design and build phases, the findings and recommendations derived from our assessment in Chapters 4 and 5 – the need for impartial, competent and clear advice on the Design and Build Contractor's proposals, those flowing from the Independent Review of Edinburgh Schools, and the issues of principle within Part A of the Infrastructure Commission report – encompass the steps we put forward as learning and positive changes for the future. (9.8.3)
- The main theme of our findings on governance throughout the phases of commissioning and maintenance – or handover and operation of the hospital – is assurance. This encompasses the challenge to seek assurance, and to ensure that assurance is available. (9.8.4)
- IP&C within the built environment is a crucial element in decision-making for all investments in health and care buildings (9.8.5)
- The arrangements for involvement of stakeholders at each stage was strong, and the complex process of moving clinical services with patients and staff and equipment into the new hospitals was successful. (9.9.4)

Recommendations

49) We endorse the recommendations of the Review of Edinburgh Schools as applied to hospital and other healthcare buildings and public sector capital investment. We recommend that they are implemented in full. (9.9.2)

50) The data on which those with responsibility offer assurance must be sharable to ensure transparency, complete with information on context and, where available and appropriate, valid comparison and external peer challenge. (9.9.3)

51) Stakeholders advising on critical systems such as IP&C should be:
    - Properly trained, experienced, capable of management and organisation of resource, capable of effective influence and have scoped the highly specialist functions of a healthcare building;
    - Capable of escalating problem solving, and networking with evidence providers nationally and internationally when the situation demands it;
    - Capable of understanding the implications of derogations, guidance and compliance;
    - Diligent in documenting decision-making that is transparent and accountable. (9.9.4)

52) Board and Area Infection Control Committees should:
- Have programme management responsibilities;
- Where they have clear governance responsibilities, have well defined scope and remit in respect of other governance bodies;
- Have the remit and scope of their governance responsibilities clearly defined;
- Be competently supported by the Infection Control Manager, so that secretariat and professional leads pursue matters arising diligently, reporting progress and resolution at subsequent meetings;
- Have clear and well understood interfaces between the CCGC, other sub-Committees of the Board and other governance groups. (9.9.4)

53) The Health Board should:
- Retain as formal consultants experienced construction professionals in non-executive positions at times when the organisation is making major investment in estates and facilities. They should scrutinise the project team's performance, critical external relationships with the contractor and assurance systems that include independent verification. They should also provide comment on main developments and changes;
- Expect fuller briefings with problem-orientated records and risk management plans for key adverse events, such as those that are the subject of unplanned capital investment, or sustained and adverse public attention;
- Expect the documentation of more significant critical incidents to address the wider effects on patient care and lessons learned in regular, routine reporting of the Infection Prevention and Control function. This should be in addition to Healthcare Infection Incident Assessment Tool (HIIAT) reports;
- View the Estates and Facilities management function of the NHS Board as central to the Board's work, as NHS GG&C does now, to ensure that stewardship of the built environment and the Board's capital assets receive proportionate management focus. (9.9.4)

54) The documentation and audit trails of key decisions during the time of important projects should be better preserved in order to ensure accountability and clarity of past decision-taking. There should be a review of reasonable timescales for records retention, and this may involve law or regulation to ensure the necessary changes. (9.11.1)

CHAPTER 9 – PART D – BEHAVIOUR AND RELATIONSHIPS

Findings

- The behaviour of individuals has been, at times, inappropriate. Reports of the conduct of the prolonged IMT through much of 2019 illustrates this point. We heard accounts and allegations of bullying behaviour and intimidating conduct at meetings – 'extreme behaviour' in one account. Our observations relate to the behaviour of individuals; we found no evidence of institutionalised bullying in NHS GG&C. (9.12.5)

Recommendations

55) We therefore report examples of team and individual behaviour that were inappropriate. We ask the teams we have identified to reflect on these remarks, and the extent to which the IP&C function has left behind the tendency to focus on the dispute rather than the problem needing to be solved for the benefit of the patients at the centre of the incident. We commend initiatives already underway to address this matter. We direct readers to the recent (2019) reports from John Sturrock QC and Coia and West on inappropriate behaviour care and compassion for staff, and urge stakeholders to examine and apply the recommendations of these reports in their own context. (9.12.9)

CHAPTER 9 – PART E - COMMUNICATION

Findings

- We find a mixed picture on communications. The communications between clinicians and patients and their families have been, by and large, of high quality. Transmission of sensitive clinical information from hospital to headquarters was sound. There are learning points for communication within the IP&C professional community, between that community and other disciplines that influence patient safety factors, and strategic communications when a succession of adverse events occur and need explanation. (9.13.1)

Recommendations

56) We welcome NHS GG&C's recent investment in its strategic communications capability. NHS GG&C's Board needs to ensure political and public messaging that is accurate and sensitive:
    - To manage adverse events and atypical public disclosures effectively within an overall plan underpinned by values of accountability and transparency;
    - To recognize that modern communications need to acknowledge perceptions as well as facts as the NHS Board sees them;
    - To adapt to a changing picture including defensive approaches that could include rebuttal of inaccurate reporting and disclosure that is false or threatens confidentiality;
    - To recognise tactically within its internal and external communications that declining public trust may necessitate greater disclosure in justifying its actions rather than tighter control on the flow of information (9.14.1)

CHAPTER 9 – PART F – THE NATIONAL CENTRE FOR REDUCING RISK IN THE HEALTHCARE BUILT ENVIRONMENT

Findings

- We support the development of a new National Centre for Reducing Risk in the Healthcare Built Environment and propose aims over a range of its possible functions that we draw from the learning of the Review. (9.15.1)

CHAPTER 9 – PART G – RESEARCH, EVALUATION AND LEARNING

Findings

- The challenge for standard setting bodies for clinical, engineering and construction professions is to collaborate on learning, innovation, evaluation and research that focuses on cost-effectiveness for patient outcomes just as much as for value and time scheduling. The clinical realm does not find it easy to look outside its patient and health professional perspective to collaborations that bring much greater gains; design of systems to enhance patient safety is a part of that endeavour. (9.19.1)

Recommendations

57) Construction related research and evaluation should be grouped under the following headings:
    - Air quality;
    - Water quality;
    - Sanitary ware;
    - Healthcare & BREEAM;
    - Microbiology, Environment Health & Public Health;
    - Communicating health and risk. (9.16.4)

58) There are three key areas where evidence review and research is urgently needed, so that future technical guidance can be clearer, and project and incident managers can make better decisions:
    i. The evidence base for air changes and air quality that protects against infection in a range of hospital settings; we understand that air ventilation systems, the resulting air quality characteristics and their influence on clinical outcomes is an under-researched area.
    ii. The need for additional water disinfection for large buildings and little used water outlets, especially where vulnerable people are concerned; several rapid developments are occurring in the realm of modern hospital design, complexity of water systems, microbiological testing relating to water, unusual organisms and vulnerable patients, and the influence of these developments on patient safety and clinical outcomes.
    iii. The significance of findings of unusual micro-organisms in patient and environmental sampling. (9.17.1)

59) We ask the Academy of Medical Royal Colleges and Faculties in Scotland and the UK, the Royal College of Nursing, together with the Royal Academy of Engineering, The Royal Incorporation of Architects in Scotland, Architecture and Design Scotland and those with interests in the environmental sciences to examine ways to engender a community of practice and scholarship that enhances collaborative work in improving the healthcare built environment. The National Centre for Reducing Risk in the Healthcare Built Environment should facilitate this initiative with its UK counterparts. (9.20.1)
60) The National Centre for Reducing Risk in the Healthcare Built Environment and local NHS Boards should encourage linkages, facilitate robust networks that are cross-disciplinary, build on experience and form part of career and professional development, anticipate the need for expertise in areas where construction projects and novel interventions are in the planning stages. (9.20.2)
61) The National Centre and participants should recognise that lessons are often held in organisations at a distance from host institutions by the very nature of unusual occurrences and occasional projects, and that they should create a 'safe space' where experience that is reputationally sensitive can flow more freely. (9.20.3)

CHAPTER 9 – PART I – DUTY OF CANDOUR

Findings

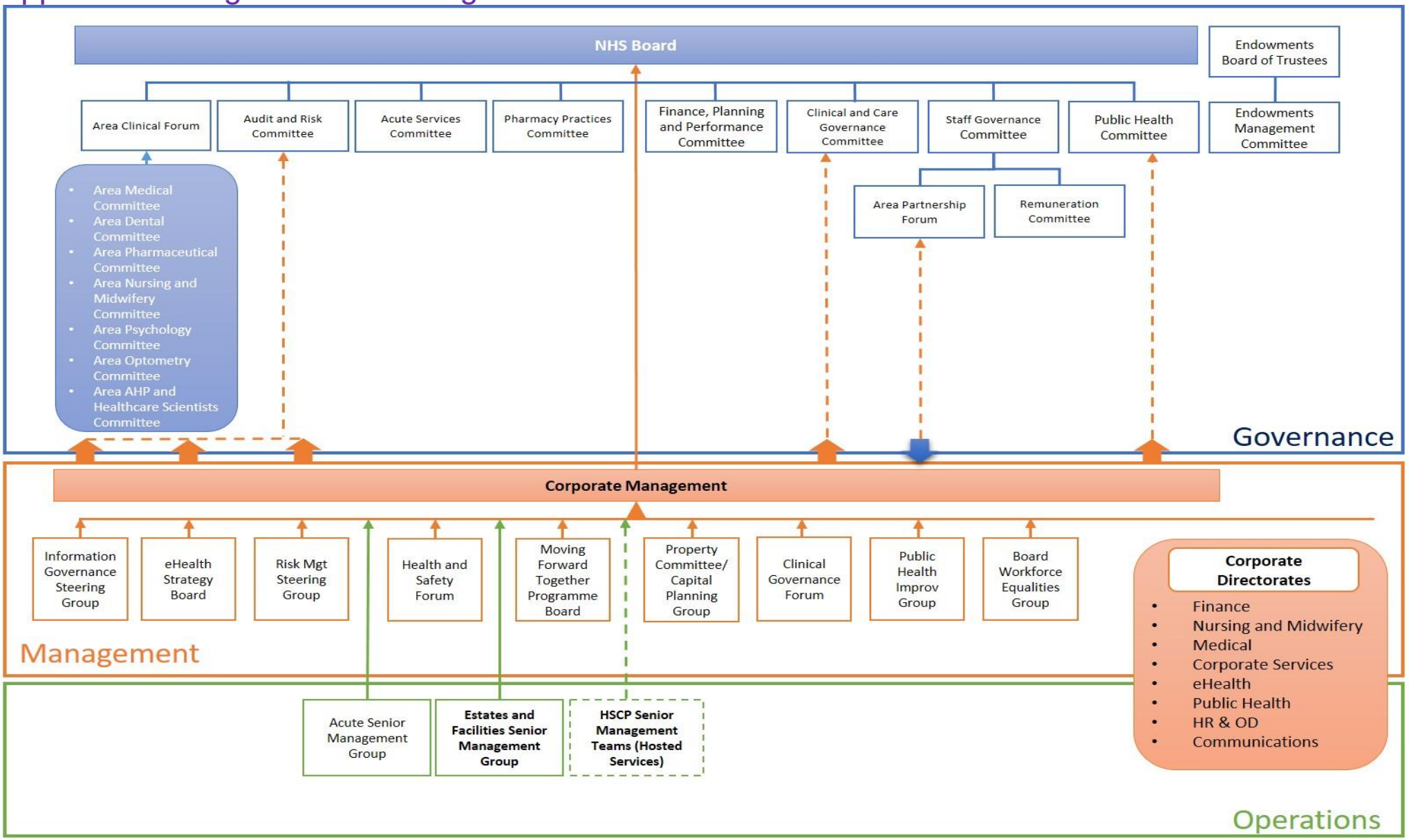
- In common with whistleblowing, the legal provision applying organisational Duty of Candour to NHS Boards is a recently introduced procedure with local application, and has been in use as part of the events that this Review has examined. Neither policy nor guidance envisages the scenario of clusters of infectious disease events with uncertain cause, nor for the specific involvement of an Infection Control specialist. (9.27.1)

Recommendations

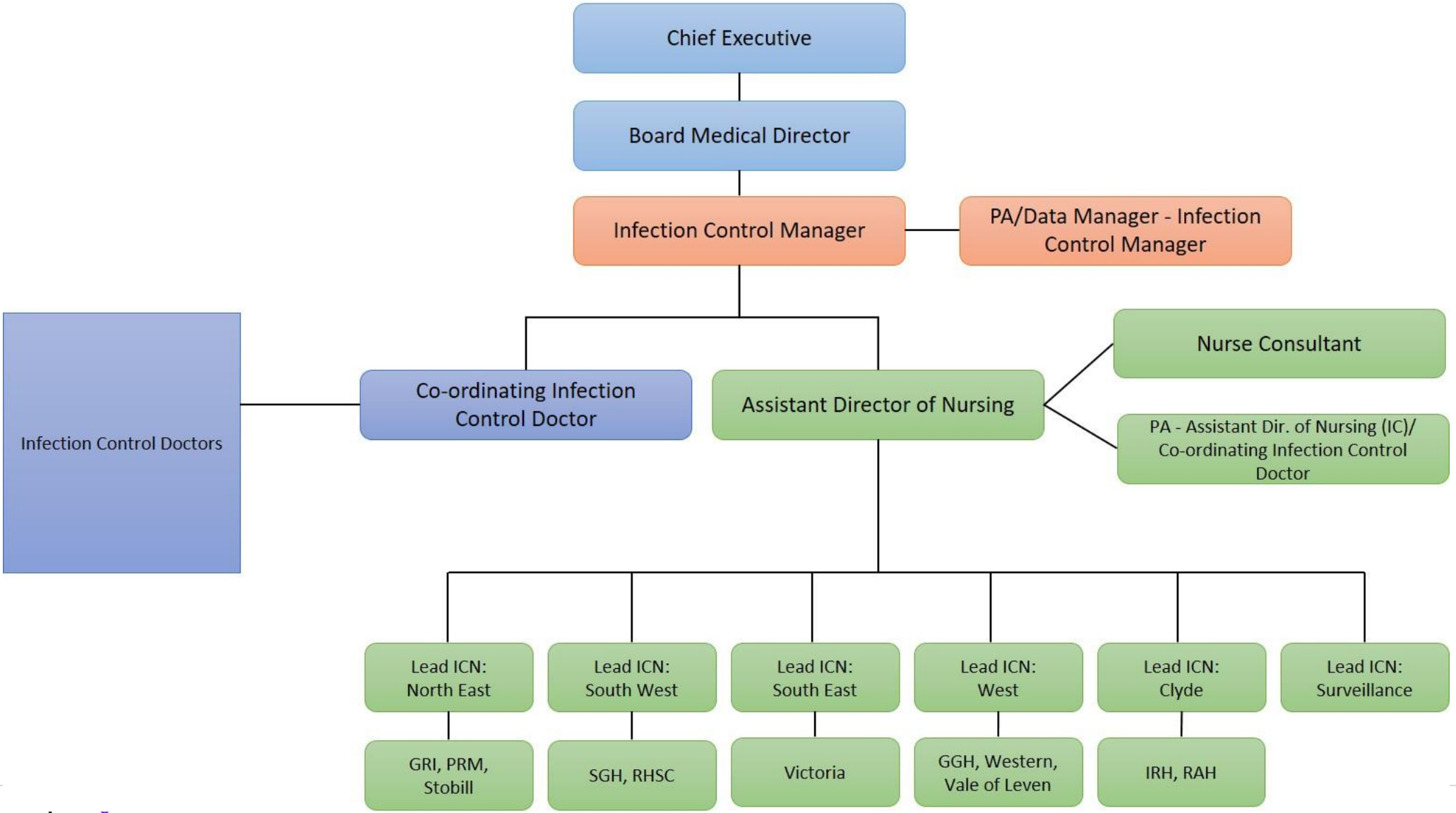
62) Infection Control specialists should reflect as a group on the development of their role in Duty of Candour relating to HAIs. They should share examples in confidence as a learning process, with a view to sharing experience. As these events are unusual, such learning should be on a Scotland-wide basis, in a confidential setting. It may subsequently form a critical event for reporting and discussion in enhanced professional appraisal. (9.28.1)
63) Those responsible for Duty of Candour Policy in NHS Boards and Government may wish to review their operational processes to allow for this eventuality. They should consider how to apply the Duty consistently relating to HAI, encompassing governance to acknowledge events that have triggered a Duty action, along with a review of any learning that might arise from the Duty investigation. (9.28.2)

Appendices

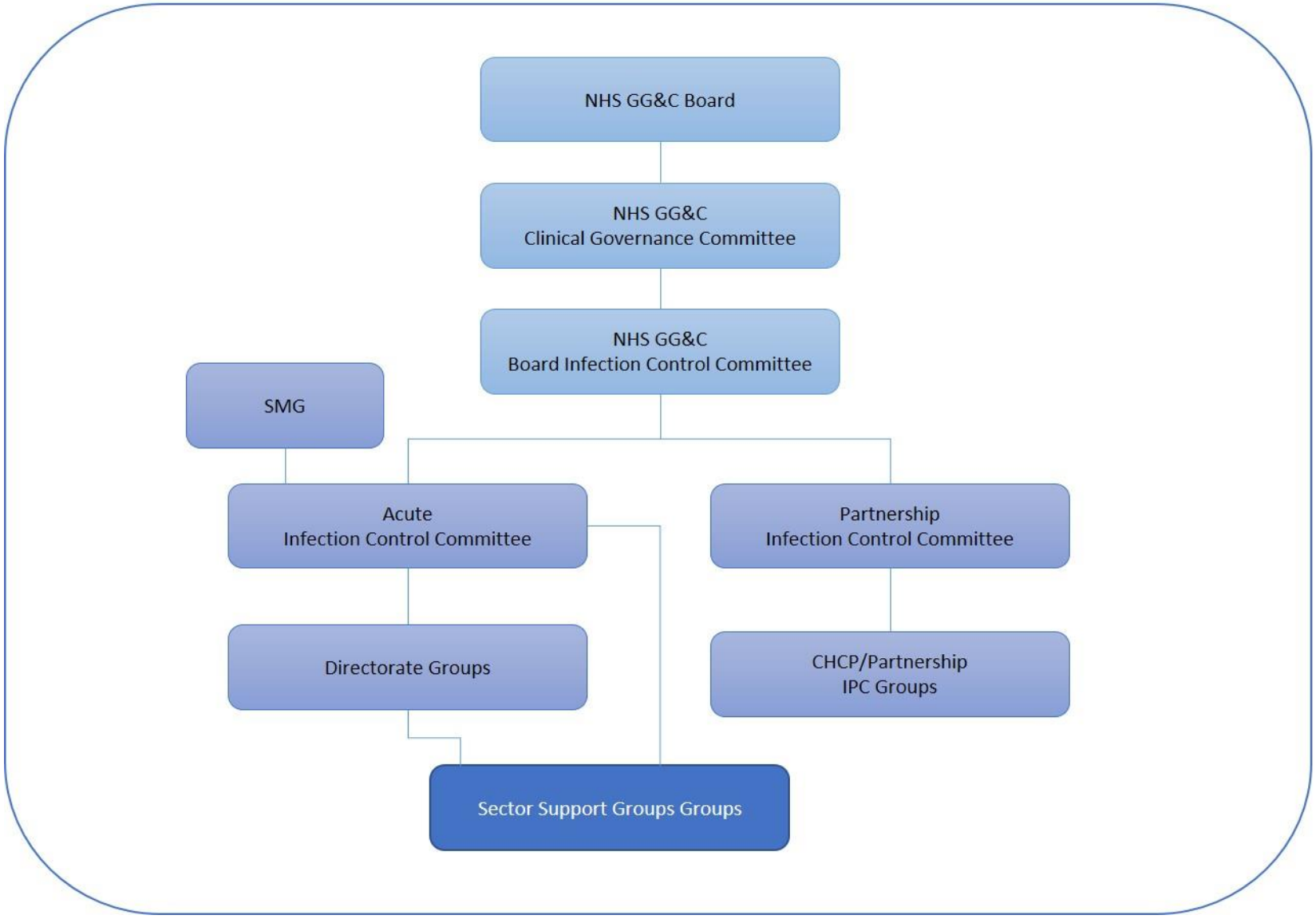
Appendix A: Organisational Diagrams



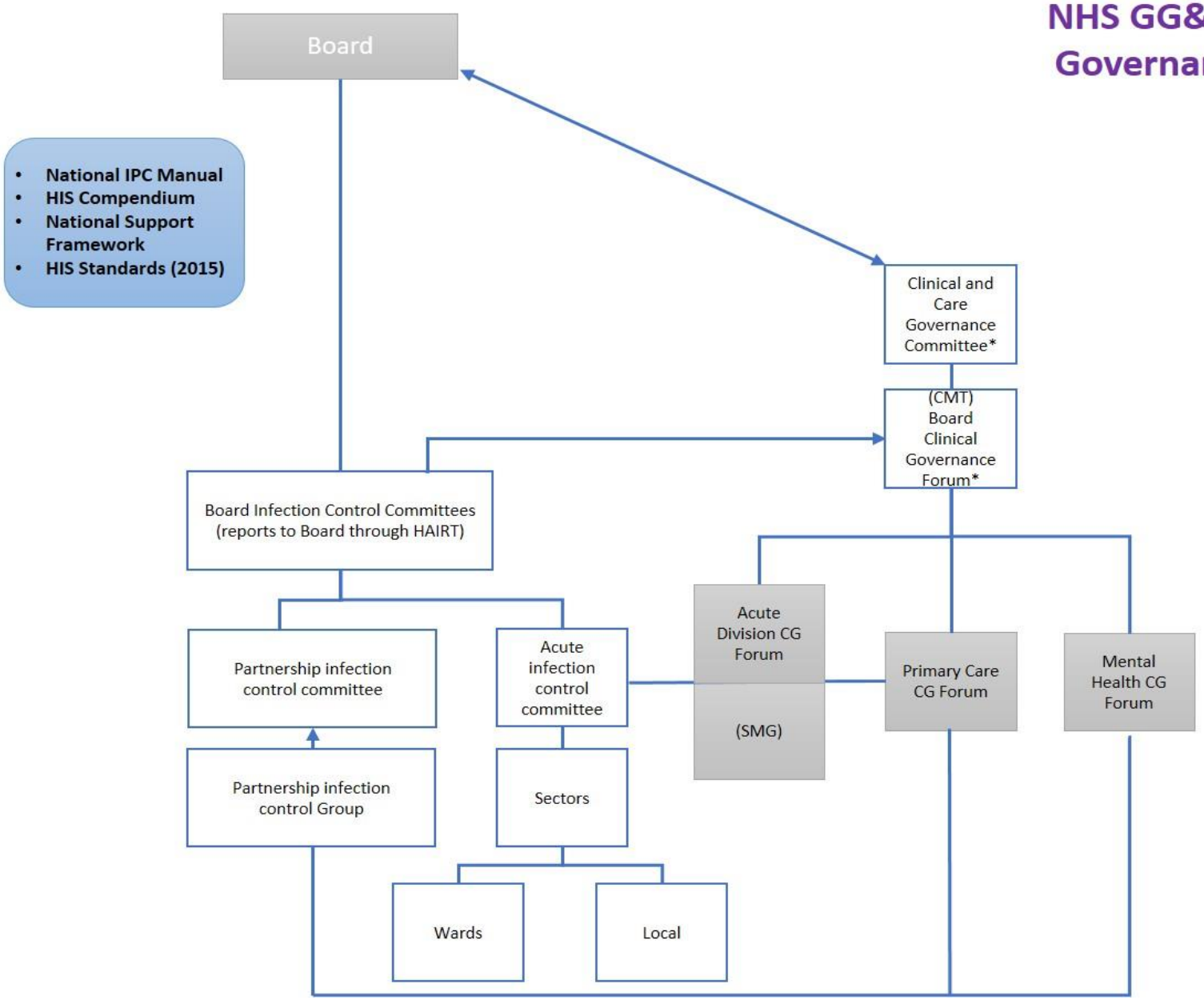
NHS GG&C Acute Infection Prevention and Control Pre 2015



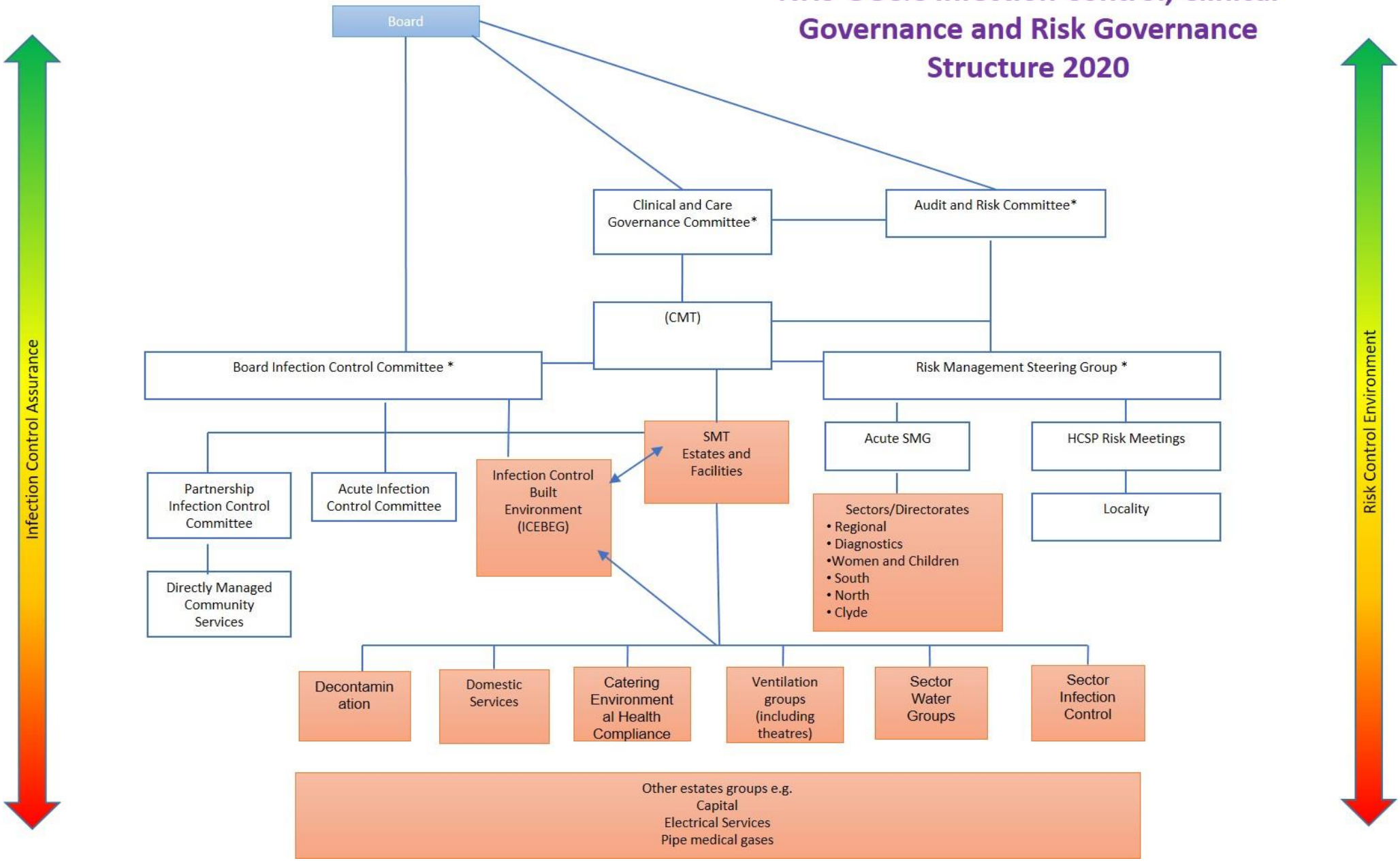
NHS GG&C Committee Structure Pre-2015



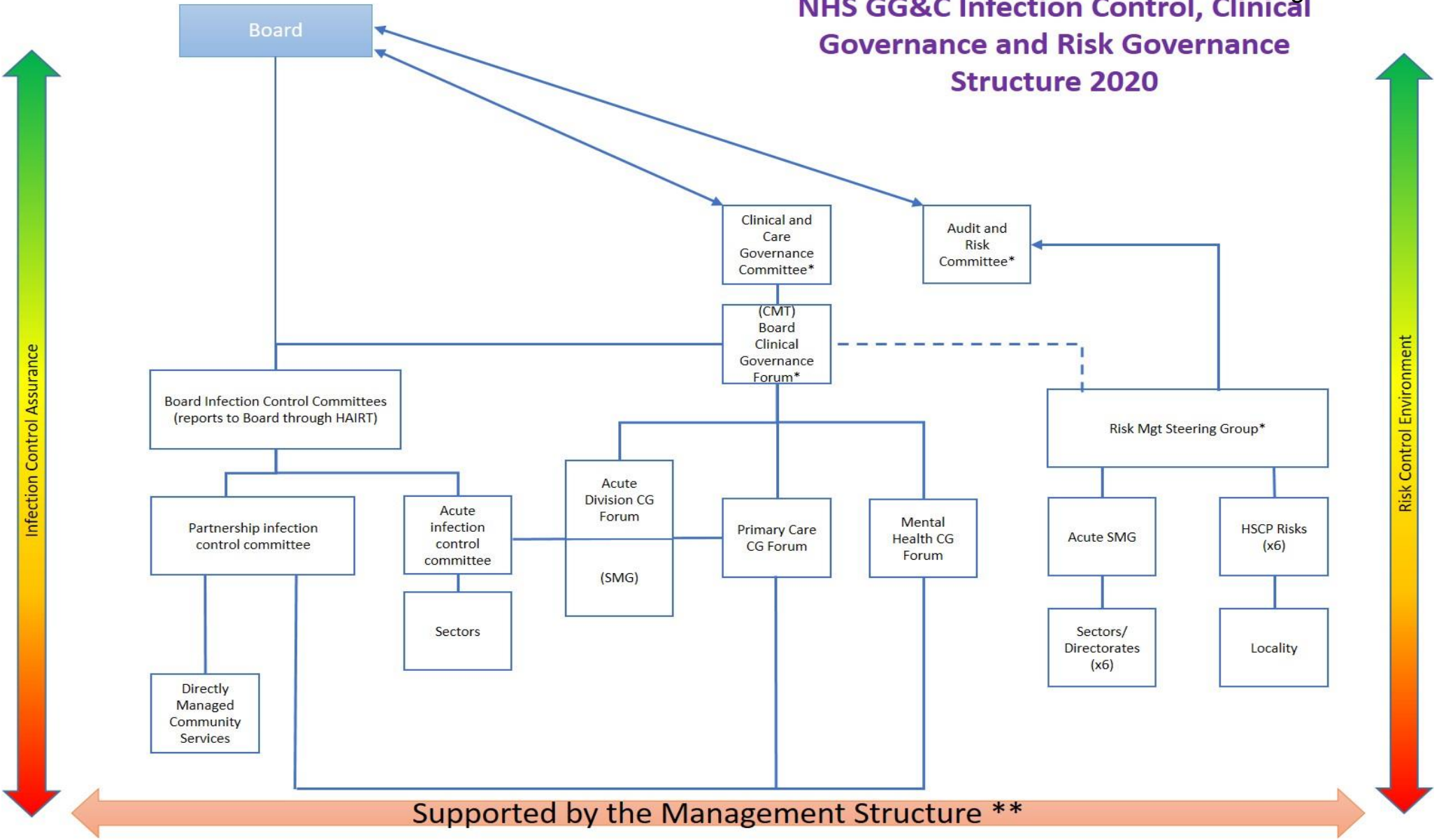
NHS GG&C Infection Control Governance Structure 2020



NHS GG&C Infection Control, Clinical Governance and Risk Governance Structure 2020



NHS GG&C Infection Control, Clinical Governance and Risk Governance Structure 2020



* Supported by the operational management structures
** The operational management structure will implement and support the work of the illustrated committees structures

Appendix B: Figures and Tables

Appendix C: QEUH Independent Review Team

Co-Chairs

Dr Andrew Fraser	Dr Brian Montgomery

Review Team

Shalinay Raghavan	Head of the Review
Mark Dorrian	Deputy Head of the Review
Sam Anderson	Documents and Evidence Manager
Angela McCargow	Business Manager /Deputy Documents and Evidence Manager
Kerry Faichney	Executive Assistant
Dr Karen Munro	Researcher/Analyst
Dr Laura Rodriguez Labajos	Researcher/Analyst
Keigh-Lee Paroz	Statement Taker
Maureen Bryce	Audio Typist
Chrissie Gerstenberger	Audio Typist

Expert Advisors

Professor Billy Hare	Professor in Construction Management, Deputy Director of the BEAM Research Centre, Glasgow Caledonian University.
Linda Dempster	Former Head of Infection Prevention and Control in Nursing team at NHS Improvement.
Dr David Jenkins	Deputy Director of Infection Prevention and Control at University Hospitals of Leicester NHS Trust.

Acknowledgements

As co-Chairs of the Queen Elizabeth University Hospital Independent Review we would like to express our thanks to the many people who have contributed to the Review in a variety of different ways. This includes those who gave advice which helped inform and shape our chosen approach and methodology, the expert advisers who offered technical advice to inform and enhance our understanding of the issues, and the many participants - staff, patients, families and contractors - who submitted documentation, met with us to discuss aspects of the Review or accompanied us on site visits. We are extremely grateful for the openness and candour that we encountered which have allowed us to identify numerous lessons and recommendations. If implemented, these will further enhance the improvements underway at QEUH, and if applied more widely, will benefit the people of Scotland.

We are also grateful for the contributions of our independent expert advisers on infection prevention and control, Linda Dempster and Dr David Jenkins and particular mention goes to Professor Billy Hare, Deputy Director of the BEAM Research Centre, from Glasgow Caledonian University, for his technical knowledge, commitment to the Review and for his humour throughout the Review process. Without his contribution, this Report would not have been possible.

Finally, we would like to express our gratitude to our outstanding Review team, Shalinay Raghavan; Mark Dorrian; Sam Anderson; Karen Munro; Laura Rodriguez Labajos; Angela McCargow; and Kerry Faichney for their hard work, their individual and collective skills and their commitment, all of which enabled us to produce a report which delivers our remit, is constructive, contains valuable learning and is on time.

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The Queen Elizabeth Hospital Review
PO Box 27152
Glasgow
G2 9LX

Information@queenelizabethhospitalreview.scot

APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS704026 (06/20)

Louise Mackinnon

Subject: FW: Respiratory ward ventilation

-----Original Message-----
From: Peters Christine (NHS AYRSHIRE AND ARRAN) [redacted]
Sent: Thursday, May 26, 2016 9:05 PM
To: Inkster Teresa (NHS GREATER GLASGOW & CLYDE) [redacted]
Subject: RE: Respiratory ward ventilation

Questions for DL

What was the IC input into the decision to deviate from the recommendations and on what evidence base?

Was this considered to be adequate for respiratory wards and wards where FLU patients, renal transplant patients and all immunocompromised patients would be accommodated. Was consideration given to sputum induction and aerosol generating procedures and the impact this would have ?

What negative pressure was stipulated in this novel design?
Were HFS consulted on such a deception on a massive scale?

C

From: Inkster Teresa (NHS GREATER GLASGOW & CLYDE)
Sent: 26 May 2016 20:31
To: Peters Christine (NHS AYRSHIRE AND ARRAN)
Subject: FW: Respiratory ward ventilation

DOnt think attachments will come
Dr Teresa Inkster
Lead Infection Control Doctor NHSGGC
Training Programme Director Medical Microbiology Dept of Microbiology Queen Elizabeth University Hospital Glasgow Direct dial : [redacted]
From: Powrie, Ian [redacted]
Sent: 26 May 2016 18:34
To: Inkster Teresa (NHS GREATER GLASGOW & CLYDE); Frew Shiona (NHS GREATER GLASGOW & CLYDE)
Cc: Loudon David (NHS GREATER GLASGOW & CLYDE); Harkness Anne (NHS GREATER GLASGOW & CLYDE); Walsh Thomas (NHS GREATER GLASGOW & CLYDE)
Subject: RE: Respiratory ward ventilation

Hi Teresa,

I can confirm that a typical single room with en-suite is supplied with air at a rate of 40 l\s (equating to 3.19 ACH) and an extract derived via the en-suite at 45 l\s.
The move away from the requirement in SHTM 03-01 for 6 ACH was agreed by the Board prior to formal contract award, the justification for the proposed variation to that specified and its acceptance is provided in the following attached documents:

1. Ward ventilation design strategy Dec 2009-SP2
2. Extract from M&E clarification log
3. Signed off vent drawing ZBP-ZH-XX-PL-524-058

As can be seen from the clarification log, the board accepted this proposal with the caveat "Negative pressure to be created in the design solution." achievement of the -ve pressure design has been validated by Brookfield's design team in the attached report ref: 20160518 ward ventilation strategy - issue 3.

If you require any further information or support on this matter please let me know.

Regards

Ian

I. Powrie
Sector Estates Manager (South & Clyde)
Queen Elizabeth University Hospital Campus,
1345 Govan Rd,
Glasgow,
G51 4TF,
Direct : [redacted]
Mob: [redacted]

From: Inkster Teresa (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 25 May 2016 13:42
To: Powrie, Ian; Frew, Shiona
Cc: Loudon, David; Harkness, Anne; Walsh, Tom
Subject: Respiratory ward ventilation

Dear both,

Despite numerous requests for information I have not received anything in writing confirming the ventilation spec of the rooms in level 7 Respiratory at QEUH .

I have been told verbally that these rooms have 3 ACH and are at neutral pressure - is this accurate and can I be sent confirmation of this?

I appreciate there is nothing that can be done to remedy this. However, I need to do an infection control risk assessment and put risk mitigating measures in place on the unit .

It would be useful if I could have the same information for the other high risk areas in the hospital . These are; respiratory outpatient clinics ,ward 5C , level 4 renal transplant.

Do we know whether the same decision to reduce air changes was made for RHC?

Kind Regards
Teresa

Dr Teresa Inkster
Lead Infection Control Doctor NHSGGC
Training Programme Director Medical Microbiology Dept of Microbiology Queen Elizabeth University Hospital Glasgow Direct dial : [redacted]

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Louise Mackinnon

Subject: FW: respiratory ventilation

Importance: High

From: Peters, Christine
Sent: Monday, May 23, 2016 10:42 AM
To: Powrie, Ian [redacted]
Cc: Inkster, Teresa (NHSmail) [redacted]
Subject: respiratory ventilation
Importance: High

Hi Ian, we have a Problem Assessment Group (PAG) at 3pm today regarding Cf infections, any chance we could have the information re ACH and pressures for inpatient accommodation and clinics by then?

Kind regards,

Christine

Dr Christine Peters
Consultant Microbiologist
Southern General Hospital
GGC
Ex [redacted]
Mobile: [redacted]

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Louise Mackinnon

Subject: FW: Ventilation

From: Peters, Christine
Sent: Thursday, February 11, 2016 4:56 PM
To: Powrie, Ian [redacted]
Subject: Ventilation

Hi Ian,

Thanks for all your time this morning – it was really very helpful. I have not finished filling in all the data – but will do next week when I am back.

Just by way of issues going forward:

- The permeability testing for isolation suite on HDU, bed number 43 results. Was it done?
- We need all the commissioning data for the normal wards – using 5C as the first example. Page 141 of SHTM 03-01 states that single rooms should be 0 or –ve pressure with 6ACH with ensuite ACH 3 with –ve pressure
- Then we need the data for the out patient clinics and the respiratory labs
- I will tee up with the ID consultants to discuss the use of the rooms

We will get there in the end!

kr

Christine

Dr Christine Peters
Consultant Microbiologist
Southern General Hospital
GGC
Ex [redacted]
Mobile: [redacted]

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Management of Infection Control incidents in Wards 2A/ RHC During 2017

31/08/2020

Contents

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Background

This papers sets out the response to individual outbreaks and incidents in wards 2a and 2B during the period 1 January 2017 to 31 December 2017.

Ward 2A at the Royal Hospital for Children in Glasgow is a 25 bedded Haemato-oncology ward which cares for some of the sickest children in the hospital. Many of these patients have complex medical conditions and are often very immunocompromised.

NHSGG&C have conducted various levels of investigation around the infection control incidents in this ward during early 2017. This investigation has included:

- Presentations to various committees on infection control management and practices including
    - the Board of NHS Greater Glasgow and Clyde,
    - Oversight Board for NHSGG&C led by Scottish Government;
    - Infection Prevention and Control Governance Sub Group (sub group of Oversight Board)
    - Clinical and Care Governance Committee and
    - Board Infection Control Committee (BICC)

In addition, a desktop review relating to the clinical management of patients using Ward 2A during 2017 has also been completed and NHSGG&C have also developed a 27 point action plan in October 2017 which has involved medical microbiologists and the wider Infection Prevention and Control Team.

Aim

The aim of this report is to provide further analysis of these incidents, particularly in relation to the actions and responses by the Infection Control and Prevention Team and the Incident Management Team (IMT) during early 2017.

The report has been split into key sections to illustrate the various interventions that took place took place during this time. Part 1 of the report lists a summary of key themes and actions taken.

This is followed by Part 2 and 3 which provides a summary of the relevant IMT/ PAG meetings that took place and actions arising from these meetings. A helpful timeline of events is provided within this section which outlines the decisions made by the IMT/ PAG and ongoing monitoring of these decisions.

The report also demonstrates the proactive nature of NHSGG&C in understanding the key issues during this time and our commitment in developing a culture to improve and strengthen infection control practice across all of our patient facing services.

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Position at RHC Ward 2A in early 2017

In early March 2017, a Problem Assessment Group (PAG) was convened to discuss the perceived high number of positive blood cultures in Ward 2A. This group agreed a number of actions including a retrospective look back at blood culture rates on the unit by the IPCT. This revealed a gradual upward trend over the 6 months prior. The HIIAT Score was marked as Green and this was reported to Health Protection Scotland (HPS)


Increase in +ve
Blood Cultures in H

An action plan was developed in response to this. The following incidents/outbreaks followed in the months after and further information on each of these incidents is covered in Part 2 of the report.

- 3 cases of *Elizabethkingia miricola* bacteraemias
- 3 cases of invasive aspergillosis
- Increased incidence of Vancomycin Resistant Enterococci (VRE)
- Rotavirus and Astrovirus outbreak
- Norovirus outbreak
- cases of line associated bacteraemias

In total, 6 incidents required assessment using the Healthcare Infection Incident Assessment Tool (HIIAT) and subsequent reporting to Health Protection Scotland (HPS) and the Scottish Government via the Healthcare Infection Incident and Outbreak Reporting Tool (HIIORT).

Establishment of Quality Improvement Group

One of the critical interventions during early 2017 was the development of a specific group to understand and reduce the rate of line infection. The Central Venous Line (CVL) Quality Improvement Project Steering Group was formed to draw together frontline members of staff working on 2A, with other key stakeholders, including surgeons, anaesthetists, intensivists, radiologists, oncologists and local experts in Quality Improvement methodology, to work collaboratively and share knowledge and expertise on this matter.

The primary aim of this group was to reduce the central line associated blood stream infection (CLABSI) rate in ward 2A (and 2B) As part of this, the group collected two years' worth of retrospective data and presented in the form of a run chart. The initial baseline CLABSI rate per 1000 total line days was 3.25 and the objective of this group was to reduce this to 1 per 1000 *total* line days by Dec 31st 2018.

Benchmarking also took place against the Cincinnati Children's Hospital in Ohio due to the limited data available in the UK as well as the awareness of Cincinnati Hospital being regarded as "best in class" in relation to line infection data. The actions and results from this group can be found on Page 9- Item 13 of this report.

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Part 1- Summary of IPC Actions

The table below contains a range of summarised actions which were implemented by the IPCT. Further detail on each area is provided later in the report.

	Action Taken in Ward 2A	**Current Status**
1	Extensive surveillance of infection on the unit	This action was implemented at the time and is still ongoing
2	x2 Infection Prevention and Control Audits of the unit	These were completed at the time
3	x3 Hand hygiene audits	These were completed at the time
4	x11 Hand hygiene education sessions for staff;	These were completed at the time and education remains a critical part of the function of IPCT
5	Increased presence on the ward by IPCNs providing face to face support and learning	These were completed at the time of the incidents
6	x4 enhanced supervision sessions (monitoring of general clinical practice including line care and supported feedback)	These were completed at the time
7	Provision of parent education sessions	These were completed at the time and is ongoing;
8	Review of general environment including ceiling spaces for fungal growth	This was completed at the time
9	Review of cleaning and maintenance on the unit was completed	This was completed at the time
10	Sampling of water outlets and vents	This was completed at the time
11	Observational review of line practice and review of IV prep guidelines	This was completed at the time
12	Review of physical environment and proposal for additional prep space for reconstitution of IV meds	This was completed at the time and recommendations were made for the new build
13	Liaison with IPCTs in Great Ormond Street Hospital and WoSCC to review their line infection rate improvement plans was completed.	This was completed at the time and further detail is provided in the report
14	Participation in Quality Improvement Group dedicated to improving line associated blood stream infections on 2A was completed IPCT continue to be involved	This was completed at the time and the Chief Nurse for Women and Children's alongside a consultant surgeon led this process. IPCT continue to be involved in this process.
15	Review of external supporting services such as CLIC sargent as a possible source of infection	This was completed at the time
16	Air sampling	This was completed at the time
17	Review of anti-microbial prescribing	This was completed and a report was given to the IMT

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In addition to the above actions, domestic services also increased staffing provisions on the ward with increased domestic auditing and have invited colleagues from different hospital sites to carry out peer audits of the department. The IPCT have also recommended the following actions by the clinical teams during this time which have included

- Regular SICP's audits and hand hygiene audits at least weekly and PDSA cycles to improve practice where poor compliance is recognised was completed. Routine IPCAT audits (standard audit tool for IPCT) are now in place.
- Ensuring staff have completed online Learnpro modules relevant to IPC learning needs. There is organisational wide monitoring of completion of LearnPro statutory/ mandatory e-modules with manager oversight of this process.
- Ensure concerns/improvements are communicated at daily huddle/handover. This process is ongoing
- Cross peer monitoring of the ward by senior staff. This action was completed and is now ongoing.
- Reviewing IV line care and take zero tolerance approach to practice deviations. This has been completed and ongoing at regular intervals.

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Part 2- Detailed interventions taken by IPCT Team

Item	Intervention	Outcome/Progress
1	IPCAT audits	**Two IPCAT Audits were completed in early 2017** 19/04/17 – 87% (SICPs 93%, SPE 65%, TBPs 100%, QI 100%) 01/06/17 – 74% (SICPs 69%, SPE 69%, TBPs 94%, QI 50%) • Questions for staff included in the IPCAT were sent to Senior Charge Nurse for distribution to all staff to improve knowledge. This is a normal part of the IPCAT process and procedures and standard criteria used in every audits which is undertaken • Education for staff was delivered and was repeated later in November 2017
2	Hand hygiene audits	**3 Hand Hygiene Audits were completed** Hand Hygiene Coordinator Audit 8/3/17 – Opportunities taken 100%, Combined compliance 85% Hand Hygiene Coordinator Audit 19/4/17 - Opportunities taken 95%, Combined compliance 70% Hand Hygiene Coordinator Audit 6/6/17 - Opportunities taken 95%, Combined compliance 80% Specific bespoke Hand hygiene education was delivered to medical staff and families.
3	Review of Aseptic Technique and Line care	**Week Long Observation of practice** A week long observation of line practice (beginning 20/03/2017) was carried out by Infection Prevention and Control Nurses. The findings were discussed and reported to Chief Nurse and General Manager and the following actions following this observation were agreed and actioned.

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		• Continuations of ongoing work with the education team to complete policy and implement aseptic non-touch technique and line care; this was carried out as part of the QI work. A draft document had been available to the teams in March 2017 and the new policy was supported by learning sessions from the ANTT team based in London. • A Review of quick reference guideline for administration of IV drugs for use in 2A treatment room was completed; • Purchase of 10 new trolleys for use during IV line care was completed; • Review of environment and treatment areas (see item 6) • IPCT contacted Royal Marsden and Great Ormond Street Hospital to discuss aspects of bacteraemia reduction rates.
4	Review of Antimicrobial prescribing	**Review of Anti-Microbial Prescribing** In May 2017, the IPCT requested a review of anti-microbial prescribing due to increased incidence of VRE in stools and increasing Bacteraemia rates. This was completed and returned to Infection Control Doctor. This demonstrated a spike in Vanc/Teic use coinciding with increase in blood cultures and subsequent increase in VRE colonisations. Further information on actions can be found on Page 15.
5	Enhanced observation of practice by IPCNs	**Enhanced Observation** Further enhanced observation of practice commenced in June/July 2017 due to ongoing outbreaks incidents on Ward 2A. 6 sessions in total carried out. IPCNs observed practice in relation to SICPs, TBPs, environmental cleanliness, aseptic technique and line practice. Feedback given at time of session to nurse in charge and reported out afterwards by email to SCN, LN, CN, GM and ANDIPC. This action was completed.
6	Review of environment particularly in relation to IV medication reconstitution	**Review of Environment** The IPCT reviewed the ward in relation to appropriately sized, stocked and clean treatment rooms for reconstitution of IV medication. In general, it was felt that the treatment room and available work top space was insufficient for the volume of medication required to be made by a large volume of nursing staff. The IPCT suggested alteration works to Teenage Cancer Trust corridor to install a Clinical Handwashing sink, worktop and locked cupboards to allow IV medication to be reconstituted in this area. However It was then recognised that this would not meet building note standards. Suggested alterations sent to Senior Charge Nurse on 11/8/17 and the Estates Management Team. As a result, preparation and treatment rooms have been reconfigured to allow for more focussed space for IV preparation

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7	Staff education	**Hand Hygiene for Staff** Hand hygiene education sessions were carried out throughout June/July 2017. 8 sessions in total were provided in NICU and 2A and all staff from both areas invited to attend. A further 2 dedicated sessions held for medical staff. SICPs education was delivered April/May, 2017 ward 2A and was mainly attended by students and nursing staff. The Infection Control Doctor provided IPC education specifically for Ward 2A Medical staff in July 2017. These sessions were repeated later in 2017- see below. SICPS Education Sessions 2A 24.10.17
8	Parent education	**Education for Parents** Parent education was developed to enhance parental knowledge around Infection Prevention and Control practice and to improve the general environment in Ward 2A. 4 sessions held in total throughout July and August 2018, eight parents attended and these sessions have been repeated. In addition, a dedicated parent IPC information poster was developed and continues to be displayed in every patient room. An Infection Prevention and Control information leaflet for parents was also developed. Parent education RHC July 2017 2.ppt Parent Information Leaflet.docx
9	Water and air testing	**Water and Air Testing** Water outlets were tested in response to incidents/outbreaks on 2A since March 2017. Information on this is presented in Part 4 of the report. Air sampling is carried out routinely.

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10	Review of domestic cleaning	**Domestic Cleaning** Following an outbreak of Rota and Astrovirus in April 2017, the domestic cleaning schedule was reviewed. An audit of environmental cleanliness was carried out by the IPCT and a meeting held between IPCT and facilities management. From this meeting, a number of actions were agreed. This included: • full clean of the ward by domestic services; • full clean of the ward by external contractors; • domestic services audit • cross peer audit by domestic services • Daily review of cleaning by domestic supervisor/manager • Additional domestic hours • Long term daily routine cleaning of the unit with Antichlor plus (this is ongoing)
11	Training for auditors (SICPs and Hand hygiene)	**Training for Hand Hygiene Auditors** In July 2017, the Infection, Prevention and Control team delivered training to the staff Hand hygiene coordinator. This was to ensure that hygiene auditing continues and is recorded accurately. In August 2017, training was delivered by the Lead Infection Control Nurse to support accurate completion of the SICP audit tool.
12	CVC sweeps	**CVC Sweeps** 28/03/17 – CVC sweep in response to increased bacteraemia rates – 58% (only 11 of 19 CVC care plans in place and fully completed). Feedback given to SCN, LN, CN, ANDIC and actions were managed. Locally. Meeting were held in May re plans to improve care in relation to CVCs. 13/10/17 - CVC sweep in response to increased bacteraemia rates – 57% (only 12 of 21 CVC care plans in place and fully completed). Feedback given to SCN, LN, CN, ANDIC and actions were managed both locally and through the Quality Improvement Group that was established.

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13	The QI CLABSI group	**Establishment of QI Group** The QI CLABSI group developed a number of workstreams which has led to significant reduction in line infections. In summary, the line rate has fallen from a baseline median of 3.25 to 1.26. The detail of this work and actions taken are described below. The runchart below provides the rate of line infection over a 6 year period.  clabsi to 23rd June 2020 2.pdf

Workstream	Actions taken
Theatre (insertion + subsequent visits)	• Masks are now worn by all staff in theatre during line insertion; • The theatre is 'closed' during line insertion limiting access to only essential staff; • All patients are now bathed in the 24 hours prior to line insertion surgery; • Work is ongoing to include these changes in an amended line insertion bundle.
Access and line maintenance	• There is now a change of dressing from Mepitel film to IV3000. This is due to superior moisture and secretion handling. • A trial of Griplock dressings was initiated to minimize sutures along exit site and facilitate cleaning. • The ward introduced Curos port protectors on the 14th August 2017 which provides passive disinfection and reduces bacterial count by 100,000 times within 3 minutes of application.
Patient and family engagement	• The group introduced the concept of patients and carers as "Line Guardians" • The ward admission pack now includes a best practice sheet outlining optimal central venous line care and invites patients and their carers to challenge any deviation from that. • There is a formalised record of parent and patient training on line care and Curos added to the discharge checklist.
Staff education and training	• Training for Curos has been delivered for all staff in 2A, 2B, theatres and CT; • There is enhanced supervision and peer audit weekly. • Additional support for core 2A/2B education team has been put in place by IPCT

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			• There has been retraining of all domestic staff using the British Institute of Cleaning Sciences (BICSc) lesson plan. • Roll out of Aseptic Non Touch Technique.
14	Twice weekly ward visits	**Ward Visits** The Infection Prevention and Control Team have initiated twice weekly visits to Ward 2A (compared to once weekly in all other areas). This is often increased depending on new patient referrals. These visits allow staff to raise concerns with IPCN and provides an opportunity to share advice and monitor practice.	
15	Weekly reporting to medical director (IPC, clinical SMT, domestic and facilities)	**Enhanced monitoring of Ward 2A** The lead Infection Prevention Control Nurse developed a report tabling all the incidents and outbreaks on the unit since March 2017 and the Board Medical Director had requested weekly updates on progress in 2A during 2017. The update contained a report from IPCT, domestic services, estates and clinical team. IPCT report was issued to Chief Nurse and General Manager each Friday and this was then shared with the Medical Director. Direct reporting has now ceased and has been replaced by extant reporting arrangements including reporting to the South Sector Infection Control Committee, Board Infection Control Committee and Clinical and Care Governance Committee.	
16	Statistical Process Control monitoring	**Statistical Process Control (SPC)** SPCs were developed for environmental organisms and Coag negative Staphylococci organisms found in blood cultures. These are formulated and monitored on a month by month basis by the IPCT.	
17	Review of CLIC Sargent house	**Review external sources of transmission** The Infection Prevention and Control Team carried out a review of CLIC sargent house for any possible route of cross transmission between patients. There was no evidence of cross transmission found.	
18	Consideration of phlebotomy practice	**Review of phlebotomy practice** There was a review of phlebotomy practice amongst the clinical staff in April and October 2017 as the IPCT raised concern around storage of equipment for IV access by phlebotomists. Actions from this are listed below:	

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		1. All phlebotomists were given refresher training by the Practice Development Nurse. Phlebotomists involved in the audit of practice and also given an education session by Vygon. There were no major concerns identified. 2. There were changes to the method of cleaning the phlebotomy trolley (in-between patients). There was also the addition of 1 daily clean also; 3. Changes were made to use a wipeable plastic tray with implementation of aseptic non-touch technique; 4. Training in regards to the introduction of Curos caps (antiseptic impregnated needle-less access device on end of line).
19	Update to local policy following national guidance	**Development of triggers based on updated NICPM** NIPCM updated in June 2017 (appendix 13) to include 4 key environmental organisms. In July 2017, NHSGGC updated local processes to include these environmental organisms. The ICD developed triggers based on the available scientific literature.

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Part 3- Detailed Interventions from PAG/ IMT

February 2017

Date	Incident	IPC Actions	Outcomes
28/02/2017	3 unrelated cases of *Elizabethkingia miricola* isolated from patient line cultures. This is a rare organism and often associated with water and environment. The Gram negative SPC charts did not breach Upper Control Limits.	Problem Assessment Group (PAG) was convened on 3/3/17. • HIIAT Green. • Review of vent cleaning and maintenance by estates. • Lab sampling of vents and water outlets for analysis. • Infection Prevention and Control Nurse (IPCN) carried out visual inspection of environment.	• All 3 strains unique • Water and vent testing proved negative • Water testing of chilled beams was negative • Incident closed 27/3/17

March 2017

Date	Incident	IPC Actions	Outcomes
03/03/2017	An increase in positive blood cultures (the breakdown of isolates is unclear) in Paediatric Haematology patients General upward trend of positive blood cultures since 2014 in Ward 2A/ 2B.	Infection Control actions: Contact estates about vent cleaning regimes. *This actions was completed.* IPCT will look at line devices in use and find out why and when this was changed over from the smart site. P*rocurement has been contacted to find out specific dates.* IPCT to enquire about the short life working group for vascular access.	IMT: Not required. OCT: Not required. Patient – Moderate Services – Minor Risk of Public Transmission – Minor Public Anxiety – Minor **HIIAT Score: Green**

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	13 positive cases in January 2017 and 11 cases in February 2017* SPC charts for Gram positives breached Upper Control Limits in March 2017; Gram negatives remained within normal limits		Report to HPS. No intervention from HPS or escalation. IPCT will feed up to senior management team. No press statement required.

*How the bacteraemia rates compare with other UK tertiary units would be helpful, however given current reporting practices this data is unlikely to be available.

Date	Incident	IPC Actions	Outcomes
03/03/17	Increased bacteraemia rates. General upward trend identified since July 2016. 11-13 positive blood cultures per month.* SPC charts: Upper Warning Limits breached but rates were below Upper Control Limits for both Gram positive and Gram negative organisms	PAG convened 3/3/17. • HIIAT Green • Observational review of line care carried out by IPCNs. Report collated and fed back to clinical team. • Review of environment for reconstitution of medications – inadequate space available for preparation of IV drugs Suggestions for improvements submitted. • Quality Improvement group focusing on Catheter Associated Blood Stream Infections (CLABSI) developed. • Review of line care in Royal Marsden and Great Ormond Street Hospital by Lead IPCN – Findings relayed to CLABSI QI group and local teams.	• Monitoring of bacteraemias within the unit. • QI group continue to meet and work on various aspects of action place specific to line care
03/03/17	Perceived increase of invasive fungal infections (invasive fungal infections require assessment by	PAG was convened 6/3/17. • ICD carried out review of invasive fungal isolates and did not find rates of invasive candida infection to be	• Incident specific to invasive Candida infections closed 06/03/17.

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	clinicians in order to determine if these are infections. This cannot be monitored by positive microbiology so requires intelligence at ward level in addition to microbiological results.	any higher however it was recognised that there had been 3 cases of invasive Aspergillus fumigatus infection within an 8 month timeframe. Incident Management Team arranged for 7/3/17 specific to Aspergillus	
07/03/17	3 cases of invasive Aspergillus resulting in significant morbidity.	IMT convened 7/3/17. **Actions** • HIIAT red and subsequently reported to HPS. • BMT patients on specialist ventilated areas and all other patients in general ward area. • Review of construction and demolition works on and around the site by IPCT and exposure to patients. • Review of CLIC sargent house (Resident facility for patient and families of RHC) as possible risk by IPCT. • Review of general ward environment by IPCT for water leaks/estates. Damp ceiling tiles identified and this was followed by a full inspection of ceiling void and necessary repairs were carried out. • Full terminal clean of ward took place. • Inspection of cooling beams which were reported to leak periodically. • Air sampling ongoing and water sampling carried out. • Hand hygiene audit carried out – Scored 85% • Antifungal prophylaxis administered to ALL patients on commencement of treatment.	• All 3 patient cases recovered from the episode of Aspergillus infection and HIIAT was downgraded to Amber then eventually green once ceiling void repairs had been carried out. This incident was between June 2016 and April 2017. The incident was closed 28/4/17. • Identification of invasive aspergillosis requires a clinical diagnosis due to the complexity of the diagnostic criteria. The IPCT are reliant on the clinical team highlighting all possible cases to the IPCT. • The ICD has worked with estates colleagues to produce a water damage policy and is available on our website under Water Safety. • https://www.nhsggc.org.uk/your-health/infection-prevention-and-control/water-safety-information-hub/

April 2017

Date	Incident	IPC Actions	Outcomes
11/4/17	Increased incidence of Vancomycin Resistant Enterococci (VRE) isolates in stool. [1,2.3] Total of 9 cases of colonisation over 1 month period (previously 2 cases over 6 months). 8 of the 9 are HAI, 1 of which is related to Edinburgh Sick Kids. SPC charts for Gram positives breached UCL in March and May 2017;	• PAG convened 12/4/17. The incident then became an outbreak of Rotavirus and Astrovirus (tabled below). • Review of antimicrobial prescribing carried out which revealed an increase in the use of vancomycin and teicoplanin. This may have been due to increased bacteraemia rates described above, however it is unclear if therapy was empiric or targeted. • All isolates sent for typing – 4 patients had matching strains. The rest were unique • Full terminal clean of ward carried out. • Antichlor cleaning daily previously discontinued across GGC after winter then resumed on a permanent basis for this ward. • Enforce use of Bristol stool chart to accurately record which patients were having loose stools. Further PAG held 28/4/17 after Astrovirus/Rotavirus outbreak was closed. • Action plan developed mainly focused on reduction of bacteraemia rates. • Increased visits to ward by IPCNs to reinforce Standard Infection Control Precautions (SICPs), Transmission Based Precautions (TBPs) and hand hygiene.	• Total cases now 10 with only 1 new HAI since the initial reporting. • Ongoing monitoring by IPCT. • Hot Debrief produced by HPS • Notes 1- This is not uncommon in hemato- oncology patients who have multiple hospitalisations and exposures to anti-microbials including vancomycin and teicoplanin for the treatment of line infections 2- VRE do not cause GI upset however they will be dispersed into the environment if patient having loose stools – a frequent occurrence in patients receiving chemotherapy or stem cell transplantation. 3- It should be noted that screening for VRE is no longer performed in adult allograft patients.

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Date	Incident	IPC Actions	Outcomes
12/4/17	Rotavirus and Astrovirus outbreak. Lasted 14 days affecting 9 patients. Significant impact on service with some cases being diverted to Edinburgh.	PAG convened 12/4/17 initially to review VRE increase. PAGs held over subsequent days then identified the transmission of Rotavirus and Astrovirus. • HIIAT initially Amber then upgraded to Red following transfer of patient to PICU. • Infection Prevention and Control Audit (IPCAT) carried out 20/4/17. Scored within green range (87% overall) • Extensive cleaning carried out and external contractor brought in to terminally clean ward before reopening. • Hand hygiene audit – scored 70%. • Hand hygiene education sessions provided – currently 8 sessions carried out. • Daily IPCN visit to ward, sometimes twice daily. • Daily IMTs. • Staffing levels were increased on the ward to accommodate cohorting of patients. • Meeting held with Infection control doctor, GM facilities and GM of Ward 2A to discuss any concerns	• Ward returned to normal capacity 25/4/17 with an increase in staff numbers to allow for burden of patients in isolation. • SICPs audit repeated with SCN and IPCN. Scored 96% although some environmental issues identified again. • Hand hygiene sessions ongoing. • Agreed to increase domestic cleaning hours in Ward 2A. • SOP to be developed in relation to access to clean arrangements • SLWG to be established by General Manager facilities to look at novel technologies i.e. hydrogen peroxide

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May 2017

Date	Incident	IPC Actions	Outcomes
30/05/17	3 cases of Norovirus on ward, 2 HAI, 1 non HAI. All 3 symptomatic and nursed in rooms in close proximity to each other.	PAG convened 31/05/17. • HIIAT green. • IPCAT audit repeated 1/6/17 – score of 74% (SICPs 69%, SPE 69%, TBPs 94%, QA 50%) • Hand hygiene audit carried out – • Daily visits to ward • Ongoing meetings with facilities management again to discuss cleaning standards on the ward.	• Ongoing daily assessments • Education to be arranged for staff re. SICPs.

July 2017

Date	Incident	IPC Actions
[redacted] **2017**	2 cases of *Stenotrophomonas maltophilia** line related bacteraemias within an 8 day period. Further investigation of these cases identified that they were unrelated There were no breaches of Gram negative SPC charts. *Stenotrophomonas maltophilia is an increasingly recognised pathogen in this patient group, often causing line-related sepsis and may be acquired endogenously or from the environment.	Case 1; Positive blood culture 15/7/17. Case 2; Positive blood culture on 23/7/17. Sadly 1 patient died with [redacted] *and this was recorded on Part 3 of the Medical Certificate of Cause of Death (MCCD)*

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ACTIONS TAKEN		
Date	**What: (action)**	**When**
[redacted]/7/17	Terminal clean of bed space for case 1 (discharged at point of referral).	Completed on [redacted]/7/17
25/7/17	Terminal clean of bed space for case 2 (Still an inpatient on ward 2A)	Completed on 25/7/17
25/7/17	Daily domestic chlorine clean of ward	Has been ongoing since April 2017
25/7/17	Audit of environment and staff practice. Last IPCAT audit June 2017- 74%	Enhanced supervision carried out by IPCT. 3 sessions were delivered and final session was completed on 27/7/17.
25/7/17	Continue to improve Hand hygiene	Hand hygiene audits in March and June 2017 (scored 100% and 95% for opportunities taken and 85% and 80% for combined compliance) 11 hand hygiene sessions were carried out in May, June and July 2017
25/7/17	Typing of isolates	Samples were sent to Collingdale for typing. The results revealed the isolates were unrelated on typing.
25/7/17	Enhanced environmental monitoring	There was no evidence of Stenotrophomonas isolation from water or the environment.
25/7/17	Reconfiguration of prep area TCT to increase available space for reconstitution of IV meds – Review proposed alterations and agree plan going forward	Further information on this arrangement are outlined on Page 9- Item 6
26/7/17	IMT held	Completed on 26/7/17
26/7/17	Review of background rates of Stenotrophomonas maltophilia in 2A	Following report of Stenotrophomonas maltophilia blood culture in 2 patients, an incident meeting was held as per NIPCM chapter 3.

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		The ICD requested further water sampling in Ward 2A. 118 samples were taken and all provided negative for SM. The ICD undertook a review of Steno blood cultures. 3 further cases reviewed, 2 of which were documented as HAI also. These were reported to the IMT. On the 4th September, HPS were notified that a patient had sadly died. HPS were asked if any further action was required. We were advised that no further action was required.

Part 4- Results of water sampling

The Board has in place, a number of water assurance systems and processes to ensure the high quality of the water system and supply. This includes the following

- Infection Control in The Built Environment Group established (ICBE); (2019)
- Board Water Group;
- Local Water Groups;
- External Authorising Engineer (AE) appointed;
- Authorised Person (AP) competency checks;

151 water samples were tested between 7/3/17 and 17/11/17 (135 samples form Ward 2A and 16 samples from Ward 2B). All samples were negative for Elizabethkingia, coliforms, Pseudomonas sp. and Legionella. In addition, there was no Stenotrophomonas maltophilia identified within the water system.

Official sensitive

Part 5- Conclusion

In summary, the key conclusions from this review are listed below:

Involvement of national organisations and agencies to advise and provide assurance

- There has been ongoing involvement of external agencies during this time period to seek advice and guidance to help manage incidents and provide independent assurance to improve the ward environment in Ward 2A;
- The IPC Team have followed a set of national mandatory definitions requirement for IC reporting and have complied with the National Infection Prevention and Control Manual including the reporting of incidents to HPS.

Role of the IMT in the identification and management of incidents

- Infection Control incidents in RHC, Ward 2A appear to have been acted upon quickly and the IMT has functioned well to facilitate a multi-disciplinary approach to the management of infection control incidents;
- There has been a diligent approach and due process has been followed within each IMT with clear actions, outcomes and ongoing monitoring;
- The work of Quality Improvement Group to reduce line infection in Ward 2A has been instrumental in helping to reduce the line infection rate from a median rate of 3.5 in 2016 to 1.26 in January 2020;
- Inpatient families and carers of patients within Ward 2A have been kept fully informed of incidents and education sessions have been delivered to encourage good infection control practice.

Review of the environment

- 151 water samples were taken in Ward 2A/2B from March 2017 to November 2017. All samples have been negative.
- The Stenotrophomonas maltophilia isolates that were identified from the patients affected were sent for typing. Results show that these were not linked and there has been no single source of infection found from the environment;

Official sensitive

Governance, reporting and escalation arrangements within NHSGG&C

- The relevant standing committees of the Board, namely Board Infection Control Committee and Clinical and Care Governance Committee have continued to receive regular reports and updates on these incidents and how they were managed. The Board has also continued to receive assurance on the management of these incidents through the quarterly HAIRT.
- There has been further work undertaken by NHSGG&C to investigate the management of infection control incidents within RHC including a review of the clinical aspects of the management of patients with documented Blood Stream Infection in 2A.
- In October of 2017 at the request of the Board Medical Director microbiologist who were raising concerns about the campus were asked to prepare a SBAR to be discussed by senior managers within GGC at a meeting to which the consultant microbiologists were invited. The response to this was a 27 point action plan focusing on improvements to several areas including Ward 2A. Additional reports including one specifically focused on the ventilation system was subsequently commissioned in 2018. The purpose of these additional reports is to ensure the “triangulation” and investigation of any issues which could have led to the increase in infections during this time period.

Official Sensitive

From: Inkster, Teresa [redacted]
Sent: 22 March 2018 09:30
To: Kane Maryanne (NHS GREATER GLASGOW & CLYDE); INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE); alan.gallacher[redacted]; Purdon Colin (NHS GREATER GLASGOW & CLYDE); RANKIN, Annette (NHS NATIONAL SERVICES SCOTLAND); Redfern James (NHS GREATER GLASGOW & CLYDE); Armstrong Jennifer (NHS GREATER GLASGOW & CLYDE); Jenkins Gary (NHS GREATER GLASGOW & CLYDE); Connelly Karen (NHS GREATER GLASGOW & CLYDE)
Subject: Re: QEUH/RHC Point of Use Filters

Follow Up Flag: Follow up
Flag Status: Flagged

Thanks Maryanne

Gary/Jamie -can you let these areas know

Thanks
Teresa

Sent from my BlackBerry 10 smartphone on the EE network.

From: Kane, Mary Anne
Sent: Thursday, 22 March 2018 9:23 AM
To: Inkster, Teresa; Inkster, Teresa (NHSmail); Gallacher, Alan; Purdon, Colin; RANKIN, Annette (NHS NATIONAL SERVICES SCOTLAND); Redfern, Jamie; Armstrong, Jennifer; Jenkins, Gary; Connelly, Karen
Subject: QEUH/RHC Point of Use Filters

I can confirm that the Point of Use Filters have all been fitted and quality checked by our Estates Team in the following areas

RHC 2A and 2B
RHC 3c
NICU
PICU
Adult Hospital
4B all occupied rooms.

The taps and showers can be safely used in all these areas now .
I will confirm in writing when POU filters are fitted and QA checked in all High Risk Pseudemonas areas in the hospital
Portable sinks will be removed from 2A by FM during the course of today
Mary Anne

Healthcare Infection, Incident and Outbreak Reporting Template (HIIORT)

Complete within 24 hours for all HIIAT Red and Amber;
for HIIAT Green complete only if HPS Support requested.

Section 1 :Contact Details	
NHS Board/Care organisation	Greater Glasgow and Clyde NHS board
Date and time of reporting	18/05/18 @ 1300 hours
Person Reporting and designation	Susie Dodd – Lead Nurse IPC Dr Teresa Inkster – Lead Infection Control Doctor
Telephone number and email	Susie Dodd – [redacted] Dr Teresa Inkster – [redacted]
Section 2: Infection Incident/outbreak Details	
Care facility/hospital	Royal Hospital for Children
Clinical area/ward and speciality	Ward 2A [redacted] oncology (inpatient) Ward 2B (outpatient) [redacted] oncology
Total number of beds	25 in Ward 2A. 2B is an OPD
Total number of beds occupied	25 in Ward 2A
Section 3: Initial assessment	
Type: Incident/outbreak/ data exceedance e.g. Gastrointestinal, decontamination failure	Increased incidence of Stenotrophomonas maltophilia in blood cultures
Infectious agent known or suspected	Stenotrophomonas maltophilia

Case definition	2 positive isolates in a sterile site or 3 colonisations within a 2 week period.
Date of first case (if applicable)	04/05/18

Total number of confirmed Patient cases	Total number of probable patient cases	Total number of possible patient cases:	Total number of Staff cases:
3	0	0	0

Number of patients giving clinical cause for concern as a consequence of this incident/outbreak	1 patient has required line removal. 1 patient has had chemotherapy postponed. 1 patient has no clinical signs of infection
Number of deaths as a consequence of this incident/outbreak	Nil
Was the infectious agent cited as a cause of death on a **death certificate* (**if yes, state which part of the certificate**)**	N/A

Additional information:

3 cases of Stenotrophomonas maltophilia in blood cultures amongst 3 patients associated with ward 2A and/or 2B. Of the 3 cases, only 1 is considered an HAI using the 48 hour rule. However, it was noted that the 2 non HAI have had day visits to ward 2B in the days or week prior.

Section 4: Healthcare Infection Incident Assessment Tool (HIIAT) (link to tool)		
Severity of illness	Minor/Moderate/Major	Moderate
Impact on services	Minor/Moderate/Major	Minor
Risk of transmission	Minor/Moderate/Major	Moderate
Public anxiety	Minor/Moderate/Major	Minor
HIIAT Assessment	Red Amber Green	Amber
Section 5: Organisational Arrangements		
PAG/IMT meeting held	Yes	Date: 18.05.18 Chair: Dr Teresa Inkster
Next planned IMT	Following any further cases	Date: N/A
Press statement (send with HIIORT or provide date for receipt)	Holding	Date: 18.05.18

HPS support requested	Y/N	Date.....
Other information: e.g. decisions from IMT		

Complete this update section weekly as a minimum if red or amber or as agreed with IMT and HPS for onward reporting to SGHSCD.

Section 6: Update						
On this date:						
Cumulative total of confirmed patient cases						
Cumulative total of probable patient cases						
Cumulative total of possible patient cases						
Cumulative total of staff cases						
Total number of symptomatic patients today						
Number of patients giving cause for concern						
Total number of deaths as a consequence of the incident since last HIIORT report						
Is the ward/services closed						
Is a service restricted						
HIIAT assessment						
Organisation update Comments *(including changes to any control measures, case definition or death) certification information)*						
Date: 18.05.18	A PAG was convened today to assess 3 cases of Stenotrophomonas in blood cultures associated with patients who have been in ward 2A or attend ward 2B, the haem onc OPD. Of these 3, only 1 is an HAI by definition. It is the opinion of the IPCT that the source of these Stenotrophomonas is unlikely to be linked to the water supply following PAL filters in place on all water outlets within ward 2A and ward 2B. Stenotrophomonas maltophilia is an environmental gram negative and so the IPCT were keen to explore other possible environmental sources of the acquisition. In depth discussions took place around the standards of domestic cleaning on the unit, the standards of equipment cleaning, IV line care practice and antibiotic use, volume of footfall on the unit, clutter within 2A, control of visiting and parent adherence with IPC measures. Actions agreed were as follows; • Water will be tested in line with routine investigations following an increased incidence of Stenotrophomonas maltophilia in blood cultures. • All 3 isolates to be sent for typing. • The 3 new patient cases will be reviewed in detail to explore whether they have all been exposed to the same procedure (water or non water related) which may be the source of acquisition (No procedure could be pinpointed by clinicians during the meeting). • Antimicrobial review to be carried out in particular looking for over prescribing of Meropenom which may select Stenotrophomonas out. • Domestic cleaning concerns to be reported to Interim Director of Facilities on a background of frequent reporting of domestic cleaning concerns in this area.						

	• To look at the use of HPV following patient discharges as a rolling programme throughout ward 2A until all rooms have been done. • Increase IPCN visits to ward 2A to daily (currently 3-4 times per week) • Audit the staff and visitors entering ward 2A and their purpose for being on the unit. • Promote good adherence with IPC rules with parents in particular around clutter in the patient rooms which prevent access to clean. • Provide further hand hygiene training on ward 2A and ward 2B. • Provide further parent education sessions.
Date:	
Date:	
Date:	
Date:	

ONCE COMPLETED, EMAIL TO: NSS.HPSInfectionControl@nhs.net

From: Black, Kara
Sent: 26 February 2020 12:30
To: Stewart, Chloe
Cc: Armstrong, Jennifer
Subject: FW: Teleconference Notes 15 June 2018
Attachments: DRAFT2- NHS GGC - water - note of teleconference on 15 June 2018(v2).docx

Sent: 03 July 2018 17:04
To: 'Margaret.Syme[redacted]' [redacted]
Subject:

Dear Margaret.

Many thanks for providing the draft notes of the teleconference on 15th June 2018.

The notes have been reviewed by the GGC colleagues who participated in the teleconference, and they have proposed a number of tracked changes in the attached version as requested.

I am so sorry for the delay in forwarding the response to you , I thought I had sent it yesterday and it was sitting in my drafts.

Many thanks

Bernadette

Bernadette O'Brien
Senior Business Support to Finance Directorate & PA to Medical Director, Jennifer Armstrong
NHS Greater Glasgow & Clyde
JB Russell House, Gartnavel Royal Hospital, 1055 Great Western Road, Glasgow G12 0XH
[redacted]

NHS Greater Glasgow & Clyde, Royal Hospital for Children Water Incident:
Note of Teleconference, 15 June 2018, 16:00 – 17:00

Dialled in:
Scottish Government:
- Dr Gregor Smith, Deputy Chief Medical Officer (chair)
- Diane Murray, Associate Chief Nursing Officer and Professional Lead for HAI within CNO
- Christine McLaughlin, Director Health Finance
- Rachael Dunk, Head of Chief Nursing Officer Directorate
- Margaret Syme, HCAI Policy Unit, Chief Nursing Officer Directorate (notes)

Health Protection Scotland:
- Annette Rankin, Nurse Consultant Infection Control
- Laura Imrie, Nurse Consultant Infection Control

NHS Greater Glasgow & Clyde:
- Jennifer Armstrong, Board Medical Director
- Dr Teresa Inkster, Lead Infection Control Doctor and Training Programme Director Medical Microbiology
- Mary-Anne Kane, Interim Director Facilities
- Kevin Hill, Director of Women & Children's Services
- Alan Mathers, Chief of Medicine Women and Children's Service

1. Welcome/Introductions
After introductions, GS welcomed everyone to the call, and set out the purpose as below.

2. Purpose of the meeting
To discuss the current position regarding the water incident, including the number of patients, any emergent issues, and any on-going risks.

3. Update position from NHS GGC

Patient and ward safety
The number of patients affected since January 2018 is 17, none are giving cause for concern, and the majority of these cases were likely to have been affected before control measures were put in place.

Patient safety and ensuring wards remain safe continues to be the priority for NHSGGC. Current IMT advice is, the ward is safe to admit patients. No ongoing risks have been identified across the wider QEUH/RHC site. The NHSGGC Chief Executive is being updated daily.

Clinical decisions regarding patient treatment are being taken on a case by case basis by the medical staff in charge of each individuals care. Where appropriate and practicable, other options/hospitals for treatment have been considered, for example, one child received their chemotherapy in the Beatson. Where treatments have been delayed for clinical reasons, NHSGGC have put plans in place for treatment to resume once patients are well.

DRAFT

There are no new issues emerging, and NHSGGC anticipate that the wards (and treatment) will resume to a normal service on Monday (18 June) following work to replace spiggots (from aluminium to Plastic) cleaning of the drains and treatment of the ward with hydrogen peroxide vapour over the coming weekend.

Infection control measures

Infection control measures have been in place since the first case was identified in January 2018. These remain in place, and include:

- Point of use filters have been installed in all showerheads and taps in wards 2A and 2B, and are regularly checked/replaced (as per manufacturers instructions).
- All drains in ward 2A and 2B have been chemically treated, and a longer term decontamination plan is to be established as this impacts on national guidance .
- Due to the role they may have played in the biofilm formation, all aluminium spigots in wards 2A and 2B have been replaced with Plastic alternatives.
- Clutter has been removed from wards 2A and 2B, and patients/visitors are limited to what they can take into the ward.
- The number of people attending the ward has been limited.
- Notices and signs are up for staff, patients, parents and visitors to the ward.
- The frequency of ward cleaning has been increased and all staff (clinical, nursing and domestic) have been reminded of the infection control measures and processes.
- Daily walk around by senior clinical managers and IC staff.
- Taking advice from HPS and other UK experts.

Communication with parents

NHSGGC have been proactive in keeping patients and their families updated about what is happening in the ward. Consultants have had discussions with the parents of their individual patients, and TI has also been available to speak to them on a one to one basis.

Other areas of the QEUH/RHC site

There are good infection control measures in place throughout the site, with the longer term aim to clean drains throughout the QUEH/RHC High Risk areas, although the drain issues are restricted to wards 2A and 2B at present.

There is increased surveillance in place, and all gram negative sepsis cases across the sites are being reported and monitored.

Programme of work

Initially there was a systematic process to identify the source of the water contamination. This resulted in filters in the showerheads and taps being introduced , however, this is a temporary measure and the filters require changing every 30 days. Following further investigations, biofilm was identified in the drains, and a programme of work established to clean the drains using Actichlor and Chlorine dioxide.

A water management group was established in April. The group has been meeting weekly, and is made up of representatives from a range of specialists, including Clinical, HPS, HFS, Estates, Engineers, Service and Management and UK experts have been engaged to provide NHSGGC with advice as this is an unprecedented incident.

DRAFT

The group has concluded that the regular cleaning of the drains should continue, along with shock and continual dosing of the water system with chlorine dioxide to control this issue in the short . In the long term bespoke water dosing units are required. These may take up to 12 weeks to procure equipment (dosing units) if OJEU processes can be by passed by Procurement colleagues due to the seriousness of the situation and they will be installed in both the QEUH and the RHC.

Once the programme of work to dose the drains, and the water dosing units are fitted, the group will consider replacement of the taps and showerheads in the high risk areas in the first instance. The filters are a costly short term measure but are effective in preventing bacteria from entering the water system.

At the time this hospital was under construction, there was an issue with taps in a neo-natal unit in Belfast. This resulted in a discussion about the type of taps being installed at the QEUH/RHC, a risk assessment was undertaken, and a decision was taken at the time by Contractors, Estates, HPS/HFS to continue to fit the taps.

Since the incident has been live NHSGGC have maintained a decision log for all clinical, management, service, cost implications, and technical issues.

The programme of work to shock dose the water system will be done at weekends to minimise disruption to patients, with the entire RHC being completed over a weekend.

Decisions will be taken at a later date regarding replacing the taps and showerheads in the QEUH/RHC in low risk areas-.

Costs for this programme of work have not yet been estimated, but is likely to be significant. The Board are considering this.

The Board has a range of short and medium term control measures in place and planning for longer term solutions is underway.

4. Update position from HPS

HPS have been providing support to NHSGGC since 16 March 2018, via the IMT and more recently the water management group.

HPS felt that patient safety has been the paramount consideration by the Board and this remains so, and that all appropriate control measures have been put in place to minimise risks to patients. .

As well as the investigation being undertaken as requested by the Cabinet Secretary for Health and Sport, HPS will begin a full review alongside the investigation to try to understand better how this may have happened and NHSGGC Medical director requested that any information/ advice should be given in real time as this was an active investigation and any advice to resolve this would be helpful. In addition NHSGGC were keen to look at data from other centres to establish a baseline and asked for any support in this regard. The HPS review will, amongst other things look at data and comparisons with the old 'Yorkhill' Childrens Hospital, as well as hospitals in England and any data can be shared with GGC.

The Terms of Reference for HPS Review will be shared with this group.

DRAFT

5. Any other business, or questions to raise

It was agreed that lessons must be learned in real time for not only NHSGGC, but across NHSScotland. To do this it needs to be clear as to how this incident happened so DM asked for copies of the paperwork regarding the decisions taken at the time of the construction of the hospital and the Construction Design and Management (CDM) file to be made available to Scottish Government and HPS andHFS as it may shed light on the process for decontamination of pipes and drains at handover of the building. The file is available to HFS and HPS , but not all information is available either electronically or in paper copy. NHSGGC advised they would strive to identify all relevant documentation and this may involve external contractors.
A number of the individuals involved in the decision making process when the hospital was under construction have moved on but NHSGGC will be approaching them to ask about the decisions taken at the time.

NHSGGC were asked if they required any additional external support or expetise; at this time they do not as they already have UK experts advising them. However NHS GGC would accept any suggestion/offer of expertise to resolve the situation. NHSGGC are looking at other hospitals, within the UK and abroad to establish what they are doing, this will include what is viewed as a reasonable rate of infections in this patient group so that the NHSGGC unit can benchmark it against these. GS offered assistance from CMOs office when engaging with other hospitals if the Board were finding it difficult to obtain this information. HPS are also looking at infection rates from other centres and it was agreed that they would share any details with NHSGGC

It was noted that there are new technologies developing all the time for water systems, however it was noted that they have not been used/tested in healthcare settings, but NHSGGC are monitoring availability of new technologies should they offer an alternative solution, and meantime will progress procuring dosing units for the site.
SG colleagues commented that they were reassured by the current management of the issue and the efforts made to obtain expertise to resolve this complex situation. They did not identify further actions which NHSGGC should take at this time.

6. Summary of actions and next steps

It was agreed this meeting has been helpful for all parties, and further meetings would be an effective method of keeping everyone updated on progress.

Action no	Action	Who	Cleared
Action 1	Terms of Reference for water review to be shared with this group	HPS	
Action 2	Paperwork regarding the decisions taken at the time of the construction of the hospital and the Construction Design and Management (CDM) file to be made available to Scottish Government and HPS/HFS.	NHSGGC	
Action 3	Further teleconferences to be arranged (monthly unless situation changes significantly).	Scottish Government (DM/Policy Unit)	

Action 4	Meeting about the water system and the consequential financial impact of the actions undertaken to date and future requirements to be arranged at a later date.	NHSGGC/ Scottish Government (CMcL)

HCAI/AMR Policy Unit
Chief Nursing Officers Directorate
19 June 2018

DRAFT

From: Shariff, Imran
Sent: 19 March 2020 09:49
To: Shariff, Imran
Subject: FW: BMT summary
Attachments: BMT document.doc

From: Armstrong, Jennifer
Sent: 07 July 2015 11:20
To: Calderwood, Robert; Archibald, Grant
Subject: FW: BMT summary

FYI: currently we will review press statement as well as information to the families/patients

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From: Williams, Craig
Sent: 07 July 2015 11:18
To: Armstrong, Jennifer
Cc: Walsh, Tom
Subject: BMT summary

Dear Jennifer

I have attached a document outlining the original specification and current problems with the BMT unit at QEUH. Gary Jenkins and the clinical team are happy with the contents.

Best wishes

Craig

Original Specification

The original clinical output specification from 2009 for the Heamato-oncology area at the New SGUH clearly specified that this patient group is vulnerable to infection and therefore require the provision of a protected environment. The ventilation section of this document details the following requirements in relation to this:

Please note that the haemato-oncology ward has a very specific function. There should be no opening windows The space should be sealed and ventilated . Positive pressure to the rest of the document and all highly filtered air >90%, probably best HEPA with adequate number of positive pressure sealed HEPA filtered side rooms for neutropaenic patients as in the Beatson West of Scotland Cancer Centre.

An appendix to the specification details that the HEPA filters meet EU12 standard (99.99% @ 0.3μm)

Advice for this was sought from Dr John Hood Consultant Microbiologist

Specification for rooms at WoS Cancer Centre

In the absence of definitive UK guidance on builds for severely immunocompromised patients the positive pressure side rooms are built to the CDC specification that is 12 air changes per hour and the rooms at a positive pressure to the corridor of 5-10 kPa.

Build process

Confirmation that the build was progressing as expected was sent to the clinical team on 9th December 2013 from Heather Griffin:

Thank you for your e-mail and also for your time in meeting with us the other day.
With regard to your query -

1. The spec for the Haemato-oncology area is as requested by John , in other words - hepa filtration positive to the rest of the hospital and all highly filtered air to H13 ie 99.95%. (Myra , refer to the plan I gave you).

2. The pentamidine treatment room is negatively pressured.

John is John Hood as described in the original specification above.

The expectation therefore was that the Heam-onc unit at SGUH was being built to the same standard as WoS Cancer centre.

Commissioning

The Infection control team was assured that all areas of the SGUH had been fully commissioned and validated from a Mechanical and Ventilation point of view. The details of the validation were not provided but that is not unusual as this is an

engineering specialism and ICPT's would only normally be involved in the event of significant failure. It is now apparent that Brookfield had not been required to undertake particle count test as part of their commissioning process.

Current deficiencies identified

1.HEPA Filtration for high risk patients	HEPA filtration in each room , 2 rooms verbally reported NOT to be HEPA filtered
2. Positive Pressure in each room 5-10 Pa in relation to corridor	No method of measuring pressure gradient is currently installed in any of the 4B rooms Verbally reported as 10 Rooms not sealed Not a solid ceiling, movement of ceiling tiles
3. Air exchanges required to be >12ph	Not yet achieved
4. Sealed room (0.5-sq ft leakage)	? Validation for leak testing
5) Particle counts 29th June 960-579197	Current standard at WoS Cancer Centre <1000
6) negative pressure in the pentamadine room.	Not achieved

Conclusions

1) **The original specification provided to Brookfield if delivered would have provided a safe environment for this vulnerable group of patients**
2) **Filter integrity/Particle counting would normally be required to validate areas provided with HEPA filtered air to ensure both the function of the HEPA filter and ensure the room seal. Expert Engineering advice should be sought to advise whether the commissioning process in this case was adequate. No validation data has to date been made available to the IPCT**
3) **In the light of the current provision of isolation facilities available to the Haem-Onc patients the IPCT support the return of these patients to WoS Cancer centre until the unit at the QEUH is provided to the required specification and appropriately validated**

From: IMRIE, Laura (NHS NATIONAL SERVICES SCOTLAND)
Sent: 20 September 2019 09:33
To: HPSINFECTIONCONTROL (NHS NATIONAL SERVICES SCOTLAND)
Subject: FW: [BlockedURL][ExternaltoGGC]FW: NHSGGC - HPS Support

For filing please in NHSGGC incident folder thanks

From: Armstrong, Jennifer [redacted]
Sent: 18 September 2019 19:56
To: RAMSAY, Lorna (NHS NATIONAL SERVICES SCOTLAND)
Cc: IMRIE, Laura (NHS NATIONAL SERVICES SCOTLAND)
Subject: Re: [BlockedURL][ExternaltoGGC]FW: NHSGGC - HPS Support

Thanks Lorna for this advice. I have passed this to GGC colleagues. I had spoken to them just as the IMT concluded. They intend to meet the clinicians on Monday to go over all the findings. I did wonder about whether it maybe helpful for Lisa and Annette to attend the meeting given the need for clear advice to the clinical teams who may benefit from HPS and GGC joint input to set out clearly the key facts and provide support. However perhaps GGC colleagues and HPS colleagues can pick this up. Thanks for the advice : it is appreciated and helpful to ensure we make the best decision for patients and reassure clinical team regardless of external pressures.

Kind regards

Jennifer

Sent from my BlackBerry 10 smartphone on the EE network.

From: RAMSAY, Lorna (NHS NATIONAL SERVICES SCOTLAND)
Sent: Wednesday, September 18, 2019 7:04 PM
To: Armstrong, Jennifer
Cc: IMRIE, Laura (NHS NATIONAL SERVICES SCOTLAND)
Subject: [BlockedURL][ExternaltoGGC]FW: NHSGGC - HPS Support

Jennifer

Further to our earlier discussion, Laura has now provided the advice below from HPS in relation to the recommended approach to be taken by the IMT so that it has the necessary information on which to make an informed decision on re-opening ward 6A and that appropriate actions, triggers, case review and contingency arrangements are in place. HPS will also continue to provide advice and support through participation in the IMT. Annette and Lisa have engaged with Laura on this advised approach so are fully sighted and I am sure would be happy to have any further discussion with GGC colleagues on how to progress this.

I hope this is helpful

Thanks

Lorna

Dr Lorna Ramsay
Medical Director NSS
NHS National Services Scotland
Room 031, Ground Floor
Gyle Square
1 South Gyle Crescent
Edinburgh, EH12 9EB
Tel: [redacted]
Email: [redacted]
Website: BLOCKEDnhsnss[.]orgBLOCKED
PA: Ally Watt
[redacted]

Please consider the environment before printing this email.
NHS National Services Scotland is the common name for the Common Services Agency for the Scottish Health Service. BLOCKEDnhsnss[.]orgBLOCKED

From: IMRIE, Laura (NHS NATIONAL SERVICES SCOTLAND)
Sent: 18 September 2019 18:26
To: RAMSAY, Lorna (NHS NATIONAL SERVICES SCOTLAND)
Subject: NHSGGC - HPS Support

Lorna

Following on from our conversation this afternoon and the discussion I had with Annette and Lisa who are attending the IMT today please see below the actions HPS would consider appropriate to allow NHSGGC to reopen Ward 6A to all admissions.

- At the early stage of the IMT there was agreed hypothesis – A full report should be shared with the IMT outlining all investigations, actions and controls that have been carried out for any hypothesis. The IMT should then be in a position to made a decision on whether these were true hypothesis and if so that the actions and controls are appropriate and have reduced the risk of any further incident.
- NHSGGC have taken the action to fit HEPA filters into the ensuite bathrooms the IMT should have a detailed work plan and SCRIBE documentation with a timeline to consider.
- The IMT should consider what triggers should be in place once the ward is reopened to ensure a rapid response to any further suspected incidents. This should include triggers relating to organism, environmental (water & air) samples and environmental factors.
- HPS would suggest that a robust review of all new individual cases is carried out in real time by a small multidisciplinary team including microbiology and clinical representatives. A tool and process should be agreed by the IMT.
- There should be a clear contingency plan for the NHSBoard whilst this patient population remain in Ward 6A.

Lisa and Annette attend the IMT today at 1400 hours however they both had to leave at 1740 hours. The IMT were still discussing the epi data and the different views presented by different microbiologists.

Please give me a call if you require any further information or clarification.

Many thanks

Laura

Laura Imrie
Nurse Consultant Infection Prevention & Control
Interim Lead Consultant ARHAI Group
NHS National Services Scotland
Health Protection Scotland
4th Floor Meridian Court
5 Cadogan Street
Glasgow
G2 6QE
Direct Dial: [redacted]
HPS Reception: [redacted]
Web page: www.hps.scot.nhs.uk

From: Michela.Black[redacted]
Sent: 05 November 2019 15:54
To: 'gordon.james[redacted]'; 'laura.imrie[redacted]'; Armstrong, Jennifer; jacquelinereilly[redacted]; 'ian.storrar[redacted]'; 'Tom.Steele[redacted]'; 'Jennifer.Rodgers[redacted]'; 'Scott.davidson[redacted]'; 'Angela.Oneil[redacted]'; 'Pamela.Joannidis[redacted]'; 'Emilia.Crighton[redacted]'; 'Margaret.Mcguire[redacted]'; 'annette.rankin[redacted]'; Shariff, Imran; 'Elaine.Vanhegan[redacted]'
Cc: Josephine.Ives[redacted]; Lesley.Shepherd[redacted]; Jason.Birch[redacted]; Douglas.Imrie[redacted]
Subject: [ExternaltoGGC]Healthcare associated infections linked to Ward 6A, Queen Elizabeth University Hospital: stock-take meeting with HPS, HFS, NHS GGC and Scottish Government
Attachments: Final minutes GGC stocktake meeting - 25 September 2019.pdf

Dear all

Thank you for your comments. For completeness, please see attached the final minutes from the GGC stocktake meeting on 25 September.

Kind regards

Michela

Michela Black | PA/Administrative Assistant – Modern Apprentice | Chief Nursing Officer's Directorate | Scottish Government | 2ER St Andrew's House | Regent Road | Edinburgh | EH1 3DG | [redacted]
Email [redacted]

GGC Stocktake Meeting
Wednesday 25 September 2019, 11:00 – 13.30

Minutes and Actions

Scottish Government
Riaghaltas na h-Alba
gov.scot

Attending: Fiona McQueen (CNO), Jo Ives (JI), Lesley Shepherd (LS), Jacqui Reilly (JR), Laura Imrie (LI), Annette Rankin (AR), Gordon James (GJ), Ian Storrar (IS), Emilia Crighton (EC), Scott Davidson (SD), Jennifer Armstrong (JA), Jennifer Rodgers (JRO), Margaret McGuire (MM), Tom Steele (TS), Pamela Joannidis (PJ)

1. Welcome and introductions

CNO thanked everyone for coming to the meeting and asked attendees to introduce themselves.

2. Purpose of meeting and ground rules

CNO explained that the purpose of the meeting was to provide a stocktake on the ongoing incident in Ward 6A at the Queen Elizabeth University Hospital (QEUH) and provide an opportunity to reflect, have an open discussion and to agree next steps.

3. Overview: workings of IMT

IMT Chair presentation

EC, Chair of the Incident Management Team at GGC for this incident, gave a presentation on the work of the IMT so far. EC explained how the case definition has become narrower since the change of IMT Chair and is now looking specifically at environmental organisms causing gram-negative bloodstream infections (GNBs). EC then provided an overview of the hypotheses considered so far, which have included patient exposure to water outside Ward 6A and water dripping from chilled beams within the ward.

EC presented the RHC data on Central Line Associated Bloodstream Infections (CLABSI), which includes both gram-positive and gram-negative CLABSIs. The data showed a spike in the CLABSI rate in Spring 2018, during the time of the water incident on Ward 2A/2B, however the rate has reportedly fallen since then.

JR/LS asked about the data and whether it denoted both gram positive and gram negative isolates specifically, given the current incident on Ward 6A relates to GNBs. EC explained that it was a combined figure, however is also broken down into purely gram-negative CLABSIs. EC explained that following the water incident on 2A/2B, the rate of CLABSIs has fallen and is within the median based on “best in class”.

EC then presented the epi curve data, which looked at both environmental and non-environmental organisms. The numbers were reported to be very small and all but one organism had been seen previously in Yorkhill Hospital. LI asked if this data had been shared with the IMT and EC confirmed that the IMT had seen this data.

In terms of comparisons to other NHS Scotland children's hospitals, the HPS SBAR produced for NHSGGC reported no significant difference between NHSGGC CLABSI gram negative (p=0.10), or environmental (p=0.11) blood culture rate, and that of the Royal Aberdeen Children's Hospital or the Royal Hospital for Sick Children in Edinburgh, following the move to ward 6A. A higher incidence of positive blood culture rate for environmental organisms was seen before (p<0.001), but not a significantly different rate for gram negative blood cultures (p=0.11).

GGC noted the challenges in getting other hospital data, however GGC reported that they have compared their RHC data to data within Great Ormond Street Hospital's annual report and have found no significant differences (data not presented at the meeting).

Root Cause Analysis

CNO asked GGC to confirm that all cases had been subject to a full root cause analysis (RCA) in line with current practice and that further analysis was over and above this work.

GGC confirmed that a review of each case and timeline had been undertaken by the Lead Infection Control Doctor, however they are now doing a more in-depth RCA review to drill down into all cases associated with the incident, which is hoped to be completed on Friday 27 September. HPS has been in attendance since the seond IMT held on 25 June 2019.

CNO asked whether a RCA should have been done from the start of the incident. GGC confirmed that while some analysis was done, they need to do a lookback at workings of IMT to see what could have been done differently and lessons learned. Reviewing each case and producing a timeline is the normal approach taken by IMTs at GGC rather than an RCA of each case. This approach will be reviewed going forwards.

IMT membership was defined, but the roles and responsibilities of each member will be reviewed and guidance will be updated based on lessons learned.

EC confirmed that every bacteraemia going forwards will have an RCA – a multidisciplinary approach will be taken with real-time analysis. Lisa Ritchie from HPS has been asked to support.

Control measures

EC discussed the control measures which are in place across the patient pathway. This includes

- point-of-use (POU) filters added to taps and showers within all areas of the patient pathway.
- To mitigate any risk from condensation drips or leaks from the chilled beams, biocide has been introduced to the circulating water within; push fittings have been replaced with mechanical fittings; grills now cleaned 6 weekly rather than the previous 3 monthly rather than the recommended yearly; and a new algorithm instated to the BMS to ensure chilled beams remain above the external dew point temperature.
- Other control measures include: review of line care; water pipes for the ward ARGO bath capped off (this bath is not currently in use); and manufacturers have created

bespoke HEPA filters for installation above the ceilings within en-suites, which will be fitted once received.

- The General Manager, on behalf of the IMT has undertaken an appraisal of options in relation to Ward 6A/ alternative locations. Patient antibiotic and antifungal prophylaxis is currently under review by clinical teams around 24 October. In terms of communications, as well as regular written and verbal face to face updates, a closed Facebook page has been set up for families specifically not within the ward to ensure timely sharing of information.

Following the introduction of robust control measures, the IMT Chair advised that conditions for re-opening ward to new/high risk patients have been met. However as there had been concern expressed by some clinicians who requested an external peer review. The decision to re-open the ward must be made in consultation with all IMT members and this will be considered at the next IMT meeting, following a risk-based approach.

Follow-up questions

Data

JR explained that while it is not unusual to see some environmental organisms sporadically, from 2017/18 onwards, RHC saw more cases of specific (unusual) types happening more frequently. GGC stated that all but one type of organism was previously seen in this patient cohort at Yorkhill Hospital. JR noted that it would be helpful to have people, place, time data and that the epi curve was based on selected GNBs, therefore it would be helpful to understand case definitions in more detail and to understand inclusion/exclusion criteria. Additionally, while it is helpful to start with CLABSI data, it will be necessary to look at broader gram negative bloodstream infection (GNBSI) data. LS concurred and said it would be helpful to clarify if the case definition had remained the same throughout the lookback at historic data and that of other hospitals – only in this way will you ensure fair and reliable comparison.

EC replied that the overall GNB culture rates was presented in the slide prior to the one that showed the epicurve. The HPS analysis used common definitions in the analysis of positive blood culture rates across time and place; the epicurve was linked to the case definition.

Hypotheses and IMT communications

CNO asked what the current hypothesis is. AR explained that the IMT started because of the second case of *M.chelonae* in a 13 month period, however this expanded following concerns about increased rate of GNBSIs. The original hypothesis centred around organisms in the water, however this has since developed following links to dripping water from chilled beams.
GGC add that the original hypothesis, linked to the *M.chelonae*) case, was that the patient had been exposed to unfiltered water during visits to clinical areas out with the ward (the

ward already had filters fitted). The hypothesis relating to the GNB cases was that condensate from the chilled beams was dripping on the patients.

TS explained that, in relation to the chilled beams, the hot side was found to have no organisms, whereas a number of chemicals and organisms were found in the cold side. While it is not thought that the cold side would have leaked, biocide was added as a control measure and BMS algorithm changed and mechanical fittings introduced to ensure no risk of future leak. Other environmental sources have been fully explored. Extensive air sampling has been undertaken, drains continue to be cleaned with hypochlorite solutions and tailor-made HEPA filters installed in en-suites following some positive fungal isolates. Systematically tested hypotheses, undergone full investigations into all possible sources and control measures put in place.

GGC will be re-sharing a document setting out the chronology of interventions with IMT, which will include comments from HPS.

LI noted that the full information in terms of actions taken and control measures put in place does not always reach all IMT members, including HPS. GGC added that all information was circulated to all members of the IMT. In addition, separate meetings were held at the clinicians' convenience to brief them on actions and data.

GGC colleagues confirmed that all data and information has been presented to the IMT.

To ensure all information from GGC reaches the Scottish Government and the Cabinet Secretary, CNO asked HPS and GGC to confirm that the board complete the HIIORT fully, which HPS then use to brief SG. It was confirmed that this process is in place and all boards are copied into the HPS briefing to SG and therefore have the opportunity to make any additions or corrections.

CNO re-emphasised the need for all relevant information to be shared with all IMT members in order for them to be assured – there was agreement that all data/evidence is recorded and shared with all IMT members going forward.

<u>ICD role</u>

CNO mentioned the resignation of the Lead Infection Control Doctor (ICD) and asked whether there is an ICD currently attending the IMT. JA confirmed that both Dr Brian Jones and Prof. Alistair Leonard are giving advice to the IMT at the moment. JA stated that GGC are not seeing a high turnover rate of Lead ICDs and provided a timeline of Lead ICDs over the past few years. SD noted that GGC plan to go out to advert for a Lead ICD this month and have already received a note of interest. As part of this, GGC also confirmed that they will be also be advertising a 'Head of Infection Prevention and Control' managerial post.

Safety and ward closure to new admissions

CNO asked whether the ward is safe. EC confirmed that, as IMT Chair, she has recommended re-opening the ward to new admissions and this will be considered at the next IMT.

SD explained that there has been a conflict of opinion among microbiologists, creating uncertainty among clinicians. Time has been spent going through the data with clinicians – while clinicians said the data looked compelling, they have asked for an external review given differing opinions. SD has approached 2 external people to look at data – GOSH and Belfast turned down the opportunity. SD has approached Colin Brown at PHE and has a phone conversation scheduled.

JR and CNO advised that it is HPS' role to act as the external reviewer and/or to source an external reviewer.

Following this, CNO commissioned HPS to undertake an independent expert review of this data. CNO emphasised the importance of completing the review as a matter of urgency and HPS has been asked to confirm by COP Thursday when this will be complete.

In addition, CNO asked GGC to build on the existing SBAR on the incident to produce a position statement and status report on the incident, setting out from start to finish how the incident has developed over time and what measures have been put in place to manage risk and ensure the ward is safe. This will include a full breakdown of the original and subsequent hypotheses; the work undertaken to investigate them; and the full suite of control measures implemented.

LI suggested sharing reports with clinicians, including the process for reopening the ward and the monitoring and triggers in place going forwards.

Antimicrobial Prophylaxis

CNO asked why patients are undergoing long-term antibiotic and antifungal prophylaxis. SD confirmed the IMT agreed to advice discontinuing antifungals with clinicians discussing options around antibiotic prophylaxis. Advice of IMT is to stop prophylaxis, and this has been discussed with clinicians.

Suggestion that antifungal prophylaxis began following work to remove cladding and antibiotic prophylaxis started as control measures following GNBs in children with central line.

Internal GGC investigations cover 1) Estates, 2) Capacity and 3) Clinical safety. Findings will need to be reported back to members of closed IMT.

4. Communications

[See above for discussion around IMT Comms]

CNO asked about GGC comms lines stating that no evidence has been found to link the infections to the environment, however this seems at odds with the hypothesis for the second case of *M.chelonae*. JA confirmed that this line was in reference to the ward environment specifically, rather than wider hospital – current hypothesis is that the source is the theatre where point of use filters have now been installed.

In the future, HPS agreed to feed back to GGC comms directly if they think statistics are incorrect. GGC agreed to continue sharing comms lines with SG and HPS pre-publication.

5. Progress on Ward 2A/2B

CNO requested a progress update on work to improve Ward 2A/2B.

TS stated that GGC are aiming to have the work completed by March 2020, however this will be challenging. The work includes a refit of the ventilation system in 2A. Once the work has been completed, it will be necessary to validate equipment and undertake a thorough clean. Assuming work is completed by March 2020, the unit could be operational in April 2020.

TS confirmed that chilled beams aren't included as part of solution to Ward 2A/2B.

6. Next steps

CNO asked what further support is needed. JA stated that GGC would like a national standard for environmental testing. JR suggested that the Programme for Government commitment to establish a national body for the built environment is likely to consider this as part of its role in mitigating infection and other risks.

LI asked how the IMT can move forward in terms of reaching consensus among microbiologists to provide clinicians with robust assurance. SD confirmed there is a meeting scheduled to explore this with microbiologists on Wednesday evening (25 September).

CNO stated that the HPS review should also help support this and emphasised that HPS should give their opinion in their report.

JR and MM stated that it is impossible to entirely negate the risk given healthcare systems are complex and involve immune-compromised patients. However, in situations like this, it is important that assurance can be given that every mitigating action has been put in place to manage risk and that there will be ongoing monitoring.

CNO re-emphasised her ask that HPS undertake a review of the data and that GGC draft a position statement that the IMT sign up to, which will go to the IMT.

It is vital that GGC also consider and articulate the risks of moving families to other units across the country.

Ahead of the Cabinet Secretary's meeting with families on Saturday and Tuesday, SG will consider if there are any information gaps which require input from the board.

Jo Ives
30 September 2019

GGC Stocktake Meeting
Wednesday 25 September 2019, 11:00 – 13.30

Action Point Summary

Scottish Government
Riaghaltas na h-Alba
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Action no	Description	Who	Timescale/Status
1	Ensure process remains in place to ensure GGC fully complete HIIORT for HPS to accurately brief SG and the Cabinet Secretary. HPS will continue to copy in GGC in HIIORT briefing emails to SG to ensure the board has the opportunity to make any additions or corrections.	GGC/HPS	Immediate / TBC
2	Ensure all relevant information and evidence is recorded and shared with all IMT members in a timely manner.	GGC	Immediate / TBC
3	GGC continue to share all media lines and statement with HPS and SG in advance of publication. HPS comms to feed back to GGC comms directly if they have any questions.	GGC	Immediate / TBC
4	HPS to undertake an independent expert review of the data. CNO emphasised the importance of completing the review as a matter of urgency and HPS has been asked to confirm by COP Thursday when this will be complete.	HPS	GGC to share data by 1 October. HPS will confirm timelines following receipt of data.
5	GGC to produce a position statement and status report on the incident, setting out from start to finish how the incident has developed over time and what measures have been put in place to manage risk and ensure the ward is safe. This will include a full breakdown of the original and subsequent hypotheses; the work undertaken to investigate them; and the full suite of control measures implemented.	GGC	TBC
6	Ahead of the Cabinet Secretary's meeting with families on Saturday and Tuesday, SG will consider if there are any information gaps needing input from the board.	SG/GGC	Complete

From: Law, Leanne **On Behalf Of** Grant, Jane [Chief Exec]
Sent: 21 November 2019 14:41
To: 'CabSecHS[redacted]'
Cc: 'Fiona.McQueen[redacted]'
Subject: Clinical Review
Importance: High

Dear Cabinet Secretary
In relation to the Clinical Review undertaken by the Women & Children's Directorate in 2017, we have been unable to locate a report document from then, despite talking to the Chief of Medicine and General Manager for the Directorate. However I attach a spreadsheet looking retrospectively at cases in 2017, undertaken this year, which may be the document referred to. It relates to 14 patients, noting 26 organisms in 22 samples. This document has only been made available to my team corporately in recent days, however within the Directorate, a review was undertaken of 3 patients who sadly died. I understand the CNO's office has already received the SBAR summary on these cases.
In addition, a report was prepared by Dr Christine Peters and Dr Teresa Inkster dated 7th October 2019 which was sent to the Chair of the IMT, and that document is also attached. This report was reviewed and annotated by one of our Public Health Consultants and there were clearly different views. This document was considered at the IMT (at which HPS and the CNO's office were represented) and was shared with HPS. It was agreed that its contents, along with the raw data, would be made available to HPS as part of their external review process as we were keen they had all available information to inform their independent perspective.
In addition, I have now commissioned a full case note review of all 14 patients and I will ensure the CNO's office is updated on the results of this process in due course. We are also very keen to undertake an external review in to the case of Milly Main and we plan to discuss that with her mother as soon as possible.
We are fully committed to ensuring a swift resolution to this situation acknowledging the significant impact of patients, their families and our staff. It would be most helpful if you could share any other documents or data you are aware of to allow us to investigate further and work with government colleagues to ensure consistency.
Regards
Jane

Jane Grant
Chief Executive
NHS Greater Glasgow and Clyde
JB Russell House
1055 Great Western Road
Glasgow, G12 0XH

[redacted]

Date: 27/12/2018

- All site SPCs are in control
- No wards are currently closed due to either norovirus or influenza.

Wards exceeding or on their upper control limit or trigger, e.g. 2 cases of CDI in 2 weeks or areas / wards that have ongoing outbreaks or data exceedance:

Sector / Directorate	Hospital	Specialty/ Ward	Trigger / Organism	Date Reported	Update
W & C and South Sector	QEUH	Haematology	1 adult and 1 paediatric patient positive for Cryptococcus* in blood cultures. Paediatric patient has sadly died and it is thought that the infection was a significant contributor. Information from PF is awaited.	/18	IMT held /18. HIIAT assessed as RED. HPS and SG informed. Estates actions to be taken forward include: Cleaning of all plant rooms, review of the structure of the estate to identify areas where pests might access plant rooms. Additional anti pest devices to be placed on window ledges. There have been no new cases since /18. All high risk patients to receive prophylaxis. IMT scheduled for /18

*****Cryptococcus neoformans is an encapsulated yeast that can live in both humans and animals and is largely found in soil and pigeon excrement

Incidents / Datix Referrals (e.g. severe CDI, CDI listed on part 1 of the patient's death certificate, incidents):

Description of Incident	Date Logged on Datix if required
Clyde, RAH, Ward 5. HAI CDI, Severe case. Patient was admitted on /10/18 with and . Patient had received recurrent courses of . Stool sample from /12/18 isolated and patient was commenced on , severity score based on raised . Medical staff discussed with Microbiology and advised course of as patient was responding to treatment. Patient's severity score until /12/18 when patient's severity score , based on raised and ?ileus. changed to and commenced on . A sample will now be sent to the reference lab for typing.	12.18

Summary of all patients with CDI listed as a contributory factor (part 2) on the death certificate:

- Nil to report

Update from the Wards listed in previous reports:

Sector / Directorate	Hospital	Specialty / Ward	Trigger / Organism	Date Reported	Update
Clyde	RAH	Ward 5 Medicine for the Elderly	Two cases of CDI in 8 days	[redacted]/12/18	No further cases. One patient is now considered to be a severe case as of [redacted]/12/18 (please see above). The other patient continues to have loose stools but is not a severe case. Typing results are awaited.
North	GRI	Ward 52 Medical HDU	Two cases of CDI in 24 hours	[redacted]/12/18	No further cases. Typing results are awaited.

Update on SAB and CDI – 27/12/2018

SAB: 28 cases for December (aim is 25 per month) HAI , VOL Lomond; QEUH 6C; QEUH 11D; PRM NICU; NVACH 1; IRH J South; GRI 62; GRI 53; GRI 24]

Site	Hospital acquired	Healthcare associated	Community	TBC	Total
GGH					
GRI	**3**		**2**	**3**	**8**
IRH	**1**			**1**	**2**
Lightburn					
Mearnskirk					
NVACH	**1**				**1**
PRM	**1**				**1**
QEUH	**2**	**6**	**3**		**11**
RAH		**1**	**2**		**3**
RHC		**1**			**1**
Stobhill					
VOL	**1**				**1**
GGC Total	**9**	**8**	**7**	**4**	**28**

CDI: 32 cases for December (aim is 35 per month) HAI [**RAH 5 X2**; RAH 14; QEUH 5A; QEUH 55; QEUH 51; QEUH 4D; IRH LU2; IRH J North; GRI 63; **GRI 52 X2**; GRI 44 CCU; GRI 20/21; GGH 3A]

Site	Hospital acquired	Healthcare associated	Indeterminate	Community	TBC	Total
GGH	1		1			2
GRI	5	4		2		11
IRH	2					2
Lightburn						
Mearnskirk						
NVACH						
PRM						
QEUH	4	2		1		7
RAH	3	1		1		5
RHC						
Stobhill						
VOL						
GP		1	1	3		5
GGC Total	15	8	2	7	0	32

From: Armstrong, Jennifer
Sent: 19 April 2022 10:06
To: Shariff, Imran
Subject: FW: Sub group to review possible routes of access for crypotococcus and hypothessis re recent incident

From: Walsh, Tom
Sent: 30 January 2019 19:07
To: Armstrong, Jennifer [redacted]
Cc: Inkster, Teresa [redacted]; Steele, Tom [redacted]; Lang, Ann [redacted]
Subject: RE: Sub group to review possible routes of access for crypotococcus and hypothessis re recent incident

Hi Jennifer.

I will agree final TORs with Teresa and Tom and ask Ann to pull together a meeting.

Kr

Tom

From: Armstrong, Jennifer
Sent: 30 January 2019 18:51
To: Walsh, Tom
Cc: Inkster, Teresa; Steele, Tom
Subject: Sub group to review possible routes of access for crypotococcus and hypothessis re recent incident

Tom
I am just out of the exec meeting regarding this incident and I also spoke to Teresa and Tom St earlier today; we decided that the subgroup should provide advice to the IMT chair and the IMT on the above issue.

The group could be chaired by Dr John Hood with members comprising Tom Steele, HPS, HFS, PHE (Peter Hoffman) , Dr Andrew Seaton (just wonder about ID), and anyone else ? UK expert)name? Liz?
To discuss the results and progress;

can you perhaps also join the group to ensure it is fully supported by IC and perhaps Ann can provide support

1. Set up a meeting with the subgroup within the next week
2. Draft and agree TOR with TI
3. Invite Peter Hoffman to the site so he can walk round it

It is now very urgent that this group starts to meet so we can understand the issues at the QUEH

J

TOM I was just drafting this when your email came in! _ few other issues above
j

NHS Greater Glasgow and Clyde
Women and Children Directorate
Hospital Paediatric and Neonatology

Minutes of meeting between Dr Jennifer Armstrong and Haematology Oncology team held 1pm on 11th January 2019 in ED seminar room RHC

1. Attendance and Apologies for meeting

In Attendance
Brenda Gibson (BG) Haematology Oncology Consultant
Jaraim Sastry (JS) Haematology Oncology Consultant
Suzie Dodd (SD) Lead Nurse for Infection Control
Ian Kennedy (IK) Consultant in Public Health
Kevin Hill (KH) Director Women and Children
Alison Balfour (AB) Microbiology Consultant
Jennifer Rodgers (JRo) Chief Nurse Hospital Paediatrics and Neonatology
Emma Somerville (ES) Senior Charge Nurse Ward 2a (6a)
Angela Howett (AH) Senior charge Nurse Ward 2b (6a)
Milind Ronghe (MR) Haematology Oncology Consultant
Jennifer Armstrong (JA) Board Medical Director
Alan Mathers (AMM) Chief of Medicine Women and Children
Colin Purdon (CP) Senior Estates Manager
Karen Connelly (KC) General Manager Facilities
Dermot Murphy (DM) Haematology Oncology Consultant
Phil Davies (PD) Clinical Director Paediatric Medical Sub Specialties

Apologies
Fernando Pinto (FP) Haematology Oncology Consultant

2. Introductions by JA

JA agreed to set the scene of today's meeting and in this covered the background to ward transfer 2a to 6a, recent infections on patients since transfer and general concerns of staff around patient safety. She noted that those colleagues present today in this meeting were a senior team of people she had pulled together to discuss any issues the clinical team have; this being the range of issues which prompted the email from BG to JA earlier in the week and subsequently the need for the meeting.
JA first asked BG to express the concerns of the Clinical Team. Others from the Clinical Team would be encouraged to speak as appropriate. Following discussions she would confirm a final list of questions which responses could be provided to the Clinical team at a later date. JA then asked KH to outline the potential ways forward in addressing such listed issues and how they might be reconciled to actions already taken. JA then concluded matters after others from Estates, Microbioligy Infection Control and Public Health had spoken and thanked everyone for their time and contribution.

3. BG Summary of Concerns

BG confirmed that team were aware they needed their patients to be moved out from Ward 2a and that since then water infections amongst patients have significantly

reduced. The clinical team were also aware of the limited ventilation ward 6a would offer noting it was a general ward. However, since the decision to transfer was made the timeline for transfer to ward 6a had been extended twice. The estimated time now reported as up to 12 months. BG noted the concerns of the clinical team in that the implications of this were significantly different to the original estimated period of 8 -12 weeks. She then noted the Team were unsure what standard of ventilation system the Board were working to. She was keen how the chosen specification for new ventilation system and how do you Reference the requirement of this to the risk of an extended transfer out period in Ward 6a. BG was clear to state she did not wish for the Board not to provide Ward 2a with the most appropriate ventilation system possible. She did however want more information on how the Board were compiling the specification of this system and against what standards they were working to.JA agreed that a response on this would be provided for the Clinical team and then discussions could follow as appropriate.

BG then asked how the Clinical team would provide a safe prophylaxis plan for patients while in Ward 6a? BG described the difficulties in administering this plan and also the team's concerns on the clinical risks being put on specific patients? JA described the current day to day support microbiology team was providing. She also highlighted the additional review she had commissioned from the Antimocrobial team which would be used to assist the clinical team in making sure they used best evidenced practice for the situation faced. Again in receipt of this further discussion could be progressed in how changes to current practices might be changed and evaluated.

JS described a sarcoma patient who has had surgery delayed for infection in ward 2a and then in Ward 6a. It was agreed to defer the details / discussion around this patient to the ongoing engagement with parents which was already taking place.

JS also wanted to know how safe the boarding plans into RHC wards were when Ward6a is full? BG wanted to know how safe PiC is noting the team don't know where the child under clinical incident review had caught his infection. The team asked whether these areas / patients should be supported by use of portable hepa filtration units. Further information and dialogue on this required. It was felt sensible that the patient JS had referred to and who after surgery would need a stay in ITU was provided with a portable heap filtration unit.

AH and ES raised communication plan for staff and how they are supported when speaking to parents. They acknowledged the recent aide memoir provided in relation to use of the portable units and that they had used this successfully. Both also raised staffing issues for nursing, ANPs and medical staff. JRo and ES noted they were in a recruitment process to cover current gaps caused by maternity leave and revised service pressures. Implementing this plan would have a financial consequence and JRo / JR were working up an SBAR that would outline this.

DM queried why the adult transplant service was not moved back to BOU to allow the paediatric Haematology Oncology to move to a safer environment in Ward4b? He noted Ward 4b had an appropriate ventilation system for haematology oncology patients which was superior to that available in Ward 6a; and also that this would allow the unused BOU which had something similar to be used.

DM queried nurse staffing and reference to increased drug errors. He asked the question of how the Clinical team could turn this safety issue around given all the pressures faced. He also noted that nursing staff were unable to join key clinical meetings because of work pressures and the impact this was having on communication within the team. DM queried what is the trigger point for when a move out of Ward 6a will be considered? What is the contingency plan if this were to happen?

JA mentioned that there are beds in Ward 2a which subject to infection control scribe could be used. She did not want to discuss today whether the team could use them but note they were potentially available.
JA also rehearsed various arguments for why there would be difficulty in freeing up Ward 4b for wider paediatric group and transferring the adult BMT service to BOU. However, again this was an option which could be discussed further.

4. KH update

KH was now asked to update on the actions already taken by Directorate and those agreed but still to be taken.

A formal project plan with clear time scales for the completion of works in Ward2a for the improved ventilation system needed to be prepared with a communication plan to the clinical team in place to monitor and report on progress.

KH confirmed the current hepa filtration plan for ward 6a. All rooms and corridors in the ward would be covered by this plan. He noted the issue of noise and that this would be monitored while in use. He acknowledged the previous query about whether these units should be used for haematology oncology patients transferred to RHC including PiC. He confirmed a cleaning plan of these new units was now in place with facilities. JA noted these units were the approved contingency plan if ventilation system in Ward4b had ever failed and in this context should be considered favourably in regards impact on assisting with a clean air supply.

KH confirmed there will be weekly sampling of air in Ward6a with results shared. This is likely to be reduced to monthly subject to results and discussions with infection control and microbiology. It was noted that recent re sampling of the Ward had taken place and reports from this would be discussed accordingly.

JRo confirmed that an aide memoir for medical and nursing staff had been approved as noted earlier by ES / AH on how they proactively update parents and families on the use of this new kit. ES confirmed this discussion has been completed with all current inpatient families and will be ongoing for all new admissions. Generally there had been no concerns raised although it was acknowledged there was some discussion of it on the closed social media pages used by parents.

KH noted there remains no agreed hypothesis for the Crypto IMT in terms of understanding what has caused this particular fungus to infect 2 patients. Various actions are being progressed to try and rule in / rule out the possible hypothesis being considered. Group was updated that all windows in wards are triple glazed but Estates will check the efficacy of this through thermal imaging. KH confirmed that various other actions from the IMT will be progressed and reported through the

Executive Group he was setting up under Board CEO's instruction. This Executive group would be similar to what was established during the water incident last year with its first meet planned for 18th January 2019. Invites will be offered to senior colleagues from Facilities, Service and Infection Control / Microbiology early next week to attend. The group would initially report jointly through KH to Jonathan Best and JA.

KH noted there was an SCI of the current paediatric case. Also noted there was ongoing clinical samples taken from this and child sent to Bristol for analysis. The final report on this would take a number of weeks.

JA confirmed the negative pressure cubicle work stream covering 2c, CDU and pic is currently suspended although monies available in the capital plan to proceed

5. Other Updates

JA explained reporting processes of this current incident through Board's Clinical Governance arrangements. There needs to be a clear audit trail of why decisions have been taken and that the outcomes from this would be routinely reviewed.

She also noted that surveillance of children and young people with infection needs to be reviewed and routinely reported. The reports need to be mindful of regional elements of the child and young people pathways to other local DGH units. All acknowledged the importance of this.

From: RITCHIE, Ian (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 01 September 2021 16:09
To: BRIMELOW, Susan (NHS GREATER GLASGOW & CLYDE)
Cc: Jordan, Geraldine; Steele, Tom; White, Amy; Shariff, Imran
Subject: Re: Action from Clinical and Care Governance Committee on 8th June- Update of Actions SBAR 2017

Geraldine,
Thank you. I think this is ok.
Regards
Ian

On 1 Sep 2021, at 11:58, BRIMELOW, Susan (NHS GREATER GLASGOW & CLYDE) [redacted] wrote:

Thanks Geraldine
I'm content with this
Regards
Susan

Get Outlook for iOS

From: Jordan, Geraldine [redacted]
Sent: Wednesday, September 1, 2021 8:45:59 AM
To: BRIMELOW, Susan (NHS GREATER GLASGOW & CLYDE) [redacted]; RITCHIE, Ian (NHS GREATER GLASGOW & CLYDE) [redacted]
Cc: Steele, Tom [redacted]; White, Amy [redacted]; Shariff, Imran [redacted]
Subject: FW: Action from Clinical and Care Governance Committee on 8th June- Update of Actions SBAR 2017
Dear Susan and Iain
Further to your email on the 21st August, we can now provide the update to action 24 which Tom Steele has provided regarding assurance around the maintenance of plumbing. If you are content with this, we can close the SBAR and send this to Jane for further discussion with SG.

Item	Issue	Current Position as of 5th December 2017	Future Actions	Final Position as of May 2021
24	Plumbing not replaced in Neuro Surgical Block	The Director of Regional Services advised that there is ongoing work in the neuro building that would because of its complexity, take several years to complete, in the meantime the new operating theatres were due to open in January 2018.	Planned replacement of the INS announced in May 2021	Planned replacement of the INS announced in May 2021. Four new operating theatres were commissioned and are now in place in the ICE Building. Drainage upgrades are included in the Neurosurgery/Neurology rolling programme of ward HEI upgrade works. Regular maintenance is ongoing within Neurosurgery to ensure minimal disruption to services.

With best wishes
Geraldine Jordan
Director of Clinical and Care Governance
Clinical Governance Support Unit
Mobile: [redacted]
Email: [redacted]

From: BRIMELOW, Susan (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 21 August 2021 10:34
To: Armstrong, Jennifer [redacted]; Jordan, Geraldine [redacted]
Cc: White, Amy [redacted]; Ritchie, Ian [Board] [redacted]
Subject: Fw: Action from Clinical and Care Governance Committee on 8th June- Update of Actions SBAR 2017

Dear Jennifer and Geraldine

Please accept my apologies for overlooking this request to review the 3 updated actions from the SBAR and provide assurance on behalf of the C&CGC

Im content with the additional text for actions 3 and 17 and agree with Ian in respect of action 24 which just needs clarity on the impact of the 4 new theatres and regular maintenance on the plumbing in INS

With this minor amendment happy for this to go to SGov as complete

Kind Regards

Susan

From: RITCHIE, Ian (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 09 August 2021 13:00
To: Duncan, Gillian [redacted]
Cc: BRIMELOW, Susan (NHS GREATER GLASGOW & CLYDE) [redacted]; White, Amy [redacted]
Subject: Re: Action from Clinical and Care Governance Committee on 8th June- Update of Actions SBAR 2017

Dear Gillian,
Thanks for this. I have no particular concerns with items one and two but the third item relating to plumbing in the Institute of neurological sciences is not clear. By that I mean the title talks about plumbing but the content says that there are three new theatres. It is entirely possible that three new theatres are in place but the plumbing remains an issue. I think we will need to have assurance that the plumbing has been dealt with as well.

I hope I'm not misinterpreting things? I'm sure Susan will be able to guide us.
Best wishes,

Ian

> On 9 Aug 2021, at 12:52, Duncan, Gillian [redacted] wrote:
>
> Dear Susan and Ian
>
> The SBAR (27 Point) Action plan (paper 21/06) was formally presented to the Clinical and Care Governance Committee on 8th June 2021 and discussed under Item 9(b). The Committee reviewed the paper and requested an update on three actions, namely Actions 3, 17 and 24.
>
> Dr Armstrong, Sandra Devine and Tom Steele have now reviewed the SBAR and provided an update on the three actions and have updated the original SBAR with this information. We have also highlighted the changes below.
>
> From the draft minute attached, it was agreed that :
>
>
> * the revised paper would be sent back to the Chair and Vice Chair who would review and provide assurance on behalf of the Committee.
>
> * following approval by the Chair and Vice Chair, Mrs Grant would discuss the SBAR with Ms Amanda Croft, Chief Nursing Officer, at the Scottish Government to ensure that the Scottish Government have oversight of this
>
> I would be grateful if you can review the changes to the SBAR.
>
> SBAR changes
>
> Item 3- Lack of isolation rooms in the emergency department.
>
> "The introduction of isolation rooms in ED is technically impossible, however alternative patient pathways have been developed"
>
> Item 17- Air changes and Chilled Beam
>

> “Where possible areas within the QEUH/RHC have been modified to enhance ventilation. Specialist ventilation is in place in critical care areas in both hospitals and in the bone marrow transplant unit in QEUH.
> PPVL rooms have been changed to negative pressure isolation rooms in both QEUH/RHC and areas such as 6A and 4C have been modified to increase positive pressure to these areas as far as possible. BMT in RHC is in the process of being upgraded.
>
> The general air systems within the QEUH/RHC are nominally achieving 3AC/Hr and the pressure cascade within wards can be altered to achieve nominally positive, or negative pressure flow depending on the client use. The general AHU’s have 2 stage filtration sets which provide “theatre” quality filtered air to all spaces. Critical air systems have HEPA grade filtration as well as increased AC rate and pressure cascade. Chilled beam heating and cooling technologies are a recognised and allowable means of managing environmental temperature with the exception of areas that have HEPA in place”
>
> Item 24- Plumbing in the Institute
>
> “Four new operating theatres were commissioned and are now in place in the ICE Building. Regular maintenance is ongoing within this Unit to ensure minimal disruption to services”
>
> Kind regards.
>
> Gillian
>
> _____
> Gillian Duncan | Secretariat
> NHS Greater Glasgow and Clyde | JB Russell House | Gartnavel Royal Hospital | 1055 Great Western Road | Glasgow | G12 0XH
> t: [redacted] | e: [redacted]
>
>
>
>
>
> <SBAR Action Plan 21 June 2021.docx>

From: Walsh, Tom
Sent: 29 October 2018 11:22
To: Haynes, Jennifer; de Caestecker, Linda
Subject: RE: Whistleblowing report

Hi Jen

We have agreed a standard response as recommended. We have also made the Diagnostics Management Team aware of the intention to respond in this manner.

Bw

Tom

From: Haynes, Jennifer
Sent: 29 October 2018 09:15
To: Walsh, Tom; de Caestecker, Linda
Subject: RE: Whistleblowing report

Hi Tom

Re your email below with Linda, I wondered if there was an update on this following your meeting with Dr Armstrong? I support Linda with Whistleblowing cases, and am trying to help ensure we can close this case

Many thanks

Jen

Jennifer Haynes
Board Complaints Manager
Phone: [redacted]
Mobile: [redacted]
Email: [redacted]

From: Walsh, Tom
Sent: 08 October 2018 11:34
To: de Caestecker, Linda
Cc: Armstrong, Jennifer; Haynes, Jennifer; Devine, Sandra; Inkster, Teresa
Subject: RE: Whistleblowing report

Hi Linda

Thanks for this. We haven't seen the full report and this recommendation wasn't in the summary I received on 9th May. This is however very helpful and very timely as we discussed a recent increase in email traffic again just this morning at our SMT meeting.

Teresa, Sandra and I will agree a standard response and implement the recommendation. We can discuss at our meeting with Dr Armstrong this afternoon.

Kr

Tom

From: de Caestecker, Linda
Sent: 08 October 2018 10:53
To: Walsh, Tom
Cc: Armstrong, Jennifer; Haynes, Jennifer
Subject: Whistleblowing report

Dear Tom
One of the recommendations in my recent report on the whistleblowing concerns from Penelope Redding and Christine Peters was

1. The Infection control team should be supported to deal with multiple emails from Dr Peters about issues in which she has no direct role with a standard response;

By this I had meant that you should be able to respond to Dr Peters that a situation is being dealt with through appropriate mechanisms and you do not intend to answer any more emails on this topic from her. I am following up on my recommendations and I wondered if the issue of multiple emails demanding responding has continued and whether you and Jennifer (Armstrong) have discussed how to implement the above recommendation. Happy to discuss by phone or in person if easier.

Kind regards
Linda

Prof Linda de Caestecker
Director of Public Health
NHS Greater Glasgow and Clyde
Gartnavel Royal Hospital Campus |
1055 Great Western Road | GLASGOW G12 OXH
t[redacted], m[redacted] | e[redacted]
web: http://www.nhsggc.org.uk/publichealth

RE: ventilation issues

Armstrong, Jennifer [redacted]

Fri 07/12/2018 17:49

To:Walsh Thomas (NHS GREATER GLASGOW & CLYDE) [redacted];

Cc:Devine, Sandra [redacted]; INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE) [redacted]; Steele, Tom [redacted];

Thanks Tom and Teresa; I think it maybe helpful for us to discuss how we are progressing this; I will pick this up on Monday with Tom (Steele) as he is back from AL to discuss and we can describe best way to manage this
KR
Jennifer

From: Walsh, Tom
Sent: 07 December 2018 08:16
To: Armstrong, Jennifer
Cc: Devine, Sandra; Inkster, Teresa (NHSmail); Steele, Tom
Subject: RE: ventilation issues

Thanks Teresa

Tome Steele is on leave but I agree that a single point of contact in facilities who is coordinating this would be helpful.

Jennifer, I was at a meeting with Tom and Teresa on Wednesday. We discussed the additional workload the current water and ventilation issues are creating together with the need for more ICD input to the CDU at Cowlairs.

Tom was supportive of a case being presented for additional sessions to ensure this additional work does not detract from core IC business. I have drafted the attached SBAR setting out the position and costs. I would be grateful for your consideration and support for this.

Kr

Tom

From: INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 06 December 2018 20:02
To: Armstrong, Jennifer
Cc: Walsh, Tom
Subject: [ExternaltoGGC]ventilation issues

Jennifer , there have been a number of recent issues in relation to ventilation that I need to make you aware of and I need advice re the best way forward.

1) Following the 2A/B report I requested info on other high risk wards and did some testing with John Hood. We noted that there were inconsistent pressures in the rooms in the wards we tested , some being positive and others being negative. This has implications for wards 5C/D, Infectious diseases and level 7 Resp QEUH. These findings were confirmed by estates for 5C/D. Info for level 7 outstanding.

After discussion at our IC SMT I escalated to Health and Safety. The risk is from smear positive TB patients sitting in a positive pressure room and relates to staff/visitors in the vicinity . The ID physicians understandably have expressed concern.

I wrote to Anne Harkness who responded to tell me there is a group already looking at this .It is a concern that I am not aware of this group and there is no IPCT representation .

There is an immediate need for clinicians , estates and IPCT to understand the ventilation setup , what remedial actions can take place and understand where it is safe to place patients. H+S need to review the risk to staff in light of these findings.

2) A meeting took place to update clinical and IPCT yesterday re negative pressure room upgrades in QEUH and RHC. I had a diary conflict so a lead IPCN went . Essentially the rooms in adult critical care failed validation, not meeting the design criteria. I have not been able to sign them off. We were assured that the issues would not affect the RHC rooms however these have now also failed validation. The clinical staff present at the meeting, themselves requested that the project be halted, as they are losing beds whilst facing winter pressures. The project was put on hold.

There was also a discussion about the need to administer HPV to ductwork potentially contaminated by MDRTB and VHF?? , which has led me to wonder whether there are ductwork issues there as well as 2A . I await further info.

In light of this and the 5C/D issues were are in a difficult situation with regards to management of TB in particular. We still have the pathway in place for MDRTB to go to GRI

3) Ward 4C haematology - I have a meeting tomorrow to discuss this area as similar to 2A/B there are issues with the spec. They are in a better position currently in that the rooms are slightly positive, so this is less urgent.

4) Almost all our endoscopy units have been rated poor on validation reports ,apart from Inverclyde (data on ACADs and QEUH awaited). This has implications for bronchosopy procedures in relation to airborne infection as the air changes are insufficient.

5) Ongoing 2A/B issue - had a good meeting with design engineer re specification . Duration of project is 12 months.

I am sorry to bother you with this but I feel that we are at the stage where this needs a project manager . There are a lot of issues to work through and there needs to be representation from clinical teams , IPCT and H+S. Can you advise?

Please call me if you need more info

Kind regards
Teresa

Dr Teresa Inkster
Lead Infection Control Doctor NHSGGC
Training Programme Director Medical Microbiology
Dept of Microbiology
Queen Elizabeth University Hospital
Glasgow
Direct dial : [redacted]

A50125560

www.waspsoftware.co.uk

Multi Source Feedback Report

Name: **Dr Christine Peters**

Date: **08/07/2019**

Instrument: **NES Colleague Multi-Source Feedback**

WASP Software Ltd, Mayfield Hall, Middle Mayfield
Ashbourne, Derbyshire, DE6 2JU

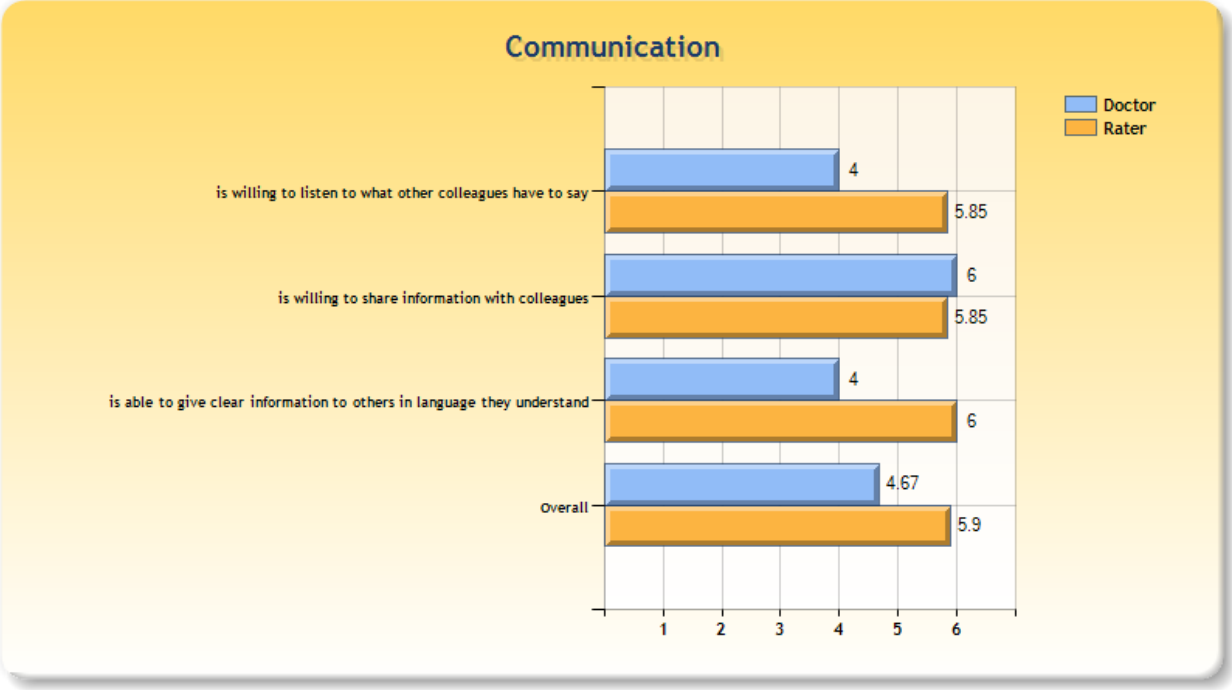
Colleague Feedback Report

Doctor Name: Dr Christine Peters

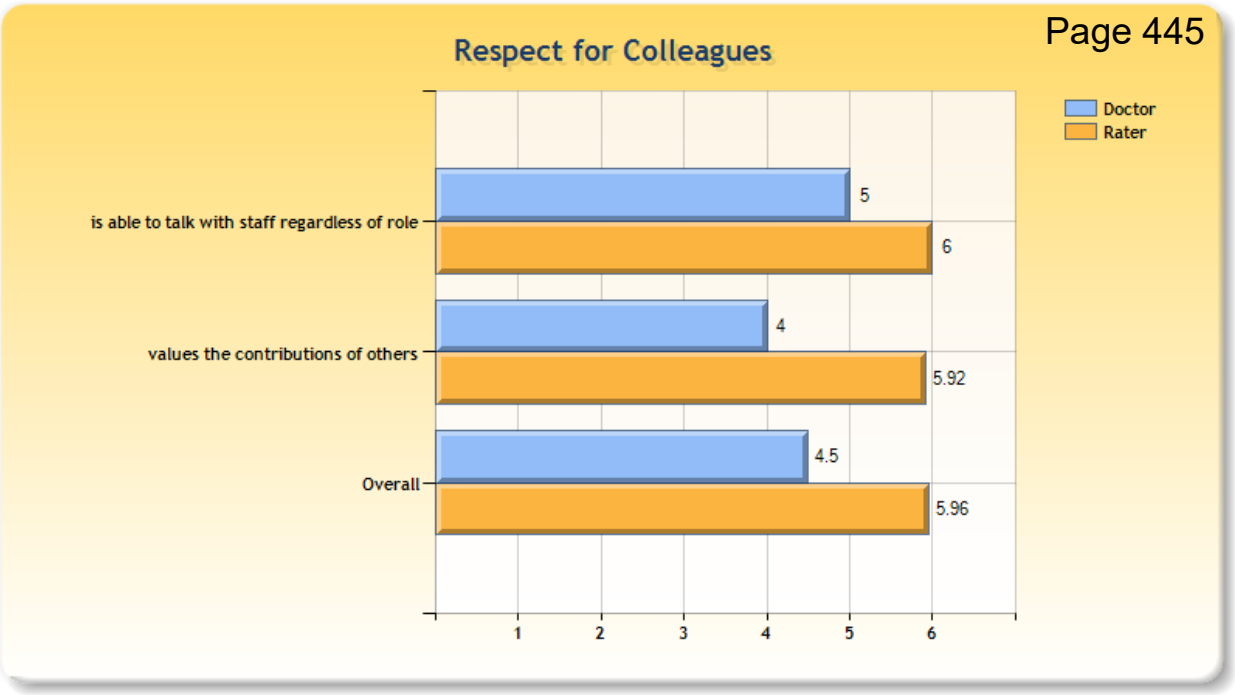
Feedback Completion Date: 15 January 2019
No. Of Completed Raters: 13

Free text comments are reproduced exactly as they are typed by the rater including spelling, punctuation and grammar

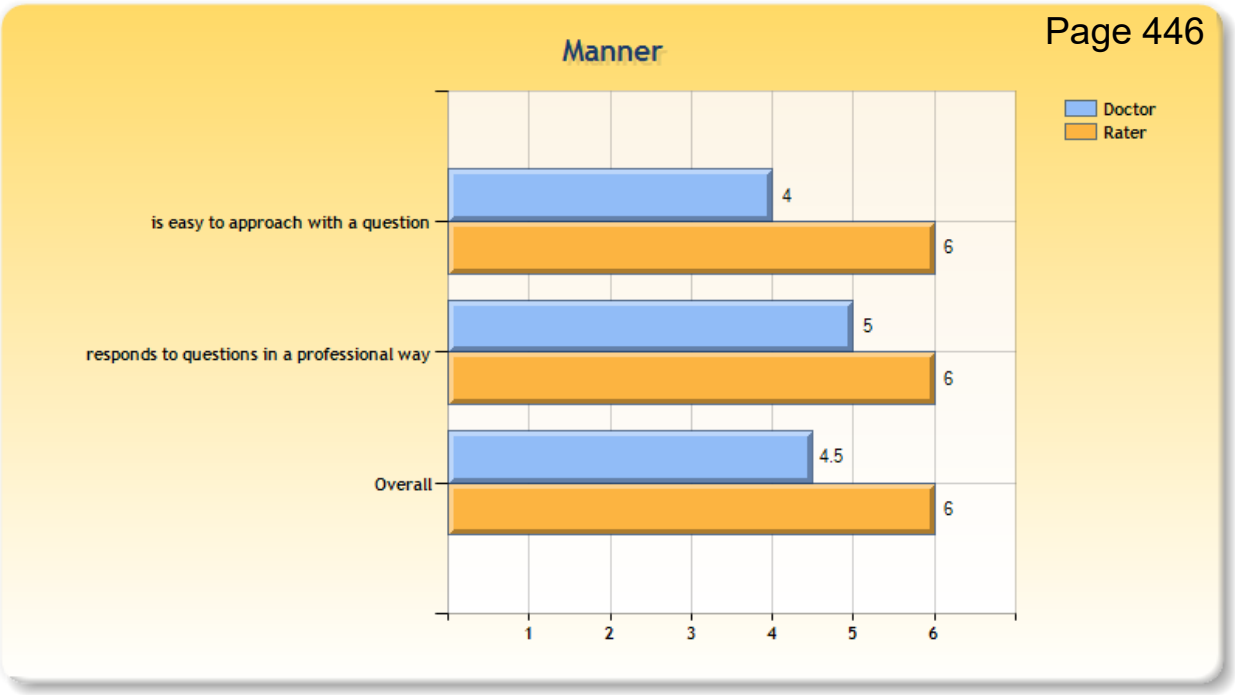
The graphs are a visual indicator only. Those marked with a ! indicate a high level of "Unable to comment" responses. Please ensure the values given correspond to the graph correctly. Where given, the mean score represents the mean of all questions for that domain.



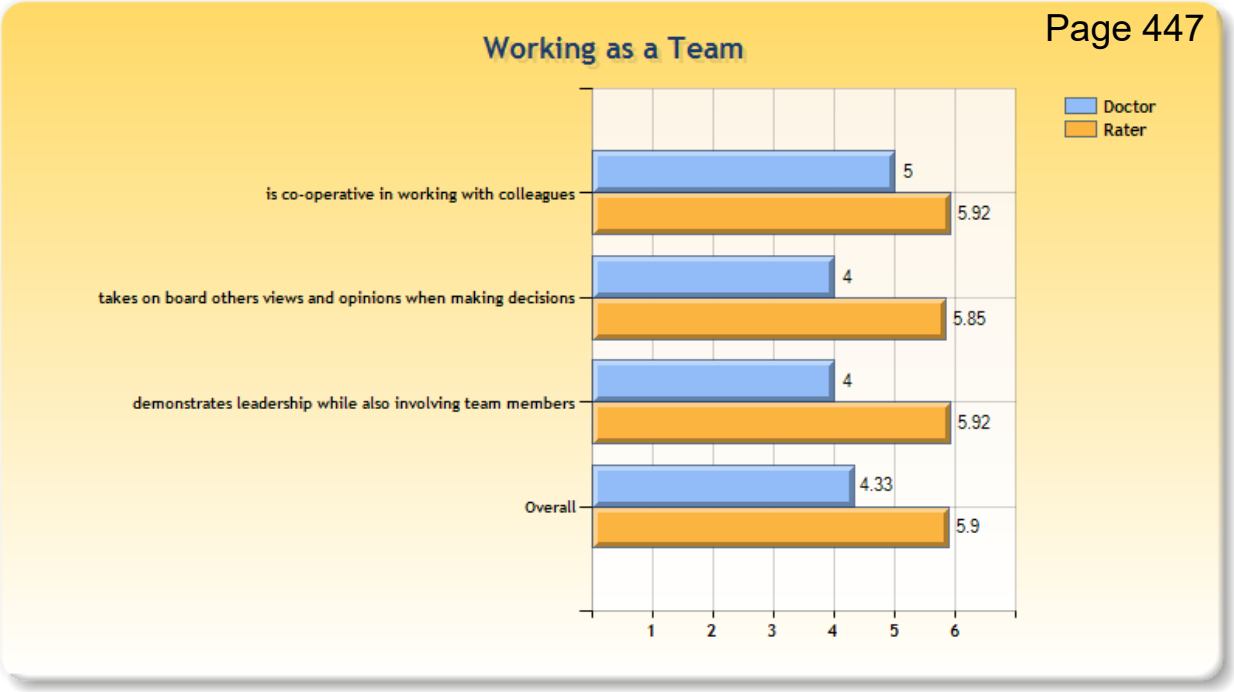
Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
An excellent communicator, very open and always willing to listen to colleagues	Dr Peters does listen to colleagues and will try to gain consensus in issues where there are divided views - this is not always easy
Dr Peters is very articulate and able to clearly put forward her point of view As Lead Consultant for QEUH Microbiology she tries hard to disseminate relevant information, both clinical and non clinical, to colleagues.	Continue current approach
An excellent communicator	No development required
Christine is extremely informative and has excellent communication both verbally and in presentations. She is hugely enthusiastic about her work and this rubs off on those listening to her present.	None
Approachable and friendly. Communicates clearly.	The demands on her time clinically are as such that I feel that she is stretched over too many tasks at the one time.
Good communication skills and team working with all grades of staff. Always helpful and will feedback to clinical colleagues. Responds in a timely manner to any questions and for advice.	I'm not sure there is much Christine can do to develop this area, she is always available for advice and shares information well.
Christine presents interesting patient cases when they arise at weekly departmental meeting. These meetings are informative for all grades of staff and Christine has the ability to highlight the importance of the contribution all staff have for positive patient outcomes.	
Excellent at keeping myself and my colleagues updated with information.	
Excellent communicator	
As far as possible, Dr. Peters keeps me informed of any clinical issues and information that I require to provide a good clinical service.	
Christine provides and excellent service for our patient cohort. I rely on and highly value her advice on an almost daily basis.	
Christine always communicates clearly and effectively. For example, we were discussing a complicated patient at our MDT, Christine made some recommendations for antibiotic treatment that were noted in the minutes. Christine then followed up her advice with an email, clearly outlining the clinical plan for the patient.	



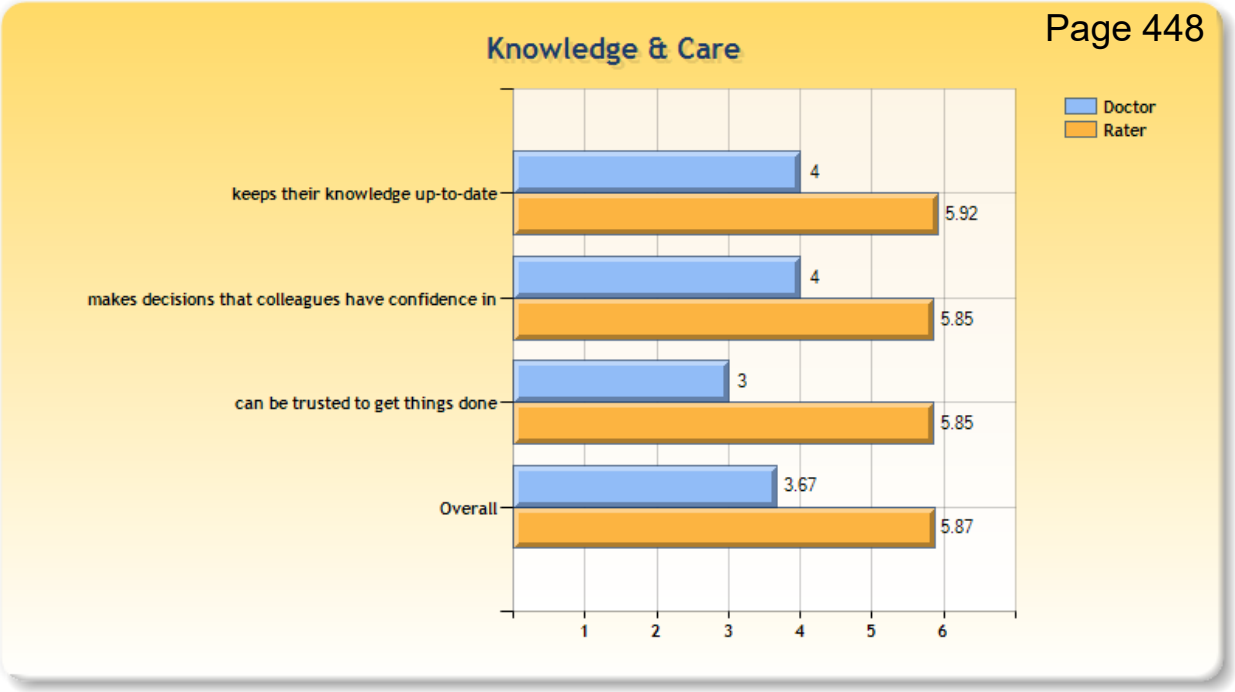
Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Values everyones' contributions and treats everyone with respect and kindness	Continue current approach
Always respectful	None
Christine is always keen to have others contribute to developing the service she is involved in and is extremely respectful of their opinions	Nothing
Respectful towards all members of staff, regardless of position	Nil to add.
Acknowledgement of hard work and commitment of work colleagues. Also respectful of all staff grades in the department and will give help and advice. Will go out her way to accommodate requests for annual /sick leave.	
Christine communicates on a daily basis with all grades of staff within the department and is held in high regard.	
Makes it easy to ask any questions that I am needing guidance with. Listens to any ideas I have.	
Good doctor	
Dr. Peters engages with ALL staff for the benefit of the service and of her staff.	
I meet with Christine within a MDT group setting at least weekly. She is always willing to hear views from all members of the team and to communicate advice in return.	
Chrisine attends our team's multidisciplinary meeting most weeks, there are various staff there of different professions and grades, she talks to everyone and makes everyone feel included in the discussion.	



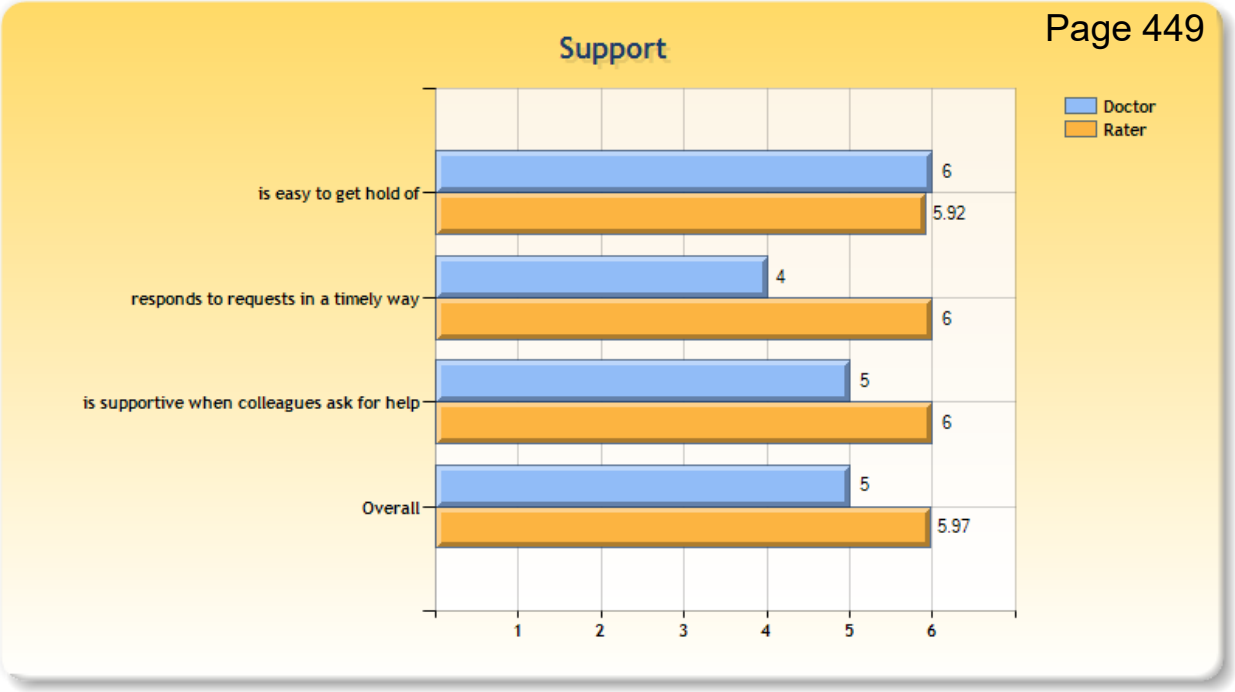
Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Always approachable and professional	Continue current approach
Dr Peters' door is always open - to the extent that she tends to take on too much	NA
Always approachable	None
Very approachable and willing to assist with all requests.	Nothing
Very approachable and empathetic	Nil
Always professional in her manner and considerate. Will check that staff are ok and are managing the work load.	
Christine is open and honest and is always approachable and helpful.	
Good doctor	
I have never felt that any question I ask is too insignificant or silly. No matter how busy she is, she always makes time and answers my questions in a professional manner.	
Always returns email advice promptly despite her obviously very busy role. Is courteous and professional in all interactions I have had with her.	
I feel like I can ask Christine a question even if I think it's maybe a silly question or not strictly her remit, she would never make you feel bad or like you were wasting her time by asking her a question. She responds to emails quickly and always with concise information, answering my question exactly.	



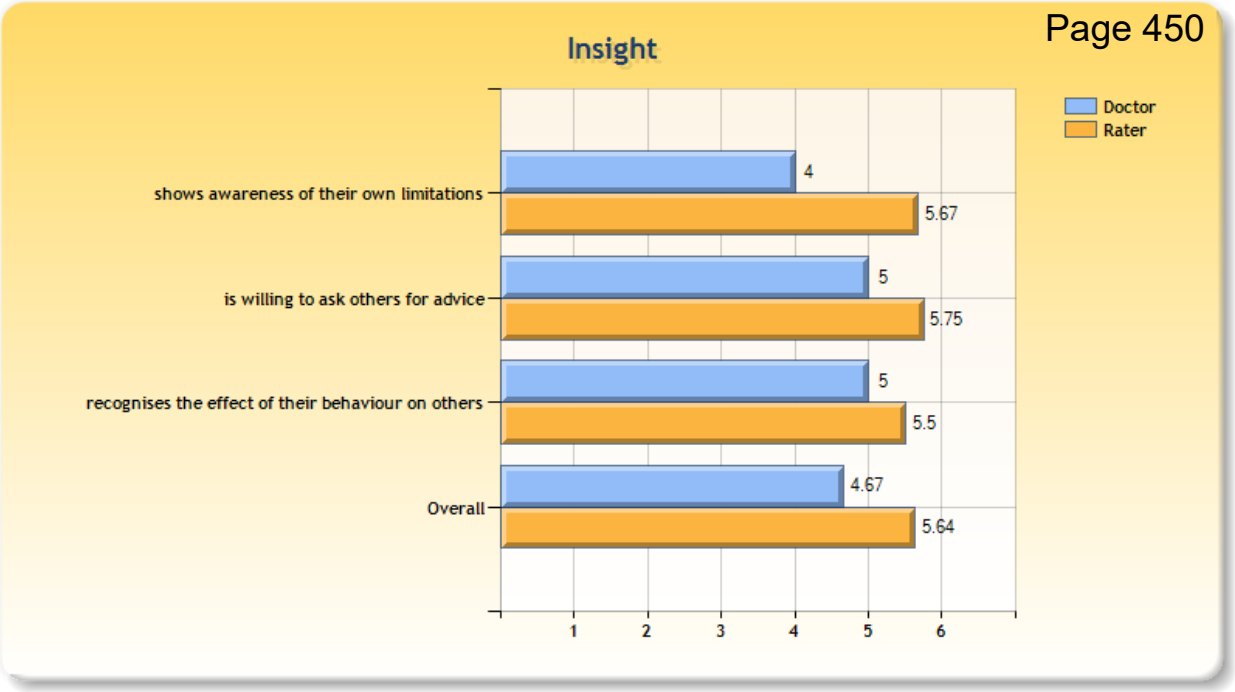
Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Has a very difficult role as local clinical lead, performs this exceedingly well, always taking on board everyones' opinions, an excellent leader and very cooperative and understanding	Continue current approach
A committed member of of team	More time during the working day to fully commit to team working as clinical work pressures are increasing.
Very good at involving the team in discussion around management of complex respiratory/ CF patients and always takes on board experience of other even non medial personnel	None
Involves staff in management decisions and informs of changes made by management, so that staff are well informed.	nothing
Christine leads by example, is supportive, inclusive and always respectful to her colleagues.	Nil
Before making any decisions that involves myself Dr Peters always checks whether we think it would work and what our opinion is first.	
Good doctor	
Dr.Peters is all about patient care. If there is a better way to make an improvement for the service then Dr.Peters involves all staff to come to a collective decision.	
I work in various groups with Christine and find her very willing and enthusiastic to undertake collaborative project work. I have also been very impressed with her leadership qualities when she has been chair of meetings.	
Christine works with our multi-disciplinary team in a very cooperative manner, she listens to the opinions of all team members when discussing patients, she demonstrates leadership by helping to steer us to a decision regarding a patient's treatment without it feeling like she is being domineering or taking over the team.	



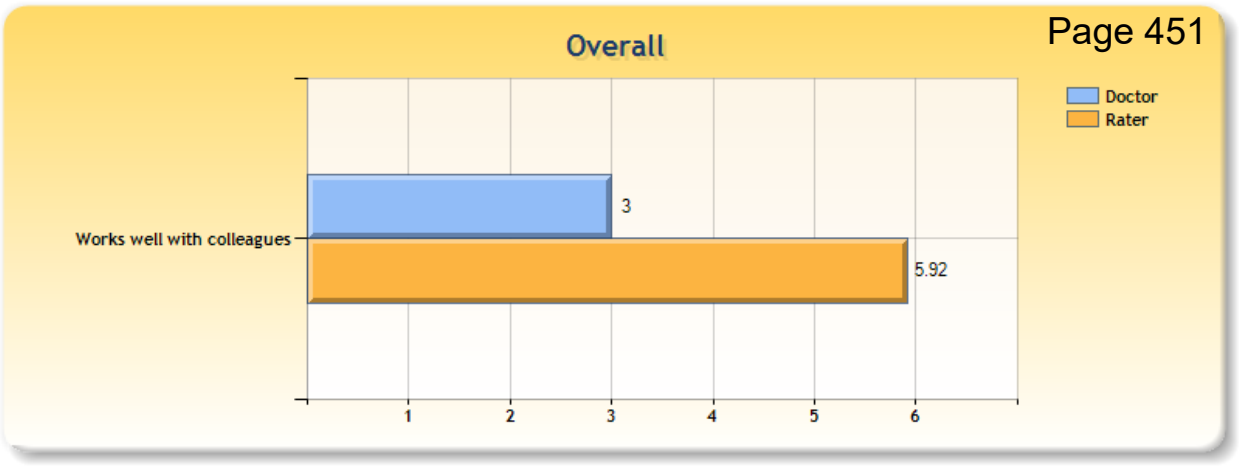
Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Very dependable and dedicated, up to date with knowledge and clinical opinions are highly respected and valued by all colleagues	Continue current approach
Displays an impressive knowledge base	Spend more time on the general processing of specimens by the staff in the Department to ensure quality of work.
Very knowledgeable lady. I have the utmost faith in her decision making and this is firmly evidence based	None
Well informed and keeps up to date with changes and new policy documents that have been implemented. Keeps up to date with recent publications and papers relevant to Microbiology and Infection Control. Aware of all the current guidelines.	As Christine is so busy with her job there have been some projects that the CF team were hoping to have her input with that we've not managed to get done (eg: patient cohorting) but I think this is a reflection of the scope of her job and the many duties she has.
Christine is proactive and has the confidence of all staff.	
Good doctor	
I have great confidence that if I ask Dr.Peters a question regarding a patient sample, I will get a fast decision.	
Absolutely- Christine's advice is key to patient care. Some cases are very complex microbiologically and Christine always has up to date information and advice.	
Christine is always referring to a new paper that she's read! I would always trust her opinion and would know that she has considered all the information before making a decision/recommendation.	



Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Very approachable and adaptable, always helpful and supportive	Dr Peters probably needs to be able to say no or she will tend to take on too much
Dr Peters is supportive of colleagues - even when it means putting herself out e.g doing extra on call when others are sick	Continue current approach
Always responds to enquiries promptly	None
Has always supported me in my endeavours to improve clinical care of the CF group and helpful when we are implementing change	Nil
Very supportive	
Always available to help the staff and considerate/ compassionate if any personal issues.	
Always makes you know she has her mobile and will answer her phone anytime.	
Christine is always available for advice and assistance when required. She is happy to support staff when help is required both professionally and on a personal level.	
Good doctor	
I always feel supported by Dr.Peters.	
Christine is very accessible when we need her and provides alternative sources of advice for us when she is on leave .	
If I email Christine for advice regarding a patient she will more often than not reply the same day, I am confident that she will answer my query.	



Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Dr Peters is very gifted in many areas and can express her views articulately	While I know that she is aware of her own limitations, sometimes it might come across that she is overconfident. I know that this stems from a commitment to do the best job that she can.
Has insight and seeks discusion / advice when appropriate	Continue current approach
Is always respectful of others and considers how her decisions may impact on others	None
Christine is totally aware of how her interactions with colleagues impact on the them, the working environment and patient care. She is always professional and willing to listen to the advice and views of others.	
Good doctor	
Dr.Peters is aware of any impact that her actions may have on patient care and on her colleagues.	
Christine brings evidence and information from colleagues outwith her Department to project and case discussions. I am always confident that she will seek the most up to date data and expert advice.	
I don't feel I work with Christine frequently enough to be able to comment on these attributes.	



Doctor Comments
Other Comments
Rater Comments
Other Comments
An excellent colleague whose advice and support is very highly valued.
At any given time she has been approachable and keen to work alongside me when I have had an issue requiring her assistance
Christine has an excellent relationship with her colleagues based on respect and integrity.
Christine is a valuable and respected member of our team
Christine's love for her job and her interest in her subject area are always apparent, she is always enthusiastic about her work.
Dr Peters has been very supportive of me as a colleague and I can see that she puts a huge amount of energy into trying to improve our service while paying attention to the welfare of her colleagues in some very trying circumstances
Excellent doctor and colleague
Has worked tirelessly for the local team at QEUH, ensuring that everyones' voices are heard and that everyone feels part of the team, an excellent colleague to work with
I have never heard of any negative comment said regarding Dr.Peters. She is well-liked and respected amongst all grades of staff.

www.waspsoftware.co.uk

Multi Source Feedback Report

Name: **Dr Christine Peters**

Date: **15/08/2023**

Instrument: **NES Colleague Multi-Source Feedback**

WASP Software Ltd, Mayfield Hall, Middle Mayfield
Ashbourne, Derbyshire, DE6 2JU

Colleague Feedback Report

Doctor Name: Dr Christine Peters

Feedback Completion Date: 21 July 2023
No. Of Completed Raters: 12

Free text comments are reproduced exactly as they are typed by the rater including spelling, punctuation and grammar

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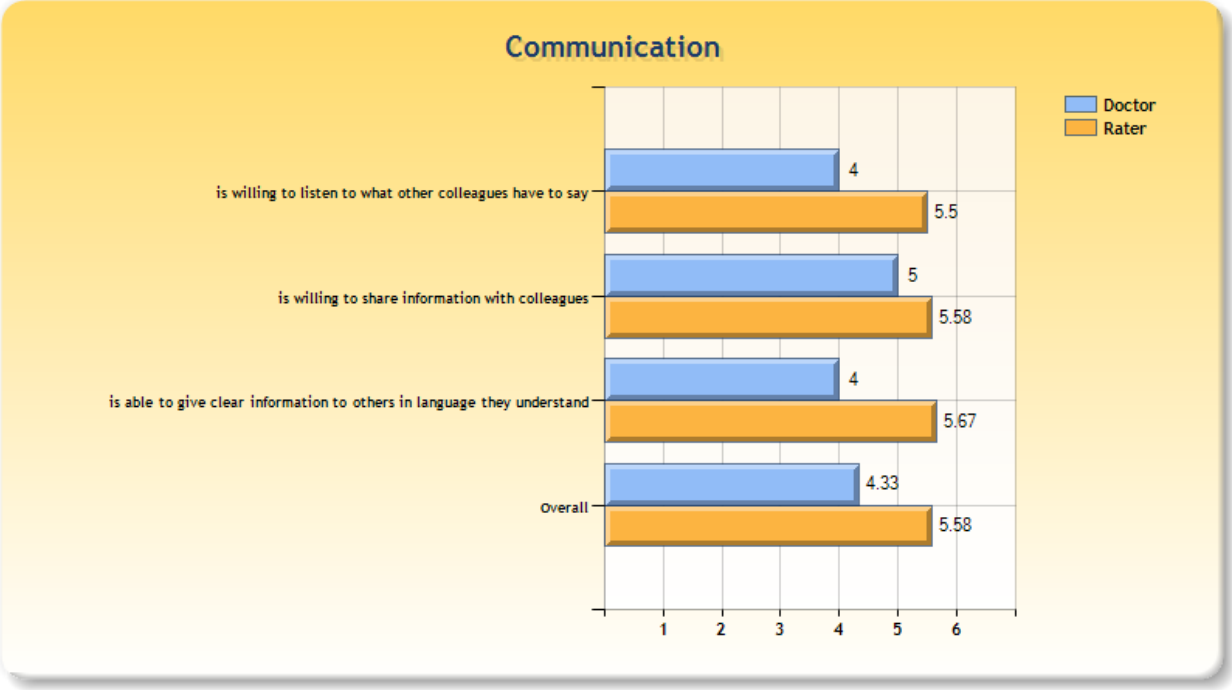
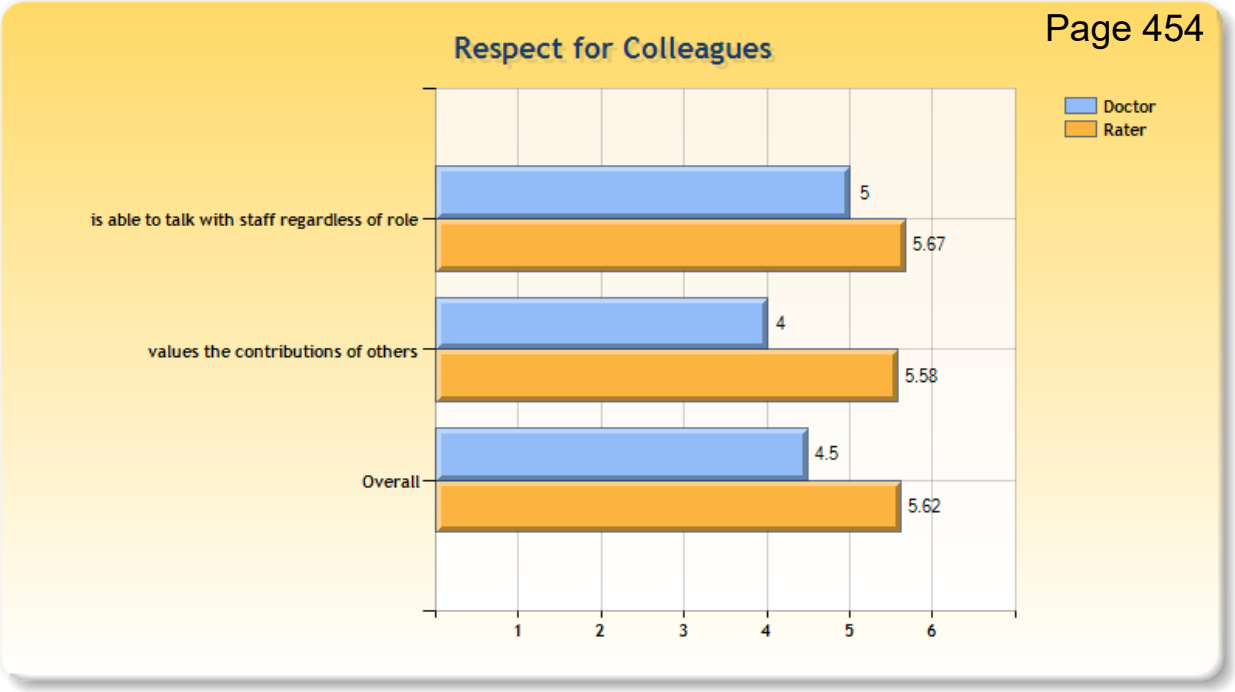


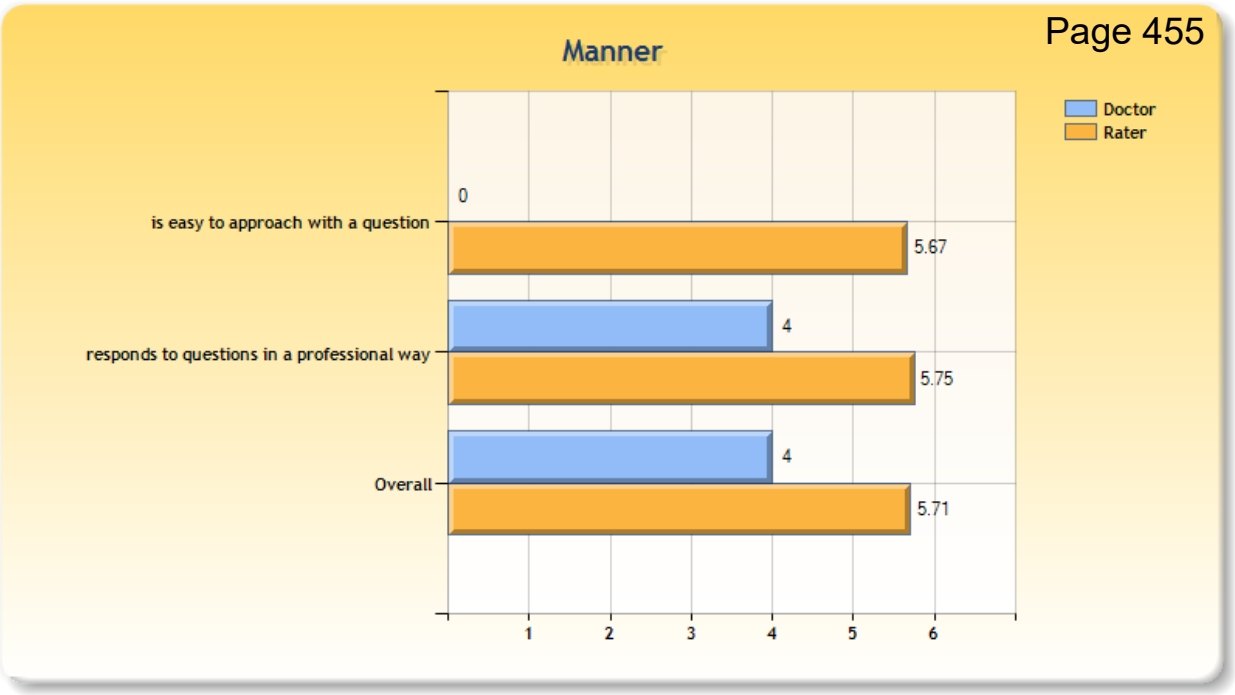
Doctor Comments	
Does well in this area	**Could develop in this area**
written handovers and raisn =g information at meetings, checking minutes for accuracy of record	working toward agreemetns regarding best way of communication within department

Rater Comments	
Does well in this area	**Could develop in this area**
Clear and excellent communicator, always helpful and open	More time to teach trainees on IPC
Christine communicates well with others and is always willing to provide guidance. Her information is current and understandable.	
DR PETERS HAS A WIDE CLINCAL KNOWLEDGE AND THIS CAN BE HELPFUL WITH OTHER COLLEAGUES	
Excellent teacher and Mentor to trainees and very humble. One of world best in Infection Prevention and Control.	
Christine communicates well within the team and provides clear handovers.	
Excellent communication skills , good at sharing information	
Clear communication of decision making on ICU microbiology ward round. Always takes into account opinions of other team members.	
Always communicates to laboratory staff why requests are being made and provides background	

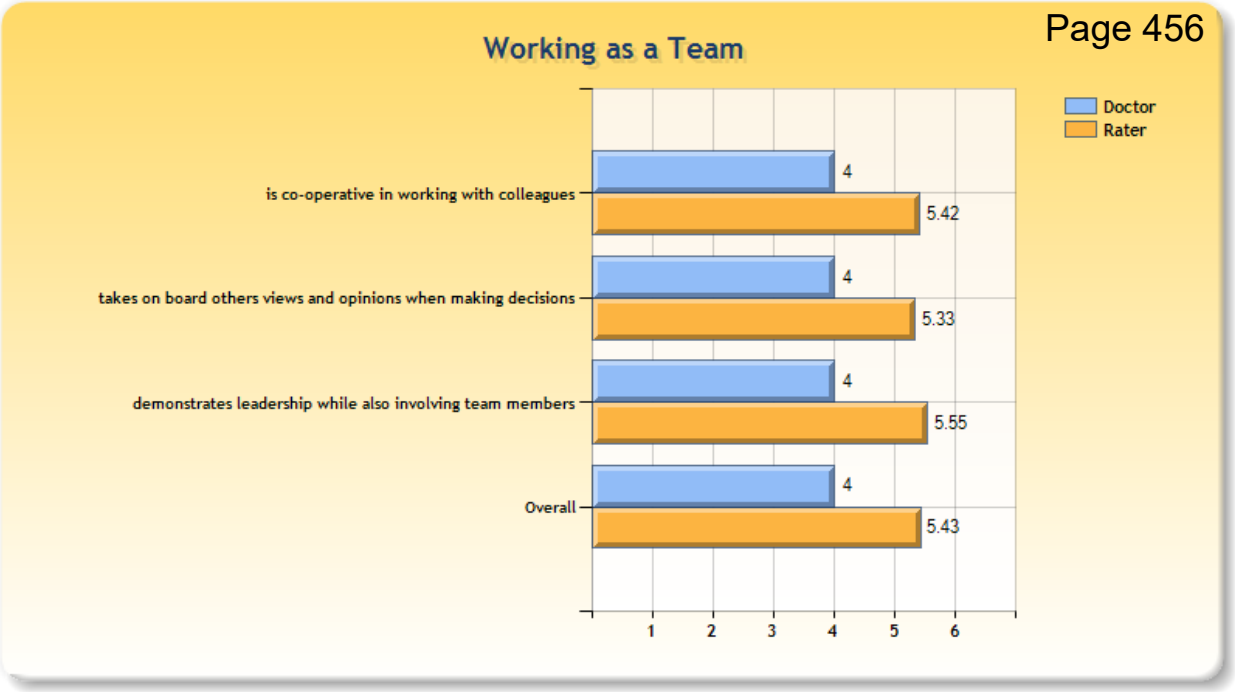


Doctor Comments	
Does well in this area	**Could develop in this area**
good communication with colleagues and other specialties	communication with managagers and infection control is problematic

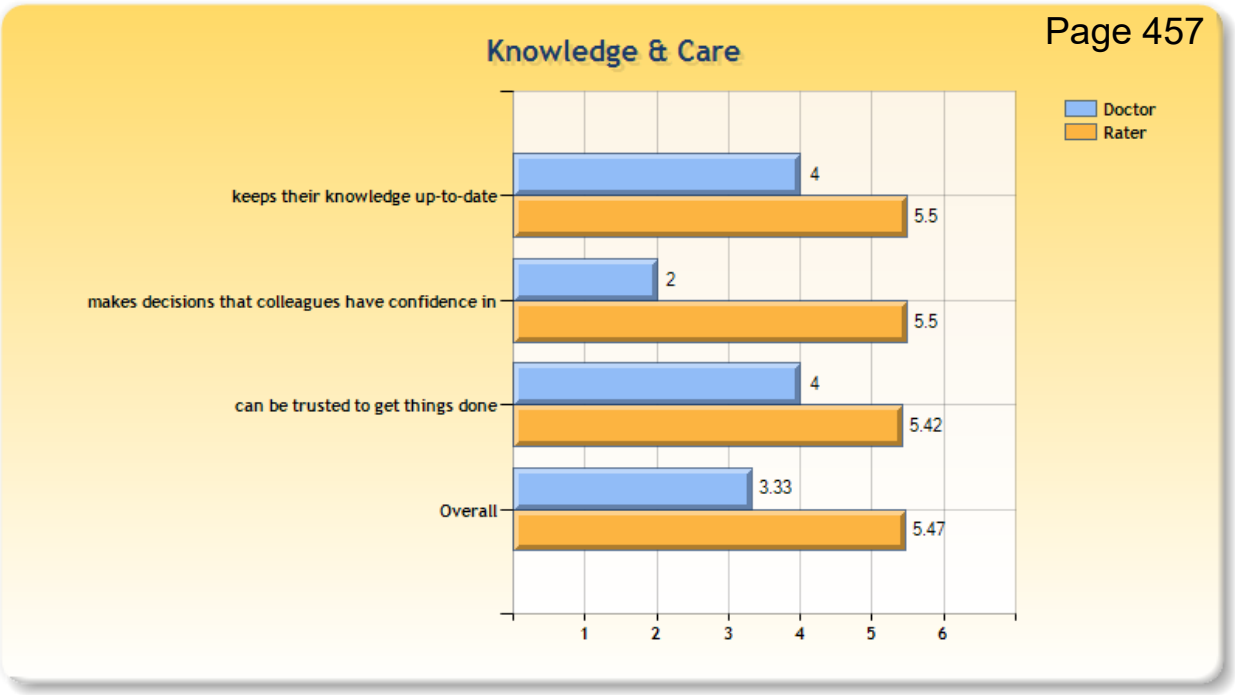
Rater Comments	
Does well in this area	**Could develop in this area**
Gets on well with all members of multidisciplinary team, well liked by lab colleagues, always appreciative of others	-
Christine is always willing to discuss anything with anyone irrespective of grade or role. She is also keen to understand the thoughts and contributions of others and never makes anyone feel insignificant with their opinions.	Could be more visible at meetings where all staff are present.
DR PETERS IS COMFORTABLE SPEAKING TO STAFF OF ANY ROLE	
Very humble, down to earth	
Christine respects all other colleagues within the department.	
Speaks to all levels of staff within the department and uses appropriate language for different grades.	



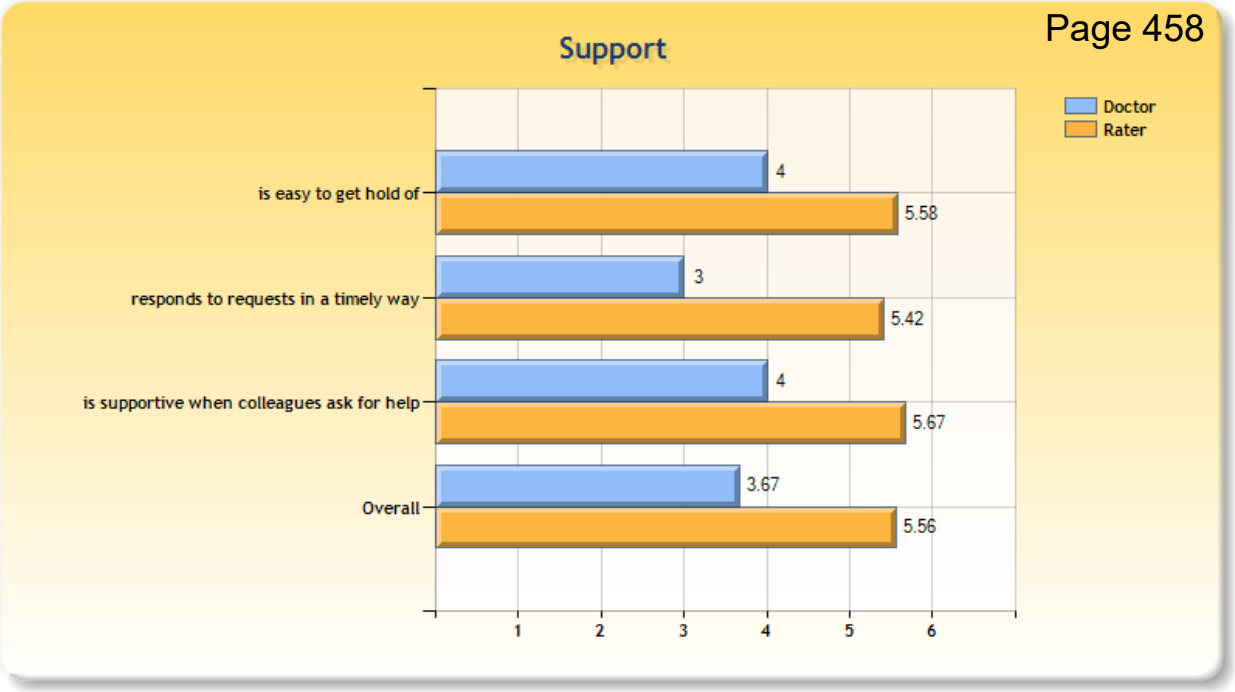
Doctor Comments	
Does well in this area	**Could develop in this area**
always available to trainees and collegues	have observed some people feedback that they feel they cannot disagree - however this is difficult in teh context of a PI
Rater Comments	
Does well in this area	**Could develop in this area**
Christine has always been willing to assist me with any question that I have, she responds promptly and professionally. I have often dropped her a message to ask a question and she has always willingly offered her advice, guidance and support.	Spare more time to teach trainees
DR PETERS IS VERY APPROACHABLE AND IS WILLING TO HELP WITH ANY QUESTIONS ASKED	
excellent teacher, she was very helpful when I was preparing for FRCPath Part 2 exams. Always ready to answer my questions.	
Christine is very approachable and answers questions to the best of her ability.	
Always approachable.	



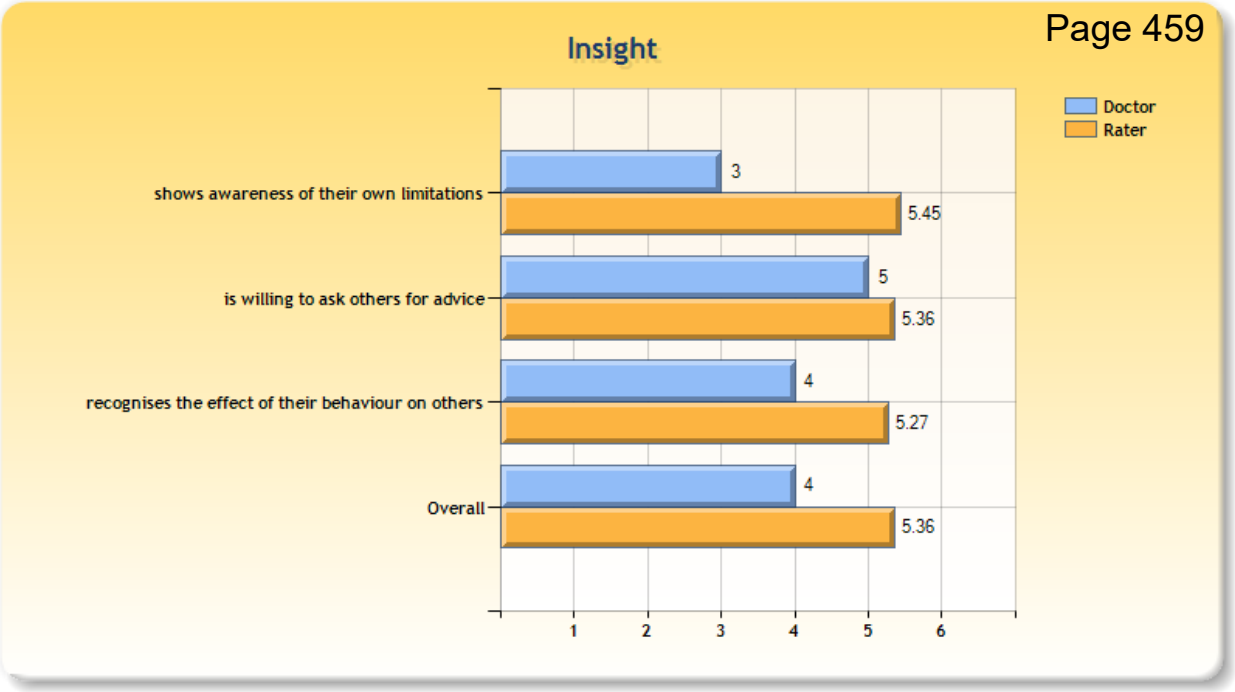
Doctor Comments	
Does well in this area	**Could develop in this area**
i value others opinions, and am ready to acknowledge limitations of my own experience	IPC team and managers have frequently fed back different views
Rater Comments	
Does well in this area	**Could develop in this area**
Great team member and has good people-skills, leads by example	
Christine works well within the wider MDTs that she is attached to and is well respected in the CF MDT. Again she is always considerate of the opinions of others and has never disregarded anyones contribution to conversation or decision making. When required within this MDT she will take the lead on tasks and will also be willing to support others who are taking the lead.	
DR PETERS HAS TAKEN LEAD WITH STAFF MEMBERS AND CAN WORK WELL WITH COLLEAGUES	
She is a team player.	
Christine co-operates well with other colleagues.	
We have been working together as a CF MDT over the last few months and Christine's involvement in progressing guidelines and answering queries has been vital to making great progress.	



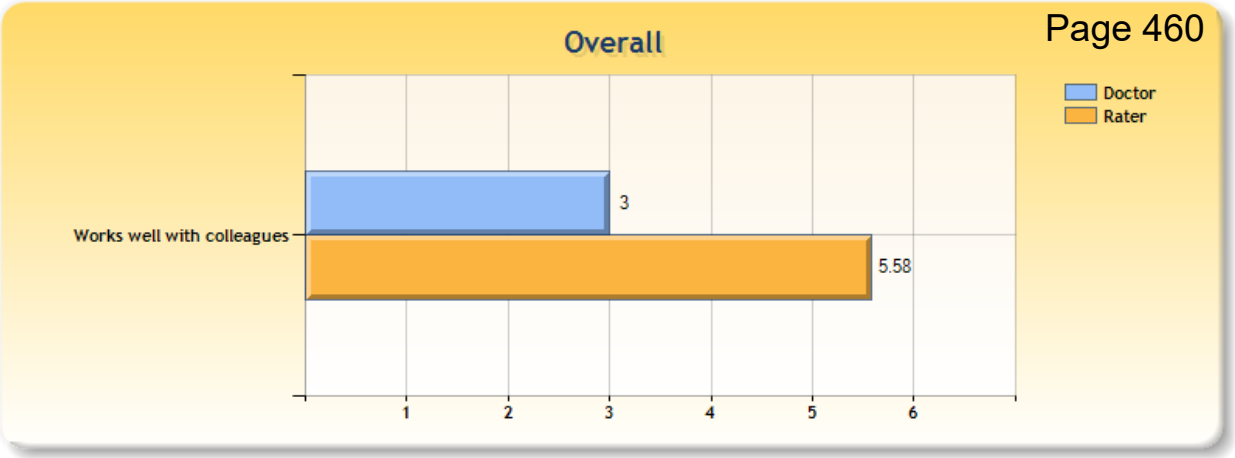
Doctor Comments	
Does well in this area	**Could develop in this area**
read a lot on areas that are relevant	with teh PI ongoing there has been a lot of unermining of credibility
Rater Comments	
Does well in this area	**Could develop in this area**
Dependable, and very knowledgeable	
Christine is always ahead of the curve in her knowledge. She is continually research issues which are close to her heart and pivotal to her working life. I have full confidence in her decisions when it comes to patient care and thus why I would contact her at anytime with any number of questions, knowing that she will have an answer or research until she can give me a balanced view on something. She will always see the job through and always gets things done no matter how busy she is.	
DR PETERS IS WILLING TO KEEP LEARNING WHEN NEW KNOWLEDGE IS AVAILABLE AND IS HANDS ON TO GET THINGS DONE	
Christine makes informed, sensible management decisions and willing to discuss these at handover meetings.	
Christine is very reliable and hardworking. She is very knowledgeable and I always value and have trust in her opinions.	
Clearly is a national expert in her domain. Has made valuable contribution to our departmental education programme.	



Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
Very approachable and supportive	It is best to email because by the nature of their job, Christine is not always on site. Usually but does not always respond in a timely way.
I have always found Christine easy to get hold of and very prompt in her responses. She has never been unable to help me and willingly puts aside time to give advice and support when this is required.	
DR PETERS IS ACCESSABLE AND REPLIES WHEN NEEDED . SHE IS SUPPORTIVE WHEN COLLEAGUES NEED THIS	
Ready to help. She was extremely helpful when I joined the Micro Lab in 2020	
She is very supportive and always willing to swap OOH shifts if required.	
Christine has always got back to me when needed by email or phone.	
In relation to complex microbiological and infection control issues that relate to patient safety, Dr Peters is a fantastic source of knowledge and support for her colleagues. I cannot overstate the level of respect that our clinical team have for her.	
Is always supportive of staff	



Doctor Comments	
Does well in this area	**Could develop in this area**
Rater Comments	
Does well in this area	**Could develop in this area**
I consider Christine to be very aware of her limitations and therefore this is why she is continually seeking to enhance her knowledge. She is always willing to ask for information and supporting areas that are not her domain. She is very considerate of what she says and the impact that this could have on others - that said she always keeps the health safety and wellbeing of the patients are the front of any judgement. DR PETERS ACCEPTS THAT SHE IS STILL LEARNING AND HAS NO PROBLEM ASKING FOR HELP WHEN REQUIRED Christine discusses challenging cases with other Consultant colleagues.	



Doctor Comments
Other Comments
as I am aware of complaints against me and as a whistleblower have had things said in the public domain I am very aware of animosity towards my stance on IPC infection safety issues
Rater Comments
Other Comments
Christine is a valuable member of the QE Microbiology department.
Dr Peters is an excellent colleague, we are so lucky to have her in our team
DR PETERS WORKS WELL WITH ALL COLLEAGUES
Dr. Peters is an outstanding and well respected colleague. She is so helpful when she comes to ICU to give us microbiological advice, so important in the management of critically ill patients. She is both very knowledgeable and approachable. During the Covid pandemic she has been an invaluable authority on aerosol transmission and mitigation in the workplace.
I believe Christine to be an asset to the service, she is diligent , trustworthy and gets the job done . She is only concerned for the welfare of others and will strive to achieve this .She is considerate of others and is happy to promote the education of others and support us in our professional development.
Wonderful colleague, mentor and excellent IPC Doctor

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2015/2016

24/09/2015

Appraisal ID: 19275

Appraisal Status:

Form 4 - Completed (29/09/2015)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	24/09/2015 15:00
Place of Appraisal	Janet Horner's Office, 1st Floor, Macewan Building, GRI
Appraisal Period	2015/2016

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Dr Janet Horner
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Dr Janet Horner, on 28/09/2015

Approved By Appraisee, Dr Christine Peters, on 29/09/2015

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Dr Peters has a 7.5 PA contract , which includes 1.5 PAs for oncall and 1 SPA. It also includes 2 PAs for her role as Infection Control Doctor (ICD). Consistent with her last PDP and her responsibility for CL3 analyses within the lab, she has visited the laboratories in Newcastle and completed RCPath online course. She has also attended an ebola PPE course in Newcastle to help with her ICD role. She provided a detailed CPD report evidencing 64 CPD points to end March 2015. This covered clinical, academic and professional categories, including attendance at the Federation of Infection Societies conference She supervises a ST1 trainee and has attended a course on new requirements for Educational Supervisors .
Actions / Agreed Outcomes:	As she now has clinical responsibility for Cystic Fibrosis Unit, Dr Peters still wishes to visit laboratories in St Andrews to examine techniques looking at antibiotic sensitivities and attend a clinical CF conference in 2016 (see PDP) ---------- See PDP

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peters has had an initial look at gentamicin/vancomycin level data for GGC and identified that ITU and renal unit use of these antibiotics is following protocols. Lack of relevant staff time has precluded more detailed audit of this data. She has also produced a detailed document on GGC Laboratory Handling of High Risk VHF Specimens. Her involvement and contribution in this challenging area were recognised and complimented by the Clinical Governance Committee. Dr Peters identified a significant event in her role as ICD, when there was sewage ingress into a neurosurgical theatre. She identified issues related to efficiency of communication within the ICD team and agreement with the management team on appropriate actions required to secure patient safety. She has requested opportunity in future for ICD input into estates, in particular to ensure adherence to HAI scribe requirements. Further discussion covered her wider concerns about patient safety that have been encountered in her ICD role. She has discussed these in detail with senior colleagues, seeking their opinions. These concerns have been escalated by her and colleagues to the relavent senior management personnel and a response is awaited. She has also examined GMC advice on highlighting patient safety issues.
Actions / Agreed Outcomes:	Dr Peters may wish to seek further GMC advice on raising issues about patient safety concerns. Dr Peters may wish to discuss her job plan with regard to her ICD role.

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 0 (D) Patient Surveys = 0 (E) Complaints / Critical Incidents Statement = 1
Discussion:	Dr Peters recieved a specific request from the Cystic Fibrosis Team for her microbiology involvement, following their move to the QEUH. She attends their MDT and is working on antibiotic sensitivities and epidemiology. Dr Peters was complimented by the Clinical Governance Committee for her helpful and conscientious work on VHF. She is actively involved in the infection control team and reports meetings are now minuted, helping with management and communication. Dr Peters has received no complaints since her last appraisal. Patient surveys are inappropriate for Dr Peters in her role as microbiologist.

Actions / Agreed Outcomes:	No issues

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Dr Peters has renewed membership of MDDUS. She has completed probity and health statements and there are no issues.
Actions / Agreed Outcomes:	None

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Domain 1	A - CPD log (every appraisal)	-	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	-	1	1	1	1
	C - Significant Event (every appraisal)	-	1	1	1	1
	F - Health Statement (every appraisal)	-	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	-	0	1	0	0
	D - Patient Surveys (once every 5 appraisals)	-	1	1	0	0
	E - Complaints & Incidents (every appraisal)	-	1	1	1	1
Domain 4	G - Probity Statement (every appraisal)	-	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Health Statement	-	No Issues	No Issues	No Issues	No Issues
Probity Statement	-	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	-	Issues	No Issues	No Issues	No Issues

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Research	-	Completed
Teaching	-	Progressing
Following work that I did in Crosshouse on gent/vanc val...	-	Completed
I have been allocated an ST 1 to supervise and would lik...	-	Completed
As I am now responsible within lab for CL3 analyses and ...	-	Completed
As I am to be responsible within lab for CL3 analyses an...	-	Completed
As I am to be responsible within lab for CL3 analyses an...	-	Progressing
In my roll as ICD, ebola/VHF is current concern and I wo...	-	Completed

New Personal Development Plan for the Current Period

Title	Time Scale
As I am to be responsible within lab for CL3 analyses an...	-
Clinical responsibility for CF unit	-
As I am to be responsible within lab for CL3 analyses an...	-
Audit of TB diagnoses for CMVN	-
Keep up-to-date with general microbiology	-

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2016/2017

15/09/2016

Appraisal ID: 25452

Appraisal Status:

Form 4 - Completed (06/10/2016)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	15/09/2016 15:00
Place of Appraisal	Janet Horner's office, Macewan Building, GRI
Appraisal Period	2016/2017

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Dr Janet Horner
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Dr Janet Horner, on 20/09/2016

Approved By Appraisee, Dr Christine Peters, on 06/10/2016

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1

Discussion:	Since her last appraisal Dr Peters has increased her sessional committment to 11.5 PAs. This has been in recognition of the time committment required to tackle the numerous and extensive issues related to her current role as infection control doctor (ICD) at QEUH. She continues with weekly ICU rounds and contributes to TB, CF and orthopaedic MDTs as well as routine reporting. She is Educational Supervisor for microbiology trainees (see PDP). There continue to be staffing issues and her job plan is yet to be finalised. Following the appointment of a new colleague she plans to to relinquish her role as ICD for now. She is comfortable with this decision and looks forward to taking forward laboratory developments and her CF work. Dr Peters provided her CPD records from RCPAth that showed a total of 59 points to 31.3.16. Her PDP included objectives relevant to her taking on responsibilities with adult CF unit following its move from GGH to QUEH. She provided evidence of attendance at the Scottish Cystic Fibrosis meeting. As part of last year's PDP she was keen to keep up-to-date with general microbiology and attended the Federation of Infection Societies Conference in Nov 2015. She also attended conference in Pakistan arranged in conjunction with RCPAth where she organised very well received workshop on laboratory quality control and delivered a lecture in infection control. She also lectured in Mumbai as part of an Indian - UK scientific cooperation initiative. She benefited for the Indian experience of dealing with multi-resistant pathogens. She would like to continue to be involved in similar international initiatives in the future as she has an interest in global health issues. She has been unable to meet her objective to audit TB infection data and clincial management/investigation/outcomes, to support the introduction of PCR for diagnosis becuase of the difficulty in capturing the relevant clinical data. This has been accepted nationally as a very difficult case to make and is currently being considered by Health Protection Scotland.
Actions / Agreed Outcomes:	Agree job plan and aim for 10PA

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peters has been involved in the production of a number of documents on infection control advice, minimising risk to CF children at school and management of patients with Mycobacterium Abscessus. The latter issue has also been presented at a national meeting. She is currently actively investigating Mycobacterium Abcessus cross infection in paediatric CF patients. She has been involved in a prospective audit of vascular surgery antibiotic prophylaxis. The raw data is now available for writing up. She reflected on a significant event that occurred in the endoscopy suite. She initially had to persuade others that there were infection control issues, identify that, although human error was involved, there were also system changes to be made and a policy for BBV risk assessment in this setting to be developed. Dr Peters has been encouraging bio safety culture following and enquiry from, and walk round of, the pathology department. She is keen to pursue further formal training on bio safety (see PDP). Dr Peters has completed health statement and there are no issues.
Actions / Agreed Outcomes:	None

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 0 (D) Patient Surveys = 0 (E) Complaints / Critical Incidents Statement = 1
Discussion:	Dr Peters had completed a reflective template on working with colleagues. This was in response to UKAS inspection flagging up communication issues within the department and the GMC training survey also identifying communication issues with trainees within the department. In response to these, an existing 9am handover has now been formalised with a written email including CHI numbers of patients dealt with out of hours. There are now minuted weekly consultant meetings. Looking externally, in response to clinical request, she now attends the orthopaedic MDT. Following feedback from a colleague she undertook a personality team role profiling exercise and discussed this at her appraisal. This has helped her positively reflect on her role within teams. She also received recognition of her high national profile in infection control and that she has had significant impact in the last 18months in her post at SGH/QEUH. She recognises that her clinical relationships with colleagues have really developed in the last year. She submitted 2 emails congratulating her on the quality and clarity of her presentations following lectures. Dr Peters has received no complaints.

Actions / Agreed Outcomes:	None

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Dr Peters has completed probity statements and there are no issues. She has no conflicts of interest.
Actions / Agreed Outcomes:	None

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	0	1	0	0	0
	D - Patient Surveys (once every 5 appraisals)	1	1	0	0	0
	E - Complaints & Incidents (every appraisal)	1	1	1	1	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Health Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	Issues	No Issues	No Issues	No Issues	No Issues

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Teaching	-	Completed
As I am to be responsible within lab for CL3 analyses an...	-	Completed
As I am to be responsible within lab for CL3 analyses an...	-	Completed
Clinical responsibility for CF unit	-	Completed
As I am to be responsible within lab for CL3 analyses an...	-	Completed
Audit of TB diagnoses for CMVN	-	Completed
Keep up-to-date with general microbiology	-	Completed

New Personal Development Plan for the Current Period

Title	Time Scale
Educational Supervisor	9 months
Certification in Bio safety	1 year - 1st module

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor

Summary of discussion

Discussion:	Dr Peters plans to undertake STAR training modules as part of her PDP for next year, relevant to this role. It is clear that her response to the GMC survey is positive, making changes to improve communication lines within the department for trainees.
Issues:	Identify the relevant required time within her job plan for this role.
Actions / Agreed Outcomes:	Agree updated job plan.

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	Yes

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2017/2018

05/10/2017

Appraisal ID: 33629

Appraisal Status:

Form 4 - Completed (24/10/2017)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	05/10/2017 14:00
Place of Appraisal	Janet Horner's office, Macewan Building, GRI
Appraisal Period	2017/2018

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Dr Janet Horner
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Dr Janet Horner, on 09/10/2017

Approved By Appraisee, Dr Christine Peters, on 24/10/2017

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Dr Peters has a busy 11.5 PA contract, including on call. In the last year she has assumed role of Head of Service for microbiology at the QEUH. She relinquished her infection control doctor role and has developed her interest in cystic fibrosis. She has successfully merged the paediatric and adult microbiology services, developing a merged paediatric/adult Cystic fibrosis (CF) service. Dr Peters provided evidence of CPD in the Soar system. This included evidence of study related to CF, including attendance at international CF meeting and regular MDT involvement. She would like to further develop her paediatric microbiology knowledge (see PDP for next year). She has been accredited as an Educational Supervisor on the basis of her experience but has been unable, although registered, to complete her certificate in Biosafety. She has, however, established a cross discipline committee in GGC to address biosafety In line with her new role, she may also seek an independent leadership course.
Actions / Agreed Outcomes:	To attend paediatric microbiology meeting and a leadership course.

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peters submitted several emails of thanks and commendation, SOPs and protocols for CF patient management and supervision of audit on staph aureus infection in paediatric CF patients, as evidence of her very active role in quality improvement. She had also been involved in an antibiotic prescribing protocol to secure appropriate prescribing in CF patients She has established MDTs for orthopaedics and ward rounds in NICU and paediatric haematology oncology wards Following a deanery visit she has instituted various changes to postgraduate training although she acknowledged that she had been unable to address issues relating to protected job plan time for training. She expressed concern about the limited number of staff for the complexity of clinical service being supported She has completed Health and Probity statements and there are no issues. During appraisal discussions several significant events were discussed and reflected on by Dr Peters.
Actions / Agreed Outcomes:	None

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 0 (D) Patient Surveys = 0 (E) Complaints / Critical Incidents Statement = 1
Discussion:	Dr Peters has now well established regular minuted consultant meetings. She has reinstated medical staff attendance at lab staff meetings, which has been well received. She continues to work on bridging gaps between north and south services. Her drive to establish MDTs and support clinical liaison has been well received. She has reorganised the call system and rotas Discussion revealed that she has very supportive staff. Dr Peters has received no complaints. During discussion her record keeping had been shown to be excellent in relation to supporting the board answering questions in relation to 2 legal cases.
Actions / Agreed Outcomes:	Continue to work positively with colleagues in north sector.

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Dr Peters has no private work and no conflicts of interest.
Actions / Agreed Outcomes:	None.

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	1	0	0	0	0
	D - Patient Surveys (once every 5 appraisals)	1	0	0	0	0
	E - Complaints & Incidents (every appraisal)	1	1	1	1	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Health Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	No Issues	No Issues

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Educational Supervisor	9 months	Progressing

New Personal Development Plan for the Current Period

Title	Time Scale
Paediatric Microbiology	6 months
Develop leadership skills	2 years

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Following a deanery visit Dr Peters has instituted various changes to postgraduate training although she acknowledged that she had been unable to address issues relating to protected job plan time for training. Job planning is still not finalised and it is difficult to define a time scale for this. She has been accredited as an Educational Supervisor on the basis of her experience but has been unable to complete the appropriate STAR training modules, again due to time constraints.
Issues:	Inadequate protected time within job plan for training
Actions / Agreed Outcomes:	-

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	No
Clinical Supervisor	No

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2018/2019

26/11/2018

Appraisal ID: 41689

Appraisal Status:

Form 4 - Completed (30/11/2018)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	26/11/2018 15:00
Place of Appraisal	Dr Horner's office, Macewan Building, GRI
Appraisal Period	2018/2019

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Dr Janet Horner
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Dr Janet Horner, on 29/11/2018

Approved By Appraisee, Dr Christine Peters, on 30/11/2018

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Dr Peters has reduced to a 10 PA contract, including on call. She continues as Head of Service for microbiology at the QEUH. There have been significant issues with staffing in the last year affecting both consultants and trainees in south sector. Staffing was highlighted at a recent UKAS inspection and is now on the Risk Register. Dr Peters has been very active in backfilling of gaps on rotas with the attendant additional work. Dr Peters provided evidence of her CPD on SOAR and recorded that she accrued 56 points. These included attendance at the North American Cystic Fibrosis Conference in Nov 2017 and coaching sessions for leadership development, both elements in last years PDP. The latter highlighted that she has good listening skills and self awareness. Dr Peters provided evidence of various posters and lectures that she had been involved with developing and delivering.
Actions / Agreed Outcomes:	Continue to develop general paediatric micro knowledge to complement work already completed in paediatric BMT and paediatric CF areas. Continue to access material relevant to adult and paediatric CF interest.

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peters provided details of various audits, including of blood culture turnaround time, infection control of mycobacterium abscessus in CF patients, Dyson fan contamination and prevalence of pseudomonas aeruginosa antibiotic resistance in CF patients. Dr Peters has produced Consultant Induction document and other SOPs in preparation for successful UKAS inspection of laboratory. Dr Peters has been involved as a whistle blower on patient safety issues related to infection control at QEUH. Her concerns have been escalated to Health Board level and placed on the Risk Register. She has found the exercise time consuming but has had good support from the BMA throughout the process.
Actions / Agreed Outcomes:	Continue good approach to securing patient quality and safety

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 0 (D) Patient Surveys = 0 (E) Complaints / Critical Incidents Statement = 0
Discussion:	Dr Peters has had no formal complaints about her practice but submitted an email complaint from a GP about general service in south sector. Dr Peters dealt with this by telephone call to Gp and well constructed, considered email reply. As a result of this a generic email box has been created for GPs to use to access secondary care microbiology advice. Dr Peters is due to complete a MSF. However, the last year has been challenging and not an ideal time to undertake this. She will complete for her next appraisal
Actions / Agreed Outcomes:	Complete MSF April/May 2019 for next appraisal in July 2019

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Dr Peters has completed health and probity statements and there are no issues. She has received no industry sponsorship, does no private practice and has no conflicts of interest.
Actions / Agreed Outcomes:	None

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	0	0	0	0	0
	D - Patient Surveys (once every 5 appraisals)	0	0	0	0	0
	E - Complaints & Incidents (every appraisal)	1	1	1	1	0
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Health Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	No Issues	No Issues

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Educational Supervisor	9 months	Completed
Paediatric Microbiology	6 months	Progressing
Develop leadership skills	2 years	Completed

New Personal Development Plan for the Current Period

Title	Time Scale
Leadership	-
Paediatric Haematology Infections	1 year
Cystic Fibrosis	1 year

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Dr Peters has dropped her role as educational supervisor
Issues:	None
Actions / Agreed Outcomes:	-

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	No
Clinical Supervisor	No

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2019/2020

28/08/2019

Appraisal ID: 48695

Appraisal Status:

Form 4 - Completed (11/09/2019)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	28/08/2019 02:30
Place of Appraisal	Dr Peters Office
Appraisal Period	2019/2020

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Rachel Green
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Rachel Green, on 10/09/2019

Approved By Appraisee, Dr Christine Peters, on 11/09/2019

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Christine is a busy microbiologist who has a wide range of activities within QEUH to include Specialist Reference Laboratory work, clinical communications and attendence at ICU ward rounds daily. She has dropped a session over the past year but with new junior colleagues arriving she feels that she has time in her job for both this role and head of department. Pressure in terms of numbers of colleagues has had an effect on her CPD acquisition however evidence was provided of plenty of reflective learning through complex case discussions , meetings etc. The CPD presented does not reflect an entire year due to absence for health reasons but is in keeping with her scope of practice although she reflected that additional paediatric microbiology education would be beneficial. She has completed her stat/mandatory training.
Actions / Agreed Outcomes:	It may be prudent to attend an international meeting to both meet CPD requirements as well as PDP for paediatric microbiology

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Chrisitne has undertaken a large audit on the interactions of clinical microbiologists on the wards of QEUH and the alterations to therapy from these interactions. The data has been gathered but is yet to be analysed, however this will be valuable information in terms of antimicrobial stewardship. Plenty of evidence was given for her role in Infection control issues, everyday laboratory interventions and production of local and guidelines. The laboratory underwent a UKAS inspection this year and Christine was involved , the audit was successful but there were recommendations regarding the competency assessment of Consultants and these records have been improved and completed to reflect these recommendations. Christine has not been involved in an SCi in this appraisal year. Chrisitne was off this year but has returned to work and is now entirely well with no changes to her job plan required. Christine has been involved in quality improvement work within the laboratory including work across the city regarding QI with blood culture work which is about to be implemented board wide.
Actions / Agreed Outcomes:	Christine needs to complete a personnel audit in the coming year and has ideas regarding care of the elderly urine sampling.

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 1 (D) Patient Surveys = 0 (E) Complaints / Critical Incidents Statement = 1
Discussion:	This is Christines Revalidation year and so she has completed an MSF. As she does not have contact with patients No Patient Questionnaire is required. Her MSF was outstanding and she is obviously a very well respected colleague across many clinical areas.She has refelcted on the comments and will look at how best to prioritise her various commitments and reflect on how to maintain good input into the clinical teams. She has not been involved in any complaints nor critical incidents.
Actions / Agreed Outcomes:	No actions required

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Christine is not on any ethics committees nor a signatory of an endoment fund. She has received no industry sponsorship, does no private practice and has no conflicts of interest.
Actions / Agreed Outcomes:	No action required

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	0	0	0	0	1
	D - Patient Surveys (once every 5 appraisals)	0	0	0	0	0
	E - Complaints & Incidents (every appraisal)	1	1	1	0	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
Health Statement	No Issues	No Issues	No Issues	No Issues	Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	No Issues	No Issues

Appraiser Commentary for 2019/2020 Period

Health Issue(s)	As mentioned above Christine was off work for a period of 3 months but is now entirely well and back to work with no requirements to change her job plan or her working enviroment.
Probity Issue(s)	-
Complaints/Critical Incidents Issue(s)	-

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Paediatric Microbiology	6 months	Progressing
Leadership	-	Progressing
Paediatric Haematology Infections	1 year	Progressing
Cystic Fibrosis	1 year	Completed

New Personal Development Plan for the Current Period

Title	Time Scale
CF Pseudomonas and Burkholderia eradication	6 months
MAnagement of CPE infection	6 months
Neurosurgical infections	1 year

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Chrisitne is not an educational supervisor nor clinical supervisor
Issues:	None
Actions / Agreed Outcomes:	None

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	No
Clinical Supervisor	No

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2020/2021

15/04/2021

Appraisal ID: 61221

Appraisal Status:

Form 4 - Completed (16/08/2021)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	15/04/2021 14:00
Place of Appraisal	Dept of path QEUH Glasgow
Appraisal Period	2020/2021

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Hemamalini Pitchamuthu
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Hemamalini Pitchamuthu, on 23/07/2021

Approved By Appraisee, Dr Christine Peters, on 16/08/2021

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Dr Peters is a busy microbiologist involved in a wide range of clinical activities which include specialist reference laboratory work , Ward rounds at the ICU daily , attending to incoming calls from GP, hospital clinicians including paediatrics. Dr Peters is also involved in teaching, working with and supervising trainees. Dr Peters also is the lead clinician which involves organising rotas, managing departmental leave, departmental goals and organisation, job plans et cetera. Dr Peters has achieved a total credit of 62 CPD points this year.
Actions / Agreed Outcomes:	Continue the same.

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peter's developed a guideline with the Biosafety group regarding risk assessments in work place and for POCT COVID testing, this involved liaison with IPCT and virology in order to rapidly institute safe practice for use of POCT tests in COVID patients. Dr Peters developed antifungal use in paediatric haematology along with clinicians which is due for submission to AMT. Dr Peters did an audit of Neurosurgical site infections with trainee where the main finding was low rates of neurosurgical and EVD infections which is an improvement since last project 4 years ago and reassuring in context of cancelled surveillance during COVID. Dr Peters attends weekly Complex case meeting, specifically set up to discuss Cryptococcal case with Clinical team. Dr Peters is also involved in participation in Independent Review, HSE investigation, OB review, Whistle blowing review, Public Inquiry as whistle blower on QEUH building inadequacies and infection control culture.
Actions / Agreed Outcomes:	Continue good approach to securing patient quality and safety.

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 1 (D) Patient Surveys = 1 (E) Complaints / Critical Incidents Statement = 1

Discussion:	Dr Peters is not due for an MSF this year. Dr Peters is exempt from patient surveys as she does not have contact with patients. Dr Peters has been involved extensively in an OD process which has been the result of recommendations by the Oversight Board for GGC with regard to the issues in GGC Infection Control.This has involved hours of SPA time, developing communication strategies, and reflecting on 5 years of toxic culture and communication breakdowns.This is an ongoing process and continues to dominate the post external review and OB findings with regard to infection control dysfunctionality in GGC - which was a contributing factor to the patient safety issues experienced. Dr Peters has spent a lot of time ensuring robust communications and handovers within Microbiology and Infection control and taken part in a weekly "Buzz meeting" which aims to address a gap in the communications across Microbiology, virology and infection control. Dr Peters feel that there are continuing significant issues with interpersonal relationships as a result of whistle blowing and being targeted which has been a huge pressure on the Department and personally. However the feedback from OD has been encouraging and that Dr Peters professional conduct has been exemplary and she takes encouragement from that in continuing the job in hand. Dr Peters has not been involved in any complaints or critical incidence.
Actions / Agreed Outcomes:	No actions required.

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Christine is not on any ethics committees nor a signatory of an endowment fund. She has received no industry sponsorship, does no private practice and has no conflicts of interest.
Actions / Agreed Outcomes:	None.

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	0	0	0	1	1
	D - Patient Surveys (once every 5 appraisals)	0	0	0	0	1
	E - Complaints & Incidents (every appraisal)	1	1	0	1	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Health Statement	No Issues	No Issues	No Issues	Issues	No Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	No Issues	No Issues

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Paediatric Microbiology	6 months	Progressing
Leadership	-	Progressing
Paediatric Haematology Infections	1 year	Progressing
CF Pseudomonas and Burkholderia eradication	6 months	Completed
MAnagement of CPE infection	6 months	Not Continuing
Neurosurgical infections	1 year	Progressing

New Personal Development Plan for the Current Period

Title	Time Scale
Attend Paediatric International conference	1 year
Biosecurity	1 year

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Dr Peters is not an educational supervisor.
Issues:	None.
Actions / Agreed Outcomes:	None.

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	No
Clinical Supervisor	No

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2021/2022

31/03/2022

Appraisal ID: 69448

Appraisal Status:

Form 4 - Completed (25/05/2022)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	31/03/2022 14:30
Place of Appraisal	QEUH, Dept of pathology Glasgow.
Appraisal Period	2021/2022

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Hemamalini Pitchamuthu
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Hemamalini Pitchamuthu, on 28/04/2022

Approved By Appraisee, Dr Christine Peters, on 25/05/2022

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Dr Peters is a busy microbiologist involved in a wide range of clinical activities which include specialist reference laboratory work , Ward rounds at the ICU daily , attending to incoming calls from GP, hospital clinicians including paediatrics. Dr Peters is also involved in teaching, working with and supervising trainees. Dr Peters also is the lead clinician which involves organising rotas, managing departmental leave, departmental goals and organisation, job plans et cetera. Dr Peters has found it difficult to get time for her CPD due to increase in workloads, staff shortages due to MAT leave but has still written papers and collaborated across disciplines to publish and educate on issues of COVID transmission. She has had lots of citations on her articles on nosocomial Covid.
Actions / Agreed Outcomes:	To continue to get her CPD credits , but to look into job plan so that she has protected time for CPD.

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peters has supervised a FY2 and produced communication for GP's regarding email referral system with regards to phone calls for urine sensitivity which could be avoided with better information on request form. Dr Peters has audited staph aureus outbreak through infections in paediatric CF patients which would allow monitoring of changes to prophylaxis policy which is in the process of being written up. Dr Peters has also done two more audits one on Meropenem with trainee to raise awareness of alternative agents to spare meropenem use if appropriate and also to monitor toxicity. The other audit on resistance patterns in ITU. Dr Peters has also written a few guidelines including MRSA which has been updated and submitted to the committee for approval, Paediatric haematology oncology guidelines for antifungal therapy and National risk assessment tool for PPE for COVID. Dr Peters has supervised BMS laboratory staff masters project on modulator drugs and Pseudomonas testing, assisted in laboratory liaison with phage therapy study for Diabetic feet. Dr Peters has also been taking part in Police investigation and Public inquiry into safety and failings in the building QEUH and RHC and potential harm caused by HAI infections. This has involved detailed statements almost 40 hours of police interview. Dr Peters has also investigated mistakes in laboratory with Quality team such as a wrong result being reported with apology being issued to patient Dr Peters has been involved as a whistle blower on patient safety issues related to infection control at QEUH which has been ongoing for the past few years. She has found that it has involved a huge amount of work and has been mentally and physically taxing. Dr Peters has reflected and acknowledged that this a difficult process and and that there are no compromises to patient safety. She also copes with all this as she has extremely good family support, supportive friends. Dr Peters is also a keen gardener which helps her to focus on other interests.
Actions / Agreed Outcomes:	Continue good approach to securing patient quality and safety.

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 1 (D) Patient Surveys = 1 (E) Complaints / Critical Incidents Statement = 1

Discussion:	Dr Peters has raised issues regarding team functioning within Microbiology, despite a year of OD work. Dr Peters feels that the actions for this were not completed and there remain significant strains in communication pathways and relationships. Dr Peters as clinical lead has had team members expressing dissatisfaction with communication from the infection control doctors. She has raised this with HOS and the infection control management and meetings have been setup to try to resolve these issues. Dr Peters continues to experience significant levels of pressure which relate to issues about her whistleblowing, and she maintains close contact with the BMA regarding this onadvice on how to manage these issues. Dr Peters reflected that she has a poor relationship with management and gave an example of one of the issues where she had recently been told that the clinical lead role would be advertised for others to apply for but was not given the courtesy of a discussion before this decision was shared. Dr Peters currently has good relations with trainees, colleagues within the department and clinical teams that she liaises with. Dr Peters continually seeks to try to find a way forward on the issues and recently asked for a meeting to discuss the current situation with her HOS and Clinical Director, where previous requests for mediation was not actioned by management and as a whistle blower she feels vulnerable and has experienced unfair treatment for speaking up within the organisation - a topic which she has escalated out with the organisation. Dr Peters will get her MSF in the next two years before her revalidation. Dr Peters is exempt from patient surveys as she does not have contact with patients. Dr Peters has not been involved in any complaints or critical incidence.
Actions / Agreed Outcomes:	To continue as above.

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Dr Peters is not on any ethics committees nor a signatory of an endowment fund. She has received no industry sponsorship, does no private practice and has no conflicts of interest.

Actions / Agreed Outcomes:	None.

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	0	0	1	1	1
	D - Patient Surveys (once every 5 appraisals)	0	0	0	1	1
	E - Complaints & Incidents (every appraisal)	1	0	1	1	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Health Statement	No Issues	No Issues	Issues	No Issues	No Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	No Issues	No Issues

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Paediatric Microbiology	6 months	Progressing
Leadership	-	Progressing
Paediatric Haematology Infections	1 year	Completed
Neurosurgical infections	1 year	Completed
Attend Paediatric International conference	1 year	Progressing
Biosecurity	1 year	Progressing

New Personal Development Plan for the Current Period

Title	Time Scale
critical care and antibiotic use	6 months

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Dr Peters is not an educational supervisor.
Issues:	No Issues.
Actions / Agreed Outcomes:	None.

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	Yes
Clinical Supervisor	Yes

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2023/2024

24/08/2023

Appraisal ID: 81547

Appraisal Status:

Form 4 - Completed (17/11/2023)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	24/08/2023 15:00
Place of Appraisal	QEUH, Dept of pathology
Appraisal Period	2023/2024

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Hemamalini Pitchamuthu
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Hemamalini Pitchamuthu, on 07/11/2023

Approved By Appraisee, Dr Christine Peters, on 17/11/2023

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Dr Peters is a busy microbiologist involved in a wide range of clinical activities which include specialist reference laboratory work, Ward rounds at the ICU both adult and paediatric daily, attending to incoming calls from GP, hospital clinicians including paediatrics. Dr Peters is also involved in teaching, working with and supervising trainees. Dr Peters has 56 credits accumulated for this year which reflects her areas of practice. Dr Peters found the FIS conference useful especially the session on diagnostics for fungal infections and the need for advancement in technologies.
Actions / Agreed Outcomes:	No Issues.

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Dr Peters has completed a section and contributed to publication of final document on National Group of CF microbiology standards which is now out nationally for comment. Dr Peters has contributed microbiology input and data into national discussion re Phage therapy. Dr Peters has done an audit on Septrin use for AUC committee on concern regarding side effects as widely used. Outcome was reassuring, however it was picked up that renal function is not monitored as well as should be and as a result guidelines wording was adjusted to highlight need. Dr Peters has also worked for accreditation of laboratory by documenting all relevant ISO standard evidence for inspectors (email of thanks attached).
Actions / Agreed Outcomes:	Continue good approach to securing patient quality and safety.

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 1 (D) Patient Surveys = 1 (E) Complaints / Critical Incidents Statement = 1
Discussion:	Dr Peters has received good MSF reports and has excellent feed back i.e wonderful colleague and mentor and excellent IPC doctor works well with colleagues, diligent, trustworthy. Dr Peters has written to management regarding issues with team work within Microbiology and Infection control and recommended further OD work which is now ongoing however issues remain - largely regarding disagreements on the validity of whistle blow and patient safety concerns. Dr Peters also walks with BMS to organise FY2 bench rotations, feedback on handovers to trainees etc. Dr Peter also raises issues at consultant meeting regarding cases and IPC concerns.
Actions / Agreed Outcomes:	To continue as above.

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Dr Peters is not on any ethics committees nor a signatory of an endowment fund. She has received no industry sponsorship, does no private practice and has no conflicts of interest.
Actions / Agreed Outcomes:	None.

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024
Domain 1	A - CPD log (every appraisal)	1	1	1	-	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	-	1
	C - Significant Event (every appraisal)	1	1	1	-	1
	F - Health Statement (every appraisal)	1	1	1	-	1
Domain 3	D - MSF (once every 5 appraisals)	1	1	1	-	1
	D - Patient Surveys (once every 5 appraisals)	0	1	1	-	1
	E - Complaints & Incidents (every appraisal)	1	1	1	-	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	-	1

Self Declarations

Mandatory Annual Declarations	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024
Health Statement	Issues	No Issues	No Issues	-	No Issues
Probity Statement	No Issues	No Issues	No Issues	-	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	-	Issues

Appraiser Commentary for 2023/2024 Period

Health Issue(s)	-
Probity Issue(s)	-
Complaints/Critical Incidents Issue(s)	Dr Peters has mentioned the issue to me during appraisal discussion. The issue is under consideration with the investigating managers.

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Paediatric Microbiology	6 months	Progressing
Leadership	-	Not Continuing
Attend Paediatric International conference	1 year	Progressing
Biosecurity	1 year	Progressing
critical care and antibiotic use	6 months	Progressing

New Personal Development Plan for the Current Period

Title	Time Scale
statistical methods	1 year
attend CF conference	1 year

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Dr Peters is not an Educational or clinical supervisor.
Issues:	None
Actions / Agreed Outcomes:	None

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	No
Clinical Supervisor	No

Medical Appraisal Report

Dr Christine Peters

[redacted]

Gt Glasgow And Clyde

2019/2020

28/08/2019

Appraisal ID: 48695

Appraisal Status:

Form 4 - Completed (11/09/2019)

Appraisal Details

This form verifies that you have participated in an appraisal under the Medical Appraisal Scotland scheme. Appraiser and Appraisee must sign this form.

APPRAISAL FORM 4 – Notification of Appraisal

Date(s) of Appraisal	28/08/2019 02:30
Place of Appraisal	Dr Peters Office
Appraisal Period	2019/2020

Appraisee Details

Name	Dr Christine Peters
GMC number	[redacted]
Health Board / Sector	Gt Glasgow And Clyde; Secondary Care
Contact Address	[redacted]
Email address	[redacted]

Appraiser Details

	Appraiser
Name	Rachel Green
GMC number	[redacted]
Email address	[redacted]

I confirm that I have completed all aspects of the Medical Appraisal process. I understand that, if this declaration is not correct, disciplinary action may be taken against me.

Approved By Appraiser, Rachel Green, on 10/09/2019

Approved By Appraisee, Dr Christine Peters, on 11/09/2019

Appraisal Form 4 - details

4A – Summary Discussion of Appraisal

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Domain 1 summary (Knowledge, Skills and Performance)

Core Elements:	(A) CPD = 1
Discussion:	Christine is a busy microbiologist who has a wide range of activities within QEUH to include Specialist Reference Laboratory work, clinical communications and attendence at ICU ward rounds daily. She has dropped a session over the past year but with new junior colleagues arriving she feels that she has time in her job for both this role and head of department. Pressure in terms of numbers of colleagues has had an effect on her CPD acquisition however evidence was provided of plenty of reflective learning through complex case discussions , meetings etc. The CPD presented does not reflect an entire year due to absence for health reasons but is in keeping with her scope of practice although she reflected that additional paediatric microbiology education would be beneficial. She has completed her stat/mandatory training.
Actions / Agreed Outcomes:	It may be prudent to attend an international meeting to both meet CPD requirements as well as PDP for paediatric microbiology

Domain 2 summary (Safety and Quality)

Core Elements:	(B) Quality Improvement Activity = 1 (C) Significant Event = 1 (F) Health Statement = 1

Discussion:	Chrisitne has undertaken a large audit on the interactions of clinical microbiologists on the wards of QEUH and the alterations to therapy from these interactions. The data has been gathered but is yet to be analysed, however this will be valuable information in terms of antimicrobial stewardship. Plenty of evidence was given for her role in Infection control issues, everyday laboratory interventions and production of local and guidelines. The laboratory underwent a UKAS inspection this year and Christine was involved , the audit was successful but there were recommendations regarding the competency assessment of Consultants and these records have been improved and completed to reflect these recommendations. Christine has not been involved in an SCi in this appraisal year. Chrisitne was off this year but has returned to work and is now entirely well with no changes to her job plan required. Christine has been involved in quality improvement work within the laboratory including work across the city regarding QI with blood culture work which is about to be implemented board wide.
Actions / Agreed Outcomes:	Christine needs to complete a personnel audit in the coming year and has ideas regarding care of the elderly urine sampling.

Domain 3 summary (Communication, Partnership and Teamwork)

Core Elements:	(D) MSF = 1 (D) Patient Surveys = 0 (E) Complaints / Critical Incidents Statement = 1
Discussion:	This is Christines Revalidation year and so she has completed an MSF. As she does not have contact with patients No Patient Questionnaire is required. Her MSF was outstanding and she is obviously a very well respected colleague across many clinical areas.She has refelcted on the comments and will look at how best to prioritise her various commitments and reflect on how to maintain good input into the clinical teams. She has not been involved in any complaints nor critical incidents.
Actions / Agreed Outcomes:	No actions required

Domain 4 summary (Maintaining Trust)

Core Elements:	(G) Probity = 1
Discussion:	Christine is not on any ethics committees nor a signatory of an endoment fund. She has received no industry sponsorship, does no private practice and has no conflicts of interest.
Actions / Agreed Outcomes:	No action required

4B – Summary Assessment

This section provides an overview of the adequacy of documentation assessments from current and previous appraisals.

Key

0 - The doctor has provided no information relating to this domain or the information is insufficient to meet the requirements of the GMC in this area.

1 - The doctor has provided supporting information relating to this Core Element. This information is sufficient to meet the requirements of the GMC in this area.

Appraisal Supporting Information

Domain	Core Elements	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
Domain 1	A - CPD log (every appraisal)	1	1	1	1	1
Domain 2	B - Quality Improvement Activity (every appraisal)	1	1	1	1	1
	C - Significant Event (every appraisal)	1	1	1	1	1
	F - Health Statement (every appraisal)	1	1	1	1	1
Domain 3	D - MSF (once every 5 appraisals)	0	0	0	0	1
	D - Patient Surveys (once every 5 appraisals)	0	0	0	0	0
	E - Complaints & Incidents (every appraisal)	1	1	1	0	1
Domain 4	G - Probity Statement (every appraisal)	1	1	1	1	1

Self Declarations

Mandatory Annual Declarations	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
Health Statement	No Issues	No Issues	No Issues	No Issues	Issues
Probity Statement	No Issues	No Issues	No Issues	No Issues	No Issues
Complaints / Critical Incidents Statement	No Issues	No Issues	No Issues	No Issues	No Issues

Appraiser Commentary for 2019/2020 Period

Health Issue(s)	As mentioned above Christine was off work for a period of 3 months but is now entirely well and back to work with no requirements to change her job plan or her working enviroment.
Probity Issue(s)	-
Complaints/Critical Incidents Issue(s)	-

4C – Personal Development Plan

This section shows a review of the appraisee's agreed PDP from last year, and also new PDPs agreed for the year ahead.

Review of last years Personal Development Plan

Title	Time Scale	PDP Status
Paediatric Microbiology	6 months	Progressing
Leadership	-	Progressing
Paediatric Haematology Infections	1 year	Progressing
Cystic Fibrosis	1 year	Completed

New Personal Development Plan for the Current Period

Title	Time Scale
CF Pseudomonas and Burkholderia eradication	6 months
MAnagement of CPE infection	6 months
Neurosurgical infections	1 year

Recognition of Trainer

Trainer roles

Role:
Educational Supervisor
Clinical Supervisor

Summary of discussion

Discussion:	Chrisitne is not an educational supervisor nor clinical supervisor
Issues:	None
Actions / Agreed Outcomes:	None

For Review

Section A: Educational Governance Requirements	(3) I have appropriate time allocated within my role.
Section C: Generic Trainer Skills	-

Trainer Supporting Information

Appropriate supporting information has been provided for the following roles:

Role:	Appropriate Supporting Information:
Educational Supervisor	No
Clinical Supervisor	No

Louise Mackinnon

Subject: FW: Draft IMT Minutes

From: teresa inkster [redacted]
Sent: 04 October 2020 12:10
To: Henry, Julie [redacted]
Subject: Fw: Draft IMT Minutes

FYI

From: Inkster, Teresa [redacted]
Sent: 04 October 2020 11:38
To: teresa inkster [redacted]
Subject: Fw: Draft IMT Minutes

From: INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 21 September 2018 09:11
To: MacLeod, Calum [redacted]
Cc: Dodd Susan (NHS GREATER GLASGOW & CLYDE) [redacted]
Subject: Re: Draft IMT Minutes

Hi Calum, I don't think that we can do that as there was extensive discussion regarding that case. The minutes need to accurately reflect the discussions of the meeting. Can we circulate the version I have approved as chair
Thanks
Kind regards
Teresa

Sent from my BlackBerry 10 smartphone on the EE network.

From: MacLeod, Calum
Sent: Friday, 21 September 2018 9:00 AM
To: INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE)
Subject: RE: Draft IMT Minutes

Hello Teresa

Tom has asked me not to include the potential case in the minutes so I will just delete most of the patient update and state that

"No patients are giving cause for concern and no new confirmed cases have been reported"

Kind Regards

Calum MacLeod
Infection Prevention & Control Administrator
Level 2, Zone 1, Office Block

Queen Elizabeth University Hospital
G51 4TF

[redacted]

[redacted]

From: INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE) [redacted]
Sent: 20 September 2018 18:45
To: MacLeod, Calum
Subject: [ExternaltoGGC]Re: Draft IMT Minutes

Hi Calum - minutes attached . I might not make it on Tuesday but I will arrange for someone else to chair so just proceed with that time

Kind regards

Teresa

Dr Teresa Inkster
Lead Infection Control Doctor NHSGGC
Training Programme Director Medical Microbiology
Dept of Microbiology
Queen Elizabeth University Hospital
Glasgow
Direct dial : [redacted]

From: MacLeod, Calum [redacted]
Sent: 20 September 2018 16:33
To: INKSTER, Teresa (NHS GREATER GLASGOW & CLYDE)
Subject: Draft IMT Minutes

Good afternoon Teresa

Please find attached the draft minutes from today's IMT.

Can you let me know of any changes you wish to make before I disseminate to the group.

I have organised the next IMT for Tuesday 25th September at 1300 does this date/time suit yourself?

Kind Regards

Calum MacLeod
Infection Prevention & Control Administrator
Level 2, Zone 1, Office Block
Queen Elizabeth University Hospital
G51 4TF

[redacted]

[redacted]

RHC Water Incident meeting on 14th September

Present.

Jane Grant, Jennifer Armstrong, Grant Archibald, Teresa Inkster, Tom Steele, Kevin Hill, Jen Rodgers, Mary Anne Kane, Annette Rankin, Iain Kennedy, Tom Walsh, Sandra Devine, Andy Wilson

Jane Grant welcomed all attending to the meeting and introductions were made round the table.

Dr Inkster and Kevin Hill provided an update on the current clinical situation and the key points of discussion at the IMT meeting held earlier in the afternoon.

The interim arrangements for managing patients over the coming weekend were also noted;

- Each case will be dealt on by a case by case basis by their lead clinician.
- Any new identified case will go to the Children's Hospital in Edinburgh.
- Existing non GGC patients will be managed at their local District General Hospital. If patients turn up without warning then they will be assessed by the clinicians.
- Existing GGC patients where their District General Hospital is RHC will be admitted depending on a case by case basis.

The group noted the update from the IMT and debated the IMT recommendation to decant from wards 2a/2b. The proposed decant involved GGC BMT patients being accommodated in the Adult BMT unit in QEUH. The remaining patients being decanted to an area where the back biofilm was not present. The proposed decant would facilitate progression of a structured review and implementation of actions leading to a permanent solution to ongoing concerns regarding the water supply and drainage in the clinical areas. Kevin Hill updated on options reviewed at a meeting held with clinical staff earlier today and it was agreed these should be presented as a formal risk assessment/ options appraisal. Additional information from discussions with external experts on the potential for airborne/ droplets spread compounded by the ventilation system and the POU filters was provided by Annette Rankin.

The meeting unanimously noted and agreed that any decant of clinical services carried a degree of risk and therefore any decant needed to be for the minimum period and with the minimum of risk and disruption.

Through the discussion it was agreed that risk assessed options for decanting would be formulated into a paper for consideration to allow the following actions to be undertaken over a four week period.

- **Further cleaning of drains by facilities colleagues**
- **Shock dosing of the water system with Chlorine Dioxide**
- **Endoscopic review of the Drainage system**
- **Review of ventilation system.**

The meeting agreed the following actions and Jane Grant requested an update for 5pm on Monday 17th September.

Examine all drains in RHC for visible signs of black biofilm. SD/ TW

Define works to be completed in wards 2a/ 2b over 4 week timeframe MAK

Consider and risk assess options for decant of patients from wards 2a/2b for a 4 week period to enable works to progress. Ensure minimal disruption/ risk to all services. KH/JR

Discuss with adult services options for optimising access to BMT facilities for both adult and children's services during the decant. KH/AH

2017 Blood cultures	Date	Neutropenic x10^9	Site	Notes	Outcome	Current
Pantoea species	03/01/2017	No 1.6	Hickman line		2 week course of meropenum (+ shorter course gent, teico and cipro)	Alive
Elizabethkingia meningoseptica	13/02/2017	Yes 0.9	Central line	Repeat positive 14/2/17	Hickman line removed 16/02/2017	
Serratia marcescens	13/02/2017	Yes 0.9	Central line + peripheral	Repeat positive 14/2/17	Hickman line removed 16/02/2017	
Acinetobacter baumannii	23/01/2017	Yes 0.1	Central line	Also grew Enterobacter cloacae, Streptococcus mitis & Strep. mitis/Strep. oralis	Presumed management conservative (no line removal documented)	Alive
Stenotrophomonas maltophilia	13/07/2017	No 1.4	Hickman line	Also grew Enterobacter hormaechei. Repeat positive 15/07/2019	Hickman line removed 17/07/2017 tip neg - was EOT. Abx Taz, cipro, septrin	
Acinetobacter ursingii	22/12/2016	No 2.6	Hickman line	Also grew Enterobacter cloacae & Chryseomonas indologenes, repeat positive for all 23/12/2016, not seen in peripheral culture	Line removed 24/12/16 - grew Chryseomonas	
Sphingomonas paucimobilis	31/01/2017	Yes 0	Hickman line	Long admission, had lobectomy 27/04/17 for aspergillus lung	Initially conservative maangement. Line removed 14/02/17 due to enterococcus & recurrent Staph. Hominis	Alive
Delftia acidovorans	27/02/2017	No 1.8	Hickman line	Also grew Staph. Epi	Hickman line removed 2/03/17 - was EOT. Abx cipor and vanc	Alive
Brevundimonas spp	29/04/2017	No 15.1	Long line			Alive
Stenotrophomonas maltophilia	13/05/2017	No 11	Central line	Rep positive 14/05/17, 26/5/17, 28/05/17	Hickman line removed 2/6/17, tip neg	
Chryseomonas indologenes	13/05/2017	No 11	Central line	Also grew steno		
Burkholderia cepacia group	28/05/2017	No 6.9	Hickman line	Also grew steno	Hickman line removed 2/6/17, tip neg	
Kocuria rhizophila (G+)	29/07/2017	No 3.6	Central line			
Pseudomonas putida	22/08/2017	No 2	Hickman line	Also grew enterobacter cloace. Repeat positive 27/8/17	Hickman line removed 28/8/17, tip pos for Staph epi	
Stenotrophomonas maltophilia	24/09/2017	No 4.1	Hickman line		Presumed line removed 27/9/17 - tip neg 8 central lines and 2 PICCs inserted and removed in 1 year	
Stenotrophomonas maltophilia	22/04/2017	Yes 0	Central line	Repeat positive 23, 25, 26/4/17	[redacted]	[redacted]
Pseudomonas aeruginosa	11/05/2017	Yes 0	Hickman line		Conservative management with 3 weeks Abx	Alive
Stenotrophomonas maltophilia Acinetobacter baumannii Delftia acidovorans	19/06/2017	No 1.8	Hickman line	All 3 bacteria cultured from same BCx bottle	Line removed 22/6/17 - line pos for steno	[redacted] >1year later. Unrealted to infection
Stenotrophomonas maltophilia	23/07/2017	No 1.6	Central line	Repeat pos 24/7/17	[redacted]	[redacted]
Cupriavidus pauculus	22/09/2017	Yes 0.1	Hickman line		Presumed contaminent, Rx with 7/7 cipro	Alive
Pseudomonas stutzeri	13/10/2017	No 1.5	Central line	Also grew Staph. Epi	Rx Abx 1 week	[redacted]
Acinetobacter baumannii	31/10/2017	No 2	Long line		Line removed 2/11/17 - tip neg	Alive
Acinetobacter ursingii	11/12/2017	No 1.1	Hickman line	Repeat pos 13/12/17	Line removed 14/12/17 - tip neg	Alive
Serratia marcescens	10/06/2016	No 1.8	Hickman line	Repeat post 12/6/16	Hickman line removed 13/6/16 - tip neg	Alive
Stenotrophomonas maltophilia	10/06/2016					

nrelated to

SCOTTISH HOSPITALS INQUIRY

Bundle of documents for Oral hearings commencing from 19 August 2024 in relation to the Queen Elizabeth University Hospital and the Royal Hospital for Children, Glasgow

Bundle 27 - Miscellaneous Documents - Volume 9

A50125560