Witness Statement of Dr Rory Ewen Mackenzie as requested for evidence under rule 9 for module 5 of the UK Covid-19 public inquiry

1. My name is Dr Rory Mackenzie. For context, I am qualified as a consultant in anaesthesia and intensive care and have practiced as a consultant for 27 years within NHS Lanarkshire at University Hospital Monklands (UHM). For the last 4 years this has only been as a consultant in intensive care medicine and, as of the end of October 2024, I have partially retired and now only undertake non patient facing medical leadership work as National Associate Clinical Director at the Centre for Sustainable Delivery (CfSD) based at NHS Golden Jubilee National Hospital. I commenced this role in May 2021 having previously undertaken the role of Chief of Medical Services at UHM, a position I held since 2014.

2. Within NHS Lanarkshire I also held the position of chair of the Lanarkshire critical care delivery group. It was through this role that I was a member of the Scottish Critical Care Delivery Group (SCCDG) since around 2007. I was actively involved in the Lanarkshire response to the Covid 19 pandemic from the start until I stepped down from my role as Chief of Medical Services at UHM in May 2021. This involvement was with both the UHM site response and, from summer 2020, as the clinical lead for the temporarily formed pan-Lanarkshire ICU directorate.

3. The SCCDG was formed in the early 2000s following the formation of health board critical care delivery groups. These had been set up in response to a Scottish Government publication with recommendations called 'Better Critical Care' (**RM/1 INQ000571086**). I would best describe the SCCDG as a network of senior intensive care clinicians and leaders from all territorial health boards in Scotland with co-opted members from the Scottish Ambulance Service and the Scottish Intensive Care Society (SICS) including the audit group (SICSAG).

4. In September 2019 I took over as chair of the SCCDG having been elected from within the existing membership. This was in succession to the previous incumbent, and due to my experience and knowledge of the group, and, as I was the only candidate, I was duly appointed. It is important to say that the SCCDG had no secretariat support and the lead roles within the group did not attract additional funding or allocated time in lieu. There was an individual member identified within the Scottish Government Health Department as a point of contact, and they were also invited to attend our meetings.

5. I continue in the role of chair/lead for the SCCDG although it has now formed as a specialty delivery group within the CfSD and this has allowed more identified resource and project

management office support to be provided. In addition, it benefits from the recognised governance structure that CfSD sits within as an NHS board governed organisation (NHS National Waiting Times Centre Board, more commonly referred to as NHS Golden Jubilee). The CfSD was launched in 2021 in response to the Covid-19 pandemic to pull together and build upon multiple programmes of improvement work that had been sitting within Scottish Government (SG) departments to enable better remobilisation, recovery and redesign of the NHS in Scotland.

6. When I took over as chair of the SCCDG the work involved was the running of two formal meetings of the group per year and fielding any issues that emanated from the meetings or was brought up between times. These meetings happened in person within a central location in Scotland but with tele-linking options to allow more remote members to attend and input. My main responsibilities were to lead the group, organise the meetings and approve a note of the meetings. I was aided in this by another consultant colleague who undertook the honorary secretary role for the group, again without specific time allocation. At the time I took over, and prior to the start of the Covid-19 pandemic, there were concerns being raised around sustainability of some critical care services in Scotland and a request had come from the lead Intensive Care Medicine educational advisor and other colleagues in Scotland for the SCCDG to lead a national survey of the medical workforce. This was to form the main work of the group and was seen as being helpful to inform delivery of good quality sustainable care as defined at a UK level within the version of standards published by the Faculty of Intensive Care Medicine (FICM) at the time (**RM/2 INQ000269890**).

7. The SCCDG works closely with the Scottish Intensive Care Society and the two bodies were afforded an opportunity to meet with the Chief Medical Officer on an annual basis.

8. There were no other requirements for direct reporting.

9. The level of responsibilities was to change dramatically with the coming of the pandemic with at least daily contact in the initial stages.

10. The SG ICU resilience and support group met for the first time in March 2020.

11. Prior to this first meeting I had convened a SCCDG meeting in early March 2020 where the represented leads discussed the potential ability to expand the number of ICU beds provided, including a request for information on the number of ICU ventilators and possible bed spaces that could be created. All health board critical care leads including myself had been involved

in local discussions around preparedness for a pandemic in the preceding weeks due to the emerging threat and the SCCDG had been involved in surge planning 10 years earlier with the emergence of Swine flu as a threat (but to a much smaller scale). The SCCDG agreed to act as a network for the flow of information and members to be a single point of contact for critical care clinical information from that health board in relation to equipment and other matters related to the pandemic. In addition, close linkage with local medical equipment leads was confirmed by members.

Outline of the work of the SG ICU Resilience and Support Group

12. It is important for me to indicate from the outset, that as far as I am aware, there was never a situation in Scotland where a patient that was assessed by a specialist in ICM as requiring ventilation in an ICU setting did not receive that, whether presenting with Covid related disease or otherwise.

13. In compiling my response, I should point out that I am sighted on drafts of documents that, I believe, have finalised versions held by SG. These finalised versions were not formally shared with me. I will in the large part confine my statement to areas where I was directly involved but will reference other areas where I had awareness of matters but did not have direct contributions to work in that area.

14. I was the only practising ICU clinician on the group and acted as the main conduit for communicating with the wider clinical network. The group was chaired by Dr John Colvin, Senior Medical Advisor to the SG workforce directorate and previously a Consultant in Anaesthesia and Intensive Care Medicine (retired from clinical practice) and also a previous chair of the SCCDG.

15. One of the initial requirements was to confirm the baseline number of general adult ICU beds (Level 3 i.e. Level 3 - Intensive care. Patients requiring two or more organ support or needing mechanical ventilation alone. Staffed with one nurse per patient and usually with a doctor present in the unit 24 hours per day) in Scotland. The figure of 173 beds was agreed. There are a number of specialised ICU beds that support specialties such as cardiothoracic, neurosurgery, burns management and organ transplantation. The ongoing requirement for most of these beds to remain available for these specialties excluded many of them from being included in the baseline bed number of adult general ICU beds. This set the baseline available ventilator beds for the purpose of informing planning assumptions around expansion i.e. doubling, tripling, quadrupling. The initial ask of health boards was to provide

detailed local escalation plans against these 3 multipliers based on use of the current estate and generally included plans to use high dependency unit (HDU) beds, operating theatre recovery areas and operating theatre rooms. The plans also outlined existing equipment availability covering ICU ventilators, renal replacement therapy machines (e.g. haemofiltration or dialysis machines), ICU specification patient monitors, infusion devices, etc.

16. During March 2020 the SG group set out with the plan to equip a maximum of 850 ICU beds in NHS Scotland. This figure was arrived at, I believe, using a 'worst case' scenario based on available modelling at the time. I assisted in discussions with critical care leads around securing maximum surge commitments for equipment planning purposes based on usable space within their varied physical estate footprints.

17. The planning needed to consider available equipment, suitability of equipment, oxygen supply requirement of equipment and adaptability of equipment e.g. transport ventilator (a small compact, battery run, portable ventilator) use for ongoing ventilation of a patient in ICU.

18. Due to the lack of availability of a national medical equipment management system, baseline equipment could only be established through the clinical network existing via SCCDG and the individual approach to existing medical equipment lead contacts within health boards that was held by colleagues in NSS who also sat on the SG group. This process took several days as a result.

19. Based on a timeline of delivery dates for ICU ventilators that was measured in weeks and sometimes months, we decided, with advice from myself following discussion with leads around the country, to explore the use of anaesthetic machines as ventilators for ICU patients in NHS Scotland, for what was to become known as phase 1 of the Covid 19 pandemic. One factor to consider was the real concern around oxygen supply sustainability and the fact that many anaesthetic machines relied on oxygen rather than air to drive their ventilators. As a result of this, anaesthetic machines were adapted to work using medical air as a driving gas rather than oxygen, in many sites across NHS Scotland.

20. We estimated that over 600 anaesthetic machine ventilators were in existence in operating theatres and other sites within acute hospitals in Scotland and, in consultation with local teams, it was felt that 481 of these machines could be made available for use in ventilating critically ill patients if needed, with the remainder required to provide anaesthesia to patients

requiring emergency surgery and also those essential elective surgical cases still required to be undertaken.

21. The overall issue of oxygen supply security was considered, and I contributed along with other ICU clinicians to planning and modelling round this. This led to establishment of baseline requirements for each acute hospital site in Scotland with contingencies put in place to ensure security of supply in the event of high demand. The other factor that required managing was the fire safety concern raised through having potentially increased concentration of oxygen in ward areas where air exchanges were much lower than in designated critical care areas. This could occur with multiple patients in the same ward area being on additional oxygen with high flow rates. Certainly, within my own hospital, oxygen concentration monitoring was installed in ward areas to manage this potential risk.

22. This use of anaesthetic machines from established manufacturers provided an existing back up plan to manage escalated requirements during phase 1 for patients requiring invasive ventilation. Manufacturers pointed out that use of the ventilators on anaesthetic machines for this purpose was off-label and liability was therefore transferred to the treating clinician, but they did provide detailed guidance on how best to use the ventilator component of anaesthetic machines for prolonged use. This plan had to be enacted in a small number of intensive care units in phase 1 (including my own one) and, to my knowledge, there were no significant clinical incidents as a result. On reflection, the ability to adapt the use of existing equipment that was familiar to staff enlisted to support the existing core ICU staff e.g. anaesthetists and operating theatre staff, proved a good intervention and provided some familiarity in what was otherwise a most unfamiliar working environment.

23. Existing equipment had been acquired through local processes for identifying and procuring and, due to the timelines and availability, a different process had to be followed to obtain additional ICU ventilators and other ICU equipment through the SG group. Manufacturers and devices were identified and discussed at the daily meetings. Factors considered were, had the equipment been evaluated in NHS Scotland before and, if so, were any issues raised around clinical suitability. This allowed us to manage the array of ventilator offers from several sources (including the UK stockpile) and, where potentially suitable but unfamiliar alternatives were offered, I, along with medical equipment colleagues, brokered local assessment with individual health board leads. This assessment would happen first in the laboratory setting with 'test' lungs to allow familiarity and to ensure the proper set up using the associated disposable tubing and filters, etc. in that unit. In addition, training in 'how to use' was facilitated by this means.

24. My front-line clinical expertise included extensive clinical leadership of anaesthetic and critical care services in NHS Lanarkshire including the purchase of equipment and provision of consumable and disposable supplies associated with such equipment. I am by no means an expert in the technical details of equipment but understand the requirements around ensuring the use of safe and effective equipment and consumables in patient care. Throughout the pandemic I continued to work full time in ICU (indeed at the height of activity I was fully contributing to the full shift resident consultant roster introduced to manage the clinical demand) at the UHM and, during the first phase, saw first-hand the front line pressures on staff and the value that familiarity with equipment afforded staff, as well as the need to accommodate the requirements of training staff rapidly on new equipment. Many staff had not worked in critical care environments before and the need to be in full personal protective equipment (PPE) added to the alien environment in which they were now working. UHM is a hospital in Lanarkshire that sits in the West of Scotland and like other hospitals in that region saw the need to deliver ICU activity increase two to three-fold during April 2020.

25. The decision making of the SG ICU resilience and support group was aided by the close network within SCCDG and was well informed by local feedback and, additionally, the Wardwatcher/Bed Bureau digital information collection database run by the Scottish Intensive Care Society Audit Group (now part of Public Health Scotland) provided valuable daily data on all ICU activity. The underlying principle of distribution was to ensure equity of allocation of resources with distribution decisions based on clinical need. These decisions were informed by intelligence gathered through health board contacts and the daily aggregated activity data from SICSAG.

26. Additional considerations to provide resilience and ability to provide mutual support included discussion around setting up formal regional critical care networks. This was followed through in the West of Scotland which was the area of most Covid activity in Scotland during phase 1. This network allowed sharing of experience and a means to ensure formal support from neighbouring health boards in the event of any such requirement for support. This need became reality during the second phase of the Covid-19 pandemic with my own ICU at UHM having to transfer a number of ICU patients to other ICUs with fewer patients to mitigate the risk from inability to safely staff the ICU beds.

The impact of infection control guidance on equipment requirements

27. During Covid there were essentially 3 groups of ICU patients that required care.

- Suspected Covid disease
- Confirmed Covid disease
- Confirmed non Covid disease with other diagnosis leading to critical illness.

28. To minimise cross infection risks due to the airborne route as a vector for infection, patients often had to be cohorted in physical locations. The equipment in this area could not be shared easily between areas due to the decontamination requirements and, in addition, minimising the need for staff to go between different areas was important. This required purchase of additional supporting equipment such as ultrasound machines and blood gas analysers both to ensure availability, given the increased number of patients, but also to reduce the risk of nosocomial transmission.

Additional equipment ordered

29. Every ICU bed requires much more than just a ventilator even for less complex patients. Most of the additional equipment is required at the bedside and includes:

- high specification patient monitors with specialised monitoring equipment,
- infusion devices or pumps to give drugs by both continuous infusions (sedatives, analgesics and inotropes) but also intermittent infusions (antibiotics, monoclonal antibodies, etc)
- Feeding pumps to give artificial nutrition down a feeding tube
- Calf compression boots (Flotron) to prevent clots forming in the lower legs that can lead to DVTs and PTEs
- Disposable bronchoscopes
- Rebreathing bags for each bedspace
- Additional HME (heat and moisture exchange) filters
- Suction units

30. Some additional support equipment is needed due to volume and cohorting requirements (vide supra) i.e. blood gas analysers and portable ultrasound devices.

31. This planning all formed part of the work of the SG group.

Kidney failure and support (renal replacement therapy – RRT)

32. Our initial approach to RRT was assumption based and focussed on a potential need to provide kidney function replacement to a much larger cohort of ICU patients than usual. We put in orders for 90 additional haemofiltration machines and a further 30 haemodialysis machines and identified the required associated consumables and also the fluids required that are critical to the operation of RRT in ICU patients. This figure was arrived at by assuming 1 additional RRT machine would be required per 4 additional ICU beds over double capacity. This assumed that in some circumstances one machine (with separate consumables off course) could be used on more than 1 patient in any 24-hour period. This was a feasible assumption although costly in terms of overall consumable usage and the additional burden on nursing and other workforce (setting up, initiating and establishing a patient on RRT is time consuming and required expertise only available from more experienced ICU staff).

33. During the first phase, I saw at first hand the high levels of acute renal failure that required patients to be placed on kidney replacement machines. Due to the higher level of clotting seen in Covid 19 patients, this led to short periods of time before clots formed in haemofiltration circuits. My experience was supported by data available from the national Scottish audit of ICU care – Scottish Intensive Care Society Audit Group (SICSAG) - where data indicated a 25-30% requirement in Covid 19 patients (this figure was higher than published information from other countries with earlier experience). Haemofiltration is a form of renal replacement therapy (RRT) where a large cannula is inserted into a large vein (through the neck or groin area). Blood is then pumped around a circuit and through a specialised filter where fluid, salts, waste products and toxic substances are removed from the body (an artificial kidney). This elevated level of clotting leading to limited circuit duration, resulted in pressure on the stock levels and supply chain of disposable sole use circuits during phase 1 and led to NHS Scotland adapting its strategy around RRT to include contingency for use of haemodialysis as a mode of RRT. This was undertaken through a SLWG set up in April 2020 with representatives from critical care leads, renal equipment technicians' group, SG and national procurement, to consider the demand modelling along with the constraints around supplies. The review of strategy was informed by direct discussions with RRT equipment manufacturers. In Scotland there were 2 main suppliers, Fresenius and Baxter.

34. The RRT SLWG produced several recommendations to mitigate the risks around inability to deliver RRT.

35. Haemodialysis (HD) is a different form of RRT that can provide the same treatment but over a much shorter period of time. There was no shortage of disposables highlighted for HD. However, it required specialist input from renal doctors and nurses so by no means was an easy solution and, in those hospitals without these staff, was unachievable. Nevertheless, in appropriate settings, this resulted in local enabling works in several boards and required purchase of appropriate equipment. Most of this work happened as activity dropped after phase 1 passed (June 2020 onwards).

36. Additional HD machines purchased were generally in line with individual board RRT models and future replacement planning.

37. HF requires large volumes of specialised fluids (20+ litres per day), and it became apparent that there were concerns in that supply chain. This led to daily stock takes and contingency planning to mitigate against the risk of any ICU running out of appropriate fluids, from April 2020 onwards. This level of scrutiny avoided any situation arising, to my knowledge, where RRT could not be initiated or continued if deemed clinically appropriate.

38. Fortunately, for many possible reasons, the incidence of kidney failure was lower in the subsequent phases of Covid so what was a real concern during phase 1 became less of an issue, although, throughout the pandemic, maintaining HF fluid stocks was a constant challenge due to the worldwide availability and the need to match availability to demand.

ICU consumables

39. In view of growing concerns around the supplies of ICU consumables, a Short Life Working Group (SLWG) was commissioned by Scottish Government ICU COVID Surge Lead Caroline Lamb. This Group met in April 2020 and drew on input from myself on behalf of the Scottish Critical Care Delivery Group, Medical Physics, ICU Nurses, Anaesthetists, and NSS National Procurement and worked to review rapidly the current position in relation to the availability and supply chain of ICU consumables, and to recommend a range of mitigating actions that could be taken forward to address issues of concern. These ranged from assessing alternative products and suppliers to maximise availability to suggesting changes in some current practice to protect the current stocks.

    The specific products that were assessed by the group are listed here:

    - Closed Circuit Suction Catheters
    - Venturi Valves and Oxygen Masks

- PEEP Valves
- Supraglottic Airways (i-Gel)
- Arterial Blood Gas Syringe
- Machine End Filters
- Wet / Humidified Circuits
- Oxylog 3000 Circuits
- Endo-Tracheal Tubes
- Anaesthetic Machine Water-Traps
- NG Feeds - High Protein / Low Sodium

40. This pro-active approach avoided situations where consumables were not available and also minimised any avoidable waste during the Covid pandemic.

CPAP and Non-invasive ventilation (NIV)

41. The use of CPAP and other forms of NIV formed an important intervention during Covid and understanding of when best to provide, and also, location wise, where best to provide, evolved with acquired knowledge and learning around the Covid disease process. This requires specialist equipment and there was a separate group set up to manage the acquisition and deployment of this equipment. It had clinical input from respiratory physicians and, whilst the SG ICU resilience group was kept appraised of the work of that group, I had no direct involvement in the decision making around CPAP/NIV equipment or disposables.

Personal Protective Equipment (PPE)

42. The SG ICU resilience group did not have any remit around the procurement of PPE but, in my position as chair of the SCCDG, I was not aware of any concerns around availability of PPE for intensive care staff. In the planning phase before March 2020, in my own board, front line staff were being encouraged to undergo face fit testing on FFP3 masks. There was good uptake of this, although those with facial hair could not be fitted and alternatives such as hood devices were being explored and indeed were deployed in some units. These re-usable hood devices in some units were not approved for use due to IPC advice around inability to decontaminate between cases. This resulted in variable deployment of this approach between health boards.

Medicines shortages

43. Procurement of medicines was not a function of the SG ICU resilience and support group, however in my role as chair of the SCCDG, I was made aware of national planning due to known shortages of specific medicines used routinely in ICUs and the significant risk of running out of stock. This planning, I believe, was led on a UK wide basis by NHS England and involved identification and acquisition of alternative medicines that would work as substitutes in their mode of action. This was supported by a guidance document produced to support the four nations of the UK, I believe. I was not aware of harm coming to anybody as a result of this matter, but it did require a change in practice in many units.

Isolation facilities

44. The other equipment factor to mention in relation to NHS Scotland, was the need to provide more isolation facilities, due to the lack of single room facilities in some ICUs around the country. Single rooms were most important in the overall management of patients during the Covid pandemic and, as mentioned previously, particularly to mitigate the risk of nosocomial transmission. Most existing ICU beds across Scotland were not within single rooms and each unit had a different baseline number available. Temporary isolation tent-like structures that provided the advised negative pressure isolation function were purchased by a number of units, but the SG ICU resilience group did not get involved in the procurement of these structures, although I was aware that Health Facilities Scotland provided support and advice for health boards in this area as they would update the SG group on a frequent basis.

UK Ventilator challenge

45. I had an awareness of the UK Ventilator challenge but no direct involvement. As part of the challenge, we did take and assess the Penlon ventilator. It underwent an in vitro assessment by medical physics and clinical colleagues and was deemed suitable for use in the event of an extreme surge scenario and as an alternative to the use of anaesthetic machine ventilators, but we primarily focussed on acquisition of conventional ICU level ventilators that were preferably from known manufacturers with existing models in use across Scotland. During phase 1 it was also established that Scotland would be expected to receive up to 8.2% of all orders from the UK joint procurement exercise. This was a process I had no direct involvement with but did provide a source for some of the equipment built up as part of the NHS Scotland plan. How these ventilators and other equipment (vide infra) were distributed, was decided at the daily distribution meetings that I was a contributor towards, and resulted in targeted distribution to health boards based on local escalation plan requirements.

Training materials

46. A common concern and issue factored into our thinking was the requirement to recognise and provide training for staff for unfamiliar equipment, including the local medical equipment and physics technical staff. This aspect was managed and materials compiled and archived by NHS Education Scotland.

Legacy planning

47. In clinical terms, over the period being examined by the inquiry, there were 3 distinct phases to the Covid 19 pandemic in Scotland.

48. In terms of the approach to equipment acquisition, phase 1 was the period with most activity and decision making (March 2020 to around July 2020). The target numbers of ventilators and other equipment was determined by several factors and looked to a worst-case scenario approach. This 'worst case' scenario was a challenge to set off course, but modelling was being undertaken by a number of bodies including SG, I believe, albeit I was never privy to the SG modelling data. Experience of the impact was evolving rapidly and largely based on WHO information and what we were seeing and hearing from healthcare facilities in Northern Italy. So, in March 2020 rapid decisions had to be made, and the SG group had a target number of beds to equip and set out to reach this goal (the target number escalated relatively quickly over the weeks in March 2020 and reached an approximate 4-5 fold uplift of the baseline number of general adult ICU beds in Scotland).

49. Given delivery of this number of ICU ventilators was unattainable to manage the surge of patients in phase 1, an alternative back up ventilator strategy in the form of using anaesthetic machine ventilators was delivered as mentioned earlier.

50. Given the daily meetings and the assimilation of updates on order status, clinical activity, health board readiness, oxygen capacity resilience and daily real time data from SICSAG, we were able to make judgements on equipment orders that included unfamiliar and, in a Scottish context, untested equipment. This, in my opinion, prevented unnecessary purchasing of equipment that would not have had much legacy value.

51. As we were coming out of phase 1 a SLWG was set up by SG, of which I was a member, to look into the legacy planning of medical equipment procured as part of the Covid-19

expansion undertaken. The recommendations from this group resulted in a further SLWG being set up, of which I was also a member, that looked specifically at a strategy for the establishment of a central storage facility that would service and keep functional a stockpile of medical equipment.

52. As a result of the work of these groups we started to refine the approach to legacy planning with the maximum beds requiring to be equipped revised to 714. The goal was (ideally) to have no more than 2 different ventilators by manufacturer in each health board, thereby reducing the training requirements and reducing the risk of human error during use. The ventilators provided would, where possible, align with each health board's replacement programme strategy. In addition, each health board was to keep enough ICU ventilators for double the baseline number of ICU beds available and, overall, the equipment to support double baseline capacity within NHS Boards was to be incorporated into capital asset registers as part of NHS Board readiness and local contingency planning. The remaining stockpile would be held centrally in a managed storage facility under the auspices of NSS. Details on the existing life cycle of ventilators in use at board level was also collected with a view to swapping-in more modern versions and keeping older ventilators, past the mid-point of their life cycle, in a central stockpile. This approach also afforded health boards the opportunity to avoid any capital outlay for replacing equipment at the end of its life cycle. A hierarchy of disposal was also considered for equipment that was deemed surplus to requirements, with incorporation into equipment replacement plans for health boards remaining the top consideration.

53. Up until the 28th of June 2022 we were holding a stockpile, between equipment held centrally and that held locally by health boards, to provide a minimum of 714 functionally equipped general adult ICU beds in Scotland.

54. In addition, essential consumable stockpiles held centrally that would support 4 weeks' activity at this nominal full capacity, were planned for.

55. Another important principle to minimise waste in both the consumables and medical equipment stockpile, was cycling of stock to ensure expiry dates for consumables were avoided and swap out older equipment from local health boards for newer pieces held centrally.

56. I will mention here that consideration was also given to the possible utilisation of equipment procured for use in paediatrics, and the fact that most equipment acquired could potentially

cater for that population, provides equipment cover for any future expansion needs in that area.

57. In my opinion the SG ICU resilience group adopted a strategic approach to the acquisition of equipment and provision of essential supplies within central stockpiles. By this I mean a strategy of acquiring known ventilators from established familiar manufacturers that had been both tested in vitro but also had been used previously in clinical settings. Where this first-choice approach was not available, and this was most apparent in the initial stages of the pandemic, we used our daily stand-up meetings to discuss what was on offer and potentially available through direct dealings and through the UK stockpile. This information was considered by the experts on the group along with other contextual information such as, current level of clinical activity and where about in Scotland this was, feedback from clinicians on any new equipment that had never been used before and any safety or operational concerns of any equipment in use. This approach to equipment acquisition and management was to avoid waste where possible.

58. The legacy strategy for equipment was reviewed and adapted based on the permanent funding of an additional 30 level 3 ICU beds in Scotland by SG in the second half of 2021, raising the baseline number of general adult ICU beds in Scotland to 203 (from 173) and, whilst initial surge planning remained focused on a maximum of 714 beds, this was subsequently revised down to a doubling of the new baseline adult general ICU bed number of 203 i.e. 406 equipped beds in late 2023.

Personal characteristics

59. Regarding equipment, the only link I can think of in this area was the provision of PPE. On a national basis I was not involved in this area but the matter that came up locally in Lanarkshire was regarding those with facial hair and the ability to be face fit tested for FFP3 masks. So, the alternatives for personal protection would be ventilated full face or hood like equipment, however the ability to decontaminate these was disputed through local infection control advice, and this resulted in much wasted effort on the part of clinical staff looking for solutions as alternatives to wearing tight fitting FFP3 masks for prolonged periods, as well as providing an alternative for individuals who did not wish to remove facial hair. In my own experience, as far as I can remember, as Chief of Medical Services at UHM, there were no issues raised from staff regarding PPE from female, ethnic minority or religious background perspectives.

60. As part of this statement, I am asked to reflect on good practice, challenges and lessons learned around the procurement of key medical equipment for the Covid 19 pandemic.

Good Practice

61. Through working with the critical care leads, Medical Physics leads, Health Facilities Scotland and National Procurement, the expansion work was able to be delivered rapidly, first by exceeding doubling capacity, then trebling, with the capacity to extend that to quadrupling. Given the huge global demand for ICU medical devices and equipment, the community were able to draw expertise and knowledge to come together at pace to focus on immediate issues with supply, and develop contingency plans and alternative solutions where needed, thus supporting this across NHS Scotland.

62. Through focussed short life working groups, strategies and mitigations were rapidly developed in many areas as mentioned above e.g. consumables, RRT and medicines.

63. Consistency was applied wherever possible to decisions around model of equipment and where to distribute.

64. Early consideration was afforded to legacy use of additional equipment procured.

65. Detailed planning and scoping of the practicalities around a long-term central storage facility for equipment was undertaken through a SLWG with full stakeholder engagement.

Challenges

66. Baseline equipment - The lack of a centralised national medical equipment database introduced avoidable delays in determining the baseline equipment availability in NHS Scotland.

Medicines – I have captured these from the conclusions drawn from work I was aware of from draft documents shared with me during the pandemic as part of my role in the SG ICU resilience and support group. I do not have more detail on matters referred to here but think this is a relevant subject for the inquiry.

67. The lack of any IT systems in Scotland to track medicines purchased and medicines' issues in Scottish hospitals produced a vulnerability around running out and required additional vigilance and checking by both front-line clinical staff and pharmacy departments.

68. The medicines supply chain operating on a 'just-in-time' basis compounded this vulnerability.

69. The lack of visibility of what stock is expected and when it will arrive into the UK added to this vulnerability.

70. Most critical care medicines were not held in the UK emergency Medicines Buffer Stockpile (EMBS)

RRT equipment

71. Whereas each additional bed space had requirements of a suite of associated items and indeed we had a minimum standard for this, the number of RRT machines required was arrived at based on educated guesswork on likely requirements. It is difficult to see a better solution for situations when one is dealing with a new disease where rapid change is occurring and learning is continuously increasing. In Scotland the experience was that, based on phase 1 incidence of acute renal failure, we provided adequate equipment to manage a maximum surge position. In reality, the major challenge was around RRT consumables not machinery availability.

RRT consumables – circuits, filters and fluids

72. As mentioned previously, there was an unusually high requirement for the disposable parts for haemofiltration (HF) machines used to manage patients with renal failure in ICU during phase 1. In some cases, sets clotted off several times over a few days, increasing significantly the number of sets required to manage each patient, but also impacting on the workload of the bedside nurse and, given that it was only the core ICU nursing staff that had the training to set up, run and troubleshoot RRT machines, this had the added impact of stretching their support for redeployed staff.

73. HF requires large volumes of specialised fluids to replace the 20+ litres removed in a 24-hour period. The supply of these fluids proved challenging. The group did source an additional supplier whose fluids could be used with other manufacturers' machines, but, as the pandemic progressed, the vulnerability of the global supply chain for RRT fluids became very apparent.

Market prices

74. It is hard not to mention that market forces were resulting in rapid escalation in capital costs being quoted. This was less apparent from the standard manufacturers, to my memory, as they had a finite capacity and ability to deliver any faster, but was certainly apparent from manufacturers with less market share or any intermediaries acting in the equipment space.

Lessons learned

NMEMS (National medical equipment management system)

75. A key learning point is the need for a national digital medical equipment management system to ensure we can assess, when needed, the number and point in their life cycle of the medical devices being used in NHS Boards. This is particularly important in terms of enabling National Procurement to move quickly with suppliers. Numerous manual surveys were undertaken by the Medical Physics leads at Board level to confirm the numbers, makes and models of essential ICU medical devices and consumables. This included: ventilators, anaesthetic machines, transport/portable ventilators, haemofiltration and haemodialysis machines, and infusion pumps. The ventilators are also a good example, where, if there had been a national database, we would have had all the information required to place the national order at a much earlier stage. This would have resulted in orders being secured and delivered earlier, thus avoiding the escalating costs during the early weeks of the pandemic taking grip.

Anaesthetic Machines

76. The use of anaesthetic machines as ICU ventilators, and the associated changing of the driving gas from oxygen to air for anaesthetic machines in order to reduce O2 consumption, was a key part of our strategy to bridge the gap in ventilators, whilst managing oxygen use during phase 1, as the numbers requiring invasive ventilation were rapidly rising.

Oxygen supply security

77. The work undertaken to assess Boards' oxygen usage has helped NHS Boards to review their current procedures and practices, ensuring a more sustainable approach to oxygen use. For example, NHS Western Isles have increased their oxygen capacity with the installation of a manifold, and the majority of Boards have managed their oxygen demand through changing the driving gas to air (where possible) on anaesthetic machines.

Central storage of equipment

78. Whilst appearing on the face of it an obvious answer to future equipment needs in a pandemic, the learning secured by scoping this long term and running a facility in the medium term has resulted in significant learning.

79. The challenges identified include:

- need for dedicated space,
- need for ongoing maintenance and servicing (space, electricity, medical gas supply),
- a battery management plan is needed (modern equipment has reliance on internal batteries to function),
- the asset value depreciates over a 10-year period,
- there is significant cost associated with the required maintenance and appropriate conditions for storage,
- it is unethical to store life-saving equipment that could be deployed elsewhere,
- the equipment has a finite life.

Summary

80. As chair of the SCCDG I was integrally involved in the work of the SG ICU resilience and support group in its efforts to provide multiple additional, functional and fully equipped ICU bed spaces across NHS Scotland. This approach allowed quick decision making with local teams kept fully engaged and involved, due to the functional clinical network built up over the preceding 20 or so years. Distribution decisions were well informed using equipment delivery timelines, daily data captures and local intelligence through the SCCDG and medical physics leads network, with the aim of matching equipment to those areas of most need, particularly during the initial phase of the pandemic. A legacy strategy evolved from mid-2020 to manage the large amount of equipment procured. This has been adapted, with policy changes, to have at least enough equipment locally to double the number of ICU beds currently funded within health boards, with ideally the same make and model of ventilator, but, as a ceiling, a maximum of two different makes and models. This doubling of capacity plan addresses the space and equipment components of an expansion of ICU beds, but does not address the workforce requirement challenge. The ongoing quality oversight and development of sustainable critical care services in NHS Scotland is aided by the incorporation of the SCCSDG into CfSD with its aim of sustainable improvement and delivery through innovation, co-design and consensus building through clinical leadership. Membership also includes representatives from the national procurement team.

STATEMENT OF TRUTH

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

Signed :

Personal Data

Dated : **19th February 2025**