

Learning lessons from the paediatric critical care response to the SARS-CoV-2 pandemic in England and Wales: a qualitative study

Emma Roche ¹, Chun Lim ², Meelad Sayma,³ Annakan Navaratnam,⁴ Peter J Davis,^{5,6} Padmanabhan Ramnarayan ^{7,8}, James Fraser,^{5,8} Simon Kenny,^{9,10} Paediatric Critical Care Society (PCCS), NHS England & NHS Improvement

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¹Birmingham Women's and Children's Hospitals NHS Foundation Trust, Birmingham, UK

²Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK

³Whittington Hospital NHS Trust, London, UK

⁴University College London Hospitals NHS Foundation Trust, London, UK

⁵Bristol Royal Hospital for Children, Paediatric Intensive Care Unit, Bristol, UK

⁶NHS England & NHS Improvement, London, UK

⁷Children's Acute Transport Service, London, UK

⁸Paediatric Critical Care Society, London, UK

⁹Paediatric Surgery, Alder Hey Children's NHS Foundation Trust, Liverpool, UK

¹⁰Medical Director for Children and Young People, NHS England & NHS Improvement, London, UK

Correspondence to

Dr Emma Roche, Birmingham Women's and Children's Hospitals NHS Foundation Trust, Birmingham, UK; emma.roche1@nhs.net

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ABSTRACT

Objectives To explore the experiences of clinical leads in paediatric critical care units (PCCUs) in England and Wales during the reorganisation of services in the initial surge of the SARS-CoV-2 pandemic and to learn lessons for future surges and service planning.

Methods A qualitative study design using semistructured interviews via virtual conferencing was conducted with consultant clinical leads and lead nurses covering 21 PCCUs. Interviews were conducted over a period of 2 weeks, 2 months after the initial SARS-CoV-2 surge. Interview notes underwent thematic analysis.

Results Thematic analysis revealed six themes: leadership, management and planning; communication; workforce development and training; innovation; workforce experience; and infection prevention and control. Leadership was facilitated through clinician-led local autonomy for decision-making and services were better delivered when the workforce was empowered to be flexible in their response. Communication was preferred through collaborative management structures. Further lessons include recognising workforce competencies in surge preparations, the use of virtual technology in facilitating training and meetings, the importance of supporting the well-being of the workforce and the secondary consequences of personal protective equipment use.

Conclusions During the 2020 SARS-CoV-2 pandemic, an agile response to a rapidly changing situation was enabled through effective clinical leadership and an adaptive workforce. Open systems of communication across senior clinical and management teams facilitated service planning. Support for all members of the workforce through implementation of appropriate and innovative education and well-being solutions was vital in sustaining resilience. This learning supports planning for future surge capacity across paediatric critical care locally and nationally.

INTRODUCTION

The 2020 SARS-CoV-2 outbreak in the UK demanded dramatic changes in health service provision.¹ Reports from China and Italy suggested that paediatric critical care (PCC) in the UK might need to quickly adapt.² The evolving pandemic was declared a strategic emergency in January 2020, and the Emergency Preparedness, Resilience and Response (EPRR) cell within NHS England and

What is already known on this topic?

- ⇒ Reports from China and Italy suggested that SARS-CoV-2 primarily affected adult critical care.
- ⇒ Because the effect on paediatric critical care was not known, services needed to adapt.

What this study adds?

- ⇒ In a surge pandemic situation, the workforce is healthcare's biggest asset, and developing people and implementing well-being strategies are of paramount importance.
- ⇒ Collaborations with management teams and clinician-led leadership were successful strategies in service planning.
- ⇒ Agility in response to new ways of working, including the use of digital technologies, enabled departments to effectively adapt in a time of great change.

NHS Improvement was granted executive functions and regional EPRRs given devolved responsibility.³

Preceding this, NHS England's review into PCC and specialised surgery resulted in 10 operational delivery networks (ODNs) to coordinate regional PCC ([figure 1](#)). This design allows the system to 'respond to times of surge flexibly'.⁴ These networks were at various stages of maturity at the onset of the pandemic, with some managerial teams only recently appointed.

On this background, as SARS-CoV-2 emerged, it was anticipated that demand for adult (and possibly paediatric) critical care beds would exceed national capacity. Therefore, paediatric critical care units (PCCUs) and ODNs were asked to use modelled data to develop plans for expansion and contingencies for regional PCC service demand exceeding supply. Overall PCC capacity would be increased, and regional PCC provision would expand or repurpose units. Therefore, National Health Service (NHS) leaders, regional commissioners, clinicians and nurse managers across PCCUs collaborated in new ways of working.

This was the biggest reconfiguration that PCC services in the UK had ever faced and the first time

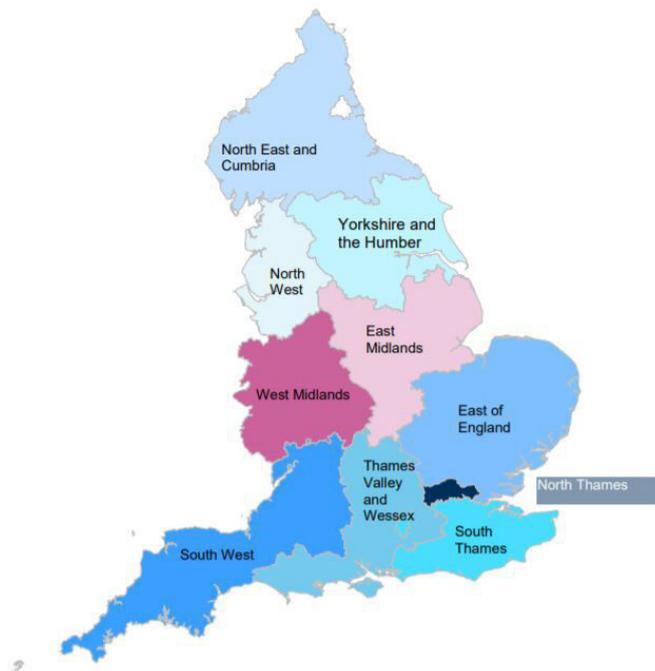


Figure 1 Ten operational delivery networks coordinate regional paediatric critical care across proposed areas in England.

that redesigned paediatric services accommodated adult patients at scale. The aim of this study was to explore the experiences of clinical leads in PCCUs in England and Wales during the reorganisation of services in the initial surge of the SARS-CoV-2 pandemic and to learn lessons for future surges and service planning.

METHODS

Design

This qualitative study used semistructured interviews and thematic analysis to allow PCC consultant clinical leads and nurse leads to reflect on their experience of service reorganisation during the first surge of the SARS-CoV-2 pandemic.

Sampling and recruitment

The target sample was a consultant clinical lead and a nurse lead from each PCCU in England and Wales. We approached all 25 PCCUs that report to the Paediatric Intensive Care Audit Network by direct email and open invitation at Paediatric Critical Care Society meetings.⁵

Data collection

Semistructured interviews using an interview guide (online supplemental appendix 1) were conducted to allow for question probing and a more comprehensive exploration of the issues discussed.⁶ The interview guide was adapted from similar NHS England and NHS Improvement work in adult critical care (ACC).⁷ Individual researchers conducted video conferencing or phone call interviews, 2 months after the initial surge in SARS-CoV-2 critical care admissions, between 22 May and 4 June 2020. Virtual interviews have been shown to be as effective as face-to-face interviews with few differences in overall data quality.⁸ Four researchers (ER, AN, CL and MS) conducted the interviews; all researchers were medical doctors with paediatric experience, one was a PCC trainee doctor and another a general paediatric trainee doctor. Three researchers had previous experience in qualitative research. One of the interviewers had a professional relationship to two of the interviewees. Each interview lasted between 45 min and 70 min.

Contemporaneous notes were recorded on a proforma during the interviews. Technology limitations among the researchers prevented recordings and addressing this would have delayed the time-sensitive nature of the project. Transcripts of notes were returned to participants for review on request.

Data analysis

A thematic analysis approach was employed (table 1), following the principles of Braun and Clarke.⁹ The extracts were coded semantically to reflect the explicit content of the data since this drew parallels with the inductive approach taken.¹⁰ The four researchers maintained an ongoing dialogue for consistent data interpretation.¹¹

All information collected was completely anonymous not enabling identification of either participants or patients in any respect in the resulting publication. Participants were assumed to provide consent for participation in the interviews if they agreed to be interviewed. At the time of interviews, they were informed that the information they provided would be treated in confidence and would be anonymised in any publication, and that their personal details would not be made available outside the interview team.

RESULTS

Eighteen interviews were conducted. In three of the interviews, the interviewees represented two PCCUs within the same city or hospital Trust, therefore capturing 21 of the 25 units in England and Wales. Four units did not respond to requests to be interviewed or declined to participate. All interviews included a consultant clinical lead, and six included one or more nurse leads.

Table 1 Phases of analysis

| Phase of analysis | Researchers involved |
|---|----------------------|
| Researchers read through contemporaneous notes to become familiar with the data. | ER, CL, AN, MS |
| Researchers extracted 821 codes from the contemporaneous notes onto Excel. To ensure credibility, each researcher had a sample of their initial analyses independently checked by another researcher. | ER, CL, AN, MS |
| Researchers read through codes individually to familiarise themselves with content and ensure that these consistently reflected the interviews. | ER, CL, AN, MS |
| Researchers reviewed the codes together and manually grouped them into 269 categories in Excel. | ER, CL, AN, MS |
| Researchers reviewed the categories in a virtual meeting to generate them into themes using Excel. Raw data were continually referenced in order to refine the themes. | ER, CL, AN, MS |
| Sense check of findings. | JF |

Table 2 Four models of care that evolved in PCC during the first surge

| Model of care | Model A: increasing capacity within PCCUs for PCC patients alone | Model B: increasing capacity within PCCUs to accommodate both PCC and ACC patients | Model C: repurposing of PCCUs as ACC with PCC workforce caring for adult patients (with redirection of PCC patients to neighbouring units) | Model D: repurposing of PCCUs as ACC units with the ACC workforce caring for adult patients (with relocation of PCCU within the same hospital) |
|-----------------------------------|--|--|--|--|
| Number of units for model of care | 10 units | 4 units | 3 units | 4 units |

ACC, adult critical care; PCC, paediatric critical care; PCCU, paediatric critical care units.

In addition to the identified themes from the interviews, the interview data revealed four different models of care that evolved (table 2). They demonstrate the variety of service provision and provide context to the experiences reported by clinical leads.

The analysis revealed six themes and box 1 illustrates the quotes for each theme.

Themes

Leadership, management and planning

Interviewees described the importance of clinician-led local decision-making benefiting from clinicians' insight into ways of working and their familiarity with the local environment (participant (pt)6). Effective collaboration between clinicians and managers positively enabled service planning and delivery. Good practice examples of clinicians and hospital management working together included the effective redeployment of PCC nurses to ACC units. Interviewees also described management teams helping in day-to-day work, such as cleaning on the PCCU (pt 2). Such examples fostered good relationships.

Interviewees raised concerns where service redesign (eg, the repurposing of beds or patient admission decisions) was proposed without proper consultation with the clinical team. Many units were minimally involved with discussions about restarting surgical services in their hospital, although one unit was actively creating plans to support surgical activity over that summer.

In relation to intraregional working, many units reported beneficial and supportive relationships with their relevant ODN, while on occasion interactions with NHS England regions caused tension.

At the bedside, approachable and proactive individuals empowered their colleagues to safely care for adult patients (pt 17). One model C unit described that their consultants improved the confidence of those delivering care through shared clinical decisions and collective learning to develop a positive culture.

Interviewees reflected that planning and preparation required agility. Plans created in advance and in the hope of being the best response to the anticipated event were often different from what was needed when the actual event occurred (pt 6). Some of the strict rules around personal protective equipment (PPE) presented particular challenges. One interviewee suggested that broad principles in planning are important without being bound by strict rules, using the analogy of a 'Napoleonic view of the battlefield' to imply that situational awareness of the big picture should be maintained to enable flexibility in response. Another interviewee expressed that prepandemic planning may have been too rigid, which required another plan to be made when the situation changed. An alternative might have been to build flexibility into operations from the outset. Good practice examples for adaptation included safely adapting protocols for medications and rota flexibility.

Communication

A characteristic of the pandemic was the large volume of new information to be disseminated (pt 6). The availability of senior doctors and nurses on every shift and use of digital technologies improved information sharing (pt 11).

Another challenge was multiple meetings at different organisational levels resulting in information being 'lost in translation'. Functional pre-existing working relationships enabled easier conversations during crisis. Some interviewees described the advantages of conversations at a horizontal level between clinicians and managers, rather than via the traditional vertical management structures existing in some hospitals.

Workforce development and training

A commonly reported challenge was how best to prepare for unfamiliar scenarios (pt 8). Examples of good practice were buddy systems for new team members and proactive training using inductions, new protocols and simulation to support new ways of working (pt 1 and pt 2). In order to sustain correct PPE use, one unit frequently reiterated messages with regular teaching sessions and posters to keep knowledge up to date (pt 10).

Workforce redeployment and the need to wear PPE significantly affected both routine departmental education programmes and bedside teaching (pt 3). However many interviewees reported new opportunities to access virtual learning (pt 15).

Workforce redeployment highlighted significant variation in bedside competencies and some units created extended nursing roles to address this (pt 1).

Innovation

Interviewees universally reported using virtual platforms, including for meetings, teaching, psychological support and ward rounds (pt 5 and pt 12). Many interviewees reflected that attendance at virtual events and work-life balance improved with remote working (pt 4).

Well-being initiatives reported across the interviews included food provision, longer breaks, hotel accommodation, well-being rooms, virtual resilience calls and psychology support. The importance of the workforce supporting each other was often reported (pt 7). One unit created a specific time for this before the start of every shift, which was reported to have a buoying effect on colleagues (pt 17).

Workforce experience

Redeployment of theatre workforce, ward nurses, nurse specialists and doctors increased numbers in PCC and ACC. Participants described familiarity with the working environment and the clinical team they were supporting as being beneficial (pt 16). Some units organised familiarisation visits to ACC units and increased consultant and senior nurse presence in clinical areas.

Box 1 Participant quotes

Leadership, management and planning

- ⇒ "Better for front line to be making decisions. With additional partitions ... easier for those who work there to explain what they were doing to others." (pt 11)
- ⇒ "People from finance mopping the floors. People just got on with it." (pt 2)
- ⇒ "The new way of working also worked well because it was an open system – people were able to speak up and say if something is not working. People learnt that they could speak up when needed." (pt 17)
- ⇒ "There was detailed planning internally prior to pandemic, perhaps too much rigid planning. This ended up with changing plans on the fly as circumstance changed. May have benefitted from a flexible plan with clear authorisation plans (eg, who signs off) and some autonomy on the clinical level." (pt 6)
- ⇒ "Empowered paediatric intensive care nurses to be tutors and mentors, really capable people who were acknowledged and generated a whole raft of educators who weren't there before and gave them confidence. Helped junior [nurses] to develop leadership skills overseeing theatre staff – really shone." (pt 1)

Communication

- ⇒ "There were daily management meetings where information dissemination from the top and clinicians relaying frontline experience." (pt 6)
- ⇒ "At start of the pandemic, we ensured that there was a sister in charge every shift (not the case before then). Lead nurse present every day." (pt 11)

Workforce development and training

- ⇒ "As part of training system for non-critical care nursing staff, they would buddy up with Paediatric Intensive Care nurse and this worked well for new staff coming in." (pt 1)
- ⇒ "Mock bed space made for simulation. Used for common scenarios. Anaesthetists didn't require specific training, just local level induction." (pt 2)
- ⇒ "What works to make everyone follow the guidance is reminders – nurses always very good at that. Two to three times daily donning/doffing training for staff. Posters outside with pictures of staff wearing standard PPE and face masks." (pt 10)
- ⇒ "Teaching on ward rounds has almost disappeared due to the constraints of PPE." (pt 3)
- ⇒ "With the advent of Zoom and MS Teams access to educational teaching is much better." (pt 15)
- ⇒ "Variable transferability of skills ... a challenge was working out what people can and can't do." (pt 1)
- ⇒ "Nurses generally felt unsupported in unfamiliar working environment. Were expected to manage adult patients without induction/support." (pt 8)

Innovation

- ⇒ "Psychology team very present, working remotely but made themselves available to everyone the same day." (pt 12)
- ⇒ "We had to learn a whole new way of communicating with virtual wards rounds." (pt 5)
- ⇒ "Brilliant changes with all the online stuff, webcam stuff, future world opportunities– less travel, environment, time benefits, safety." (pt 4)

Continued

Box 1 Continued

- ⇒ "Staff support for each other is biggest thing." (pt 7)
- ⇒ "Interventions that were helpful for wellbeing were pre-shift chats for a couple of minutes – team spirit, everyone quite buoyed up." (pt 17)

Workforce experience

- ⇒ "Human resources processes streamlined with memorandum of understanding ... allowing staff to move easily to other trusts." (pt 6)
- ⇒ "Redeployed staff is smoother with familiar staff - people worked in past and within paediatrics who know staff, easier to integrate." (pt 16)
- ⇒ "Two consultants had Coronavirus but there was flex in system – consultant covered on goodwill." (pt 8)
- ⇒ "Daily on-line calls for resilience." (pt 4)
- ⇒ "Clinical lead and lead nurse personally go around the unit and provide contact and check on staff members." (pt 14)
- ⇒ "Communication is affected by wearing PPE. Due to PPE, patients cannot see smiling and there is limited physical touch to comfort upset parents. One nurse reported that this was a moral injury as everything that made her a nurse, she cannot do." (pt 14)

Infection prevention and control

- ⇒ "Too many changes [for PPE]. No-one could keep up." (pt 5)
- ⇒ "In emergency situations, lots of people in a lot of PPE – it was more challenging to communicate with one another." (pt 5)
- ⇒ "Conflict of opinion among staff regarding necessity of PPE for all cases after hearing from media regarding PPE shortages elsewhere in the country, staff do not want to 'waste' PPE using it when caring for non-Covid-19 patients." (pt 14)
- ⇒ "Ward rounds take an awful lot longer, can't flick back to the bedside when you need to." (pt 5)

PPE, personal protective equipment.

Unpredictable rota shortages were in part related to team members self-isolating or shielding. Rota gaps were filled due to goodwill, strong relationships among team members and positive team dynamics that encouraged mutual support (pt 8).

Well-being in the workforce was affected for multiple reasons, including witnessing increased numbers of adult patient deaths and fears for their own mortality. Some units expressed the importance of providing regular reassurance to the workforce (pt 14). Some interviewees were concerned for the resilience of colleagues with the ongoing cycle of frequent changes.

Social distancing and PPE use affected workforce interactions with patients and families. Some units created a family liaison service run by specialist clinicians or nurses and provided technology such as iPads to assist communication. Many units exercised pragmatism in allowing parents to visit.

Infection prevention and control

PPE availability and protocols varied across units and over time (pt 5). Challenges resulted from a lack of agreement between infection prevention and control (IPC) and critical care teams on the necessary approach to PPE (pt 14).

Some interviewees reported PPE caused no hindrance with communication, while others reported issues in emergency situations, for example, resuscitation or interactions with colleagues

and families (pt 5). Some units used traffic light systems or marking out floor areas to delineate the type of PPE required. Unintended PPE consequences included the need for repeated fit testing, which impacted on workforce numbers; longer ward rounds; user discomfort; difficulty delivering bedside care; and negative effects on teaching.

There was variation in the perception of PPE impacting on the rates of nosocomial infection. Some describe that PPE led to challenges in maintaining adequate infection control measures, while one interviewee reported that better adherence to PPE in general might be expected to reduce nosocomial infection. For some, physical remodelling of the unit layout was reported to improve IPC.

DISCUSSION

The key findings of the study are that support for the workforce, effective communication at all levels of the healthcare system, collective clinician-led leadership and agility of response supported adaptation to new ways of working during the first surge of the SARS-CoV-2 pandemic.

The importance of support for the workforce was the most frequently discussed topic. Proactive planning for redeployment and workforce competencies were priorities. A PCCU which transformed to care for adult patients in France similarly describes training, protocols and support required during the transition.¹² NHS England's review of PCC and surgery in children found that capacity has been limited by a lack of qualified workforce.⁴ The review called for networks to 'carry out a workforce gap analysis to inform the workforce strategy specific to their region', as well as considering unit expansion and workforce retention. Workforce planning should be prioritised with appropriate development opportunities that value the work that NHS colleagues undertake in order to develop a sustainable future workforce.

Effective leadership was achieved through collaboration, clear communication, flexibility to adapt and using front-line experience. Literature suggests that organisational culture and patient outcomes are better when clinicians are included in leadership teams.^{13 14} The NHS Long Term Plan recognises that quality of care is 'directly affected by the quality of leadership'.¹⁵ Doctors and nurses should be empowered to advocate for their own services, supported to develop as leaders and be given the tools to be flexible when implementing service plans. Horizontal communication at these levels of leadership should be highlighted to facilitate open communication and collaboration in times of crisis.

The interviewees describe the importance of well-being during the SARS-CoV-2 pandemic. This is important because burnout increases the risk of medical error, and indeed the Faculty of Public Health has reported that 'wellbeing enhances resilience and protects against disease'.^{16 17} In future plans, well-being initiatives should therefore be a priority due to their beneficial impact on both the NHS workforce as well as patient care.¹⁶

PCC experiences were heterogeneous and PCC leadership at a national level noted that this led to perceptions of inequitable treatment of children and adults. This was not reflected in terms of absolute regional and national PCC capacity or demand. These differences in perception highlight the importance of effective vertical communication of national strategy between national and regional teams and providers. The newly established PCC ODNs, many of which were only in their infancy at the start of the SARS-CoV-2 pandemic, might reflect on how

communication and increases in bed capacity can best occur in future times of system pressure.

The unexpected benefits described were the collaborations between paediatric and adult critical care services and the development of new working relationships at different levels of the healthcare system. New skills were acquired by clinical and managerial teams.

Limitations

The main professional groups interviewed were senior clinicians from medical and nursing backgrounds. Regional and Trust management and junior doctors and nurses were not interviewed; this may bias the results towards a senior clinical perspective of the pandemic experience.

The experiences described by the units are considered as one data set and did not review differences between the models of care and were a single snapshot in time. It is acknowledged that each interviewee's commentary is influenced by local factors and that perceptions and attitudes may change with time.

A significant limitation is that participants' responses were documented as contemporaneous notes rather than being recorded during the interviews due to technology limitations.

CONCLUSION

During the first surge of the SARS-CoV-2 pandemic, PCC capacity was maintained nationally and ACC services were supported by PCCUs at scale for the first time. This paper investigated the experiences of clinical leaders to describe important lessons for future planning. Developing the NHS workforce and supporting their well-being are crucial for future success. Collaboration at both national and local levels allowed for coordinated and flexible responses, driven by local clinical leadership in partnership with management teams. New ways of working such as the harnessing of virtual technologies should be embraced. This learning can be used in planning for future surge capacity in PCCUs locally and nationally.

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Patient consent for publication Not required.

Ethics approval Ethics committee approval was not required as the study was deemed to be an evaluation of PCC services during the SARS-CoV-2 pandemic.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request, and where confidentiality to participants can be maintained. The datasets generated

during the interviews are available, alongside the process of thematic analysis. However, interview data was collected confidentially and would need permission of the interviewee to disclose.

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ORCID iDs

Emma Roche <http://orcid.org/0000-0002-2407-8588>

Chun Lim <http://orcid.org/0000-0003-0311-8445>

Padmanabhan Ramnarayan <http://orcid.org/0000-0003-0784-8154>

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APPENDIX 1: SEMI-STRUCTURED INTERVIEW GUIDE

| | |
|--|--|
| Situation | |
| Hospital | |
| Region | |
| Hospital descriptor <ul style="list-style-type: none"> • Stand-alone children's hospital • Co-located with adult Trust | |
| PCC commissioned capacity (Level II/III) | |
| PCC surge capacity (Level II/III) | |
| Operational Delivery Network | |
| Transport service | |

| |
|---|
| <p>BACKGROUND</p> <p>Key areas of exploration:</p> <ul style="list-style-type: none"> - Patient population and capacity - Engagement with surge planning expectations |
| <p>WORKFORCE</p> <p>Key areas of exploration:</p> <ul style="list-style-type: none"> - Leadership - Rotas and Staffing - Training |

- Wellbeing

RESOURCES AND INFRASTRUCTURE

Key areas of exploration:

- Cohorting, screening and workspace
- PPE, Equipment and Medications
- Service Restoration and Planning

COMMUNICATION

Key areas of exploration:

- To patients
- Within Teams
- Within Networks and transport services

ANY OTHER QUESTIONS

- Please tell us anything else that you feel NHS England should reflect upon in its escalation surge planning going forward
- List any further challenges not covered elsewhere
- Please list any advice you would give to other units

PREPARATION FOR 2nd COVID/ WINTER SURGE

Please list any positive learning from the 1st surge that you plan to embed into your service that you feel will better prepare your unit for a second surge/ winter:

