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Endacott, Ruth

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Running title: SEISMIC Network study

Ruth ENDACOTT   ORCID ID: 0000 0002 4352 4600

School of Nursing & Midwifery, University of Plymouth, Drake Circus, Plymouth PL4 8AA

Clinical School, University of Plymouth/Royal Devon & Exeter Hospital NHS Foundation Trust, Barrack Road, Exeter EX2 5DW

School of Nursing & Midwifery, Monash University, Melbourne VIC 3800, Australia

Susie PEARCE   ORCID ID: 0000 0003 0177 5732

School of Nursing & Midwifery, University of Plymouth, Drake Circus, Plymouth PL4 8AA

Clinical School, University of Plymouth/Torbay and South Devon NHS Foundation Trust

Pamela RAE   ORCID ID: 0000 0003 0370 6570

School of Nursing & Midwifery, University of Plymouth, Drake Circus, Plymouth PL4 8AA

Annette RICHARDSON ORCID ID: 0000 0003 1694 0454

The Newcastle upon Tyne Hospitals NHS Foundation Trust

Suzanne BENCH   ORCID ID: 0000 0002 4499 0295

London South Bank University
Royal National Orthopaedic Hospital NHS Trust

Natalie PATTISON*   ORCID ID: 0000 0002 6771 8733

University of Hertfordshire, College Lane, Hatfield AL10 9AB UK

East and North Herts NHS Trust, Coreys Mill Lane, Stevenage SG14AB UK

*Corresponding author: natalie.pattison@nhs.net n.pattison@herts.ac.uk

on behalf of the SEISMIC study team.

Conflict of interest

The authors declare they have no conflicts of interest.

How COVID-19 has affected staffing models in intensive care: a qualitative study examining alternative staffing models (SEISMIC)

Abstract

Aims: to understand how COVID-19 affected nurse staffing in ICUs in England, and to identify factors that influenced, and were influenced by, pandemic staffing models.

Design: Exploratory Qualitative study

Methods: Semi-structured, online interviews conducted July-September 2020 with regional critical care leaders including policy leads (n=4) and directors/lead nurses (n=10) across critical care networks in England.

Findings: The six themes emerging from the framework analysis illustrate how the pre-pandemic ICU culture influenced ICU staffing models during the pandemic. Changes in staffing impacted on the workforce and the care delivered, whilst it was necessary to learn from, and adjust to, a rapidly changing situation. Variation across and between networks necessitated variation in responses. The overwhelming outcome was that the pandemic has challenged the central tenets of ICU nurse staffing.

Conclusions: Pandemic nurse staffing models resulted in changes to ICU skill-mix and staffing numbers. Factors such as the impact of nurse staffing on care practices and on the workforce need to be taken into account when developing and testing future nurse staffing models for ICU. The extent to which ICUs will return to former staffing models is not yet known but there seems to be an appetite for change.

Impact:

- In common with many countries, nurse staffing in English ICUs was adapted to address surge requirements during the COVID19 pandemic.
- Findings highlight the challenge COVID-19 presented to pre-pandemic ICU nurse staffing guidelines, the impact on patient and staff wellbeing and the potential legacy for future staffing models.
- Study findings have implications for ICU nurse managers, researchers and policy makers: nurse staffing models need to be adaptable to the local context of care and future research should investigate the impact of different models on patients, staff and health service outcomes.

Key Words:

Nurses, intensive care, COVID-19, nursing workforce

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Abstract   179 words

Main text   5799 words

INTRODUCTION

Nurse staffing in the intensive care unit (ICU) has not been subject to the same scrutiny as nurse staffing on other hospital wards (Griffiths et al., 2019; 2020). Wynne et al. (2021) point out the considerable diversity in staffing models across developed nations, despite practice standards being fundamentally similar, and most mandated nurse:patient ratios depending on patient acuity and other contextual factors (The Ohio State University, 2020). In England, ICU nurse:patient ratios are principally guided by the Guidelines for the Provision of Intensive Care Services (GPICS) (2nd edition) (FICM, 2019) and historical British Association of Critical Care Nurses position statements (Bray et al., 2010). Nurse staffing tools, which are mechanisms for determining and capturing staffing requirements and based on attempts to match staffing to average demand or time requirements (Griffiths et al 2020), are not routinely applied due to the lack of evidence and sensitivity in ICU (Greaves et al 2018). One-to-one ICU nurse:patient ratios remain the norm for level 3 patients (the sickest critically ill patients), with 1:2 for level 2 patients, those requiring critical care support for single non-respiratory organ failure (NHSE, 2019). In a study examining hospital capacity before and during the COVID-19 pandemic, ICU nursing capacity was identified as the most restrictive resource in terms of increasing critical care capacity to meet the demands of the pandemics and surge in critical care requirements. Without redeployment of general nurses to the ICU, bed capacity was limited to an extra 642 patients in England (McCabe et al., 2020). In this paper, we explore the changes to ICU nurse staffing models, for ICU patients in England, during the COVID-19 pandemic, based on qualitative interview data (see glossary at Table 1).

INSERT TABLE 1

Background

Nurse staffing commands particular focus given its high costs and impact on a range of clinical, nurse and patient outcomes; previous international studies have shown clear associations between fewer ICU nurses and detrimental outcomes such as patient mortality (Rae et al 2021). In a more detailed examination, West et al. (2014) found that the number of nurses was associated with greatest impact on patients at high risk of death (OR 0.98, [0.96, 0.99]), with more nurses associated with lower risk of death, whereas the same effect was not seen with medical staffing. Prior to the COVID-19 pandemic, ICU nurse staffing levels were already problematic with a national vacancy rate of 9% across the UK, and rates in cities such as London at nearly 20% (CC3N, 2020a).

COVID-19 has thrown the pre-existing nurse-staffing crisis in ICU into sharp focus. The surge in ICU bed requirements in first wave (the dates of which were: March 23rd 2020- 30th May 2020, [Office for

National Statistics, 2021]) of the pandemic saw a rapid, up to three-fold expansion of ICU bed capacity in some areas. Hospitals throughout the world have had to expand their ICU bed provision utilising military style models, with nurses and other health care staff deployed from throughout the hospital to meet the demand (Cadge et al. 2020). ICU nurses have had to quickly adapt to working in different ways, with nurse:patient ratios below those normally experienced. Research and discussion papers from the United States (Akgün et al., 2021; Cadge et al., 2020; LoGiudice and Bartos 2021, Robinson and Stinson 2021) and elsewhere around the world (for example, Arabi et al., 2021, reporting from 6 European countries, Asia, Australasia, North and South America and Canada; Moradi et al.,2021, reporting from Iran) suggest that whilst these changes have negatively impacted nurses' well-being (Greenberg et al. 2021, Montgomery et al., 2020; Rattray et al., 2021; Sampaioa et al. 2021; Wozniak et al. 2021), they also offer opportunities to consider how best to engage our limited nursing resource.

Like other developed nations, NHS England (NHSE), supported by the ICU community, rapidly generated surge staffing criteria to mitigate and address the large shortfall in nurse staffing required to care for the increased number of critically ill patients during the pandemic, with new models coming into force in April 2020 in response to a worsening crisis (NHSE, 2020a; CC3N, 2020b). Similarly, ICU pandemic staffing models and recommendations were published in Australia (Marshall et al., 2020) and the US (The Ohio state University, 2020). However, like the NHSE guidance, these recommendations were based on expert opinion due to the lack of research evidence. Authors from across the world (for example, Cross et al., 2021) have described their approaches to managing the staffing crisis, but there is currently little published data regarding the impact of these different models.

The staffing model employed in England in the first wave was subsequently revised in December 2020, in the wake of outcry over the unsustainable ICU staffing model used in the first wave (NHSE, 2020b). The waves indicated the sustained increase in transmission and infection (Office for National Statistics, 2021). Subsequent concerns that ICU staffing models used during the pandemic in ICU may be applied as a 'new norm' in non-pandemic scenarios, led to new position statements from the alliance of all ICU nursing organisations in the UK being issued early in the second wave (determined to be beginning of September 2020 to 30th April 2021, [Office for National Statistics, 2021]) (UK Critical Care Nursing Alliance, 2020, 2021). However, there remains an absence of established evidence on what safe nurse staffing in critical care comprises.

Assumptions based on historic nurse:patient ratios continue to be challenged, not least as these are based on organ failure, rather than patient acuity and dependency (Endacott, 2012). Attempts to

measure nursing workload and nursing activity using tools such as the Therapeutic Intervention Scoring System and Nursing Activities Score have been well described in Brazil and other parts of the world. However, no tool has been shown to be superior to the professional judgement of an experienced nurse manager in assessing ICU nurse staffing requirements (Greaves et al., 2018). A narrative synthesis of international literature by Wynne et al. (2021) supports the need to develop workforce measures that more accurately reflect nursing work.

In England, critical care Operational Delivery Networks (ODNs, currently n=17), in place since 2013 across the NHS (NHS Commissioning Board, 2012), support the coordination of ICU patient pathways between healthcare providers to ensure access to specialist support at a regional level. These networks also drive forward innovation beyond individual ICUs, and benchmark care and services to ensure consistency, improving outcomes and operational productivity and efficiency at regional level. This helps to facilitate optimal services, patient care and bed management. Specialist commissioners work closely with the ODNs to set minimum standards of care and service delivery (NHSE, 2019), including examining staffing. Despite the influence of these groups on local staffing models and provision, there is negligible evidence on the impact networks have on critical care staffing decisions at a local or national level.

In England, the first wave of the COVID-19 pandemic surge in critically ill patients peaked in April 2020, with the cessation of many elective services, including non-essential surgery and outpatient appointments, to provide staffing to meet the exceptional demand for, and expansion of, ICU services. This first wave was over by the end of June 2020, with resumption of usual NHS activity in June 2020 (NHSE, 2020c). Second wave peaks exceeded those of the first wave in terms of infection rates (Cabinet Office, 2020) and approached the peak ICU bed use (ICNARC, 2020; Thomas, 2020). Not all health services ceased non-essential services in the second wave, meaning that ICUs could not draw on additional staff from operating departments, outpatients or surgical wards as they had in wave 1.

The number of ICU beds has historically been lower across the whole of the UK compared to much of Europe (UK Government 2014); an immediate expansion to bring ICU bed numbers in line with Europe is underway (Cabinet Office, 2020). These conditions have led to the need for an urgent review of ICU nurse staffing.

The dearth of evidence about nationally recommended staffing models, during and outside of pandemic situations, warrants deeper exploration of the factors influencing ICU nurse staffing decisions locally, nationally and internationally. Whilst a limited number of studies have attempted

to calculate the recommended number of staff required in specific disease situations, for example, Mascha et al. (2020), there has been little focus specifically on nurses' perspectives.

As new waves continue to emerge across the world, and health care workers become more exhausted, it is vital that critical care nurses' experiences and voices are heard and used to inform future planning (Cadge et al. 2020, Wynne et al. 2021). There is a clear need to examine the effect of the COVID-19 pandemic on nurse staffing models, on both staff and patient outcomes, as well as to understand potential future implications for ICU nurse staffing, leading to the research question: what impact has COVID-19 had on ICU nurse staffing models?

THE STUDY

Aims

The aims of this study were to understand how COVID-19 affected nurse staffing, from the perspectives of regional critical care leaders and policy makers, and to identify factors that influenced, and were influenced by, pandemic ICU staffing models.

Design A qualitative in-depth exploration of factors influencing ICU nurse staffing models from the perspectives of regional critical care leaders, including policy makers and critical care regional network leads, using semi-structured online interviews conducted between July-September 2020. Framework analysis and cross-case analysis were used to identify themes in the data (see analysis section). Study design and conduct are reported in line with COREQ guidelines.

Participants

Purposive sampling was used to identify potential interview participants. Fourteen participants were interviewed; ten were Critical Care ODN Directors and/or Lead Nurses, the remaining four were involved in setting policy directions for nursing workforce. Table 2 indicates respondents, granular detail would risk identifying participants, therefore, only broad participant information is included. The ten Network Directors and Nurse leads were responsible for ODNs across England covering between 8 and 21 ICUs, with a total of 145 ICUs in NHS Trusts.

<div align="center">INSERT TABLE 2</div>

As devolved nations, Northern Ireland, Scotland and Wales have different nurse staffing criteria and funding mechanisms and were therefore excluded. The geographical range of networks included represented the whole of England; this enabled us to sample across a breadth of staffing models, regional & ICU sizes, vacancy rates, staff turnover and sickness/absence.. Nursing leads or network

directors were interviewed, to reflect the range of management roles within networks. The sample size was informed by saturation through the concept of *information power* (Malterud et al., 2015), the premise being that the larger the information power of the sample, the smaller the sample required. In other words, the sample (who was chosen for interview) and sample size was determined by the richness, depth and breadth of data yielded.

Inclusion criteria included policy makers, network directors and lead nurses working in their role and in the ICU field for at least one year. Policy makers, or network directors/lead nurses, who had no input into decisions about ICU staffing were excluded.

Data Collection

The online interviews were solely conducted by [*blinded for peer review*], a highly experienced researcher with an extensive background in intensive care, which enhanced qualitative credibility and dependability (Denzin and Lincoln, 2011) and information saturation (Malterud et al., 2015).

The interviews explored the COVID-19 pandemic situation and how staffing models used across the different networks were applied during the pandemic, as staffing models were not considered to be a fixed entity. The interview topic guide was developed with the external collaborators (UK Critical Care Nursing Alliance). Given some of these interviews took place prior to the second wave, and all but one participant had indicated a desire to continue supporting the study, we additionally contacted participants via email in February 2021 and asked if there were any changes to their answers with the advent of the second wave. The inclusion of data from this second time point enhanced credibility of findings in a rapidly changing situation (Denzin & Lincoln, 2011).

Ethical considerations

Verbal informed consent was sought prior to each interview. Online interviews, including the consent process, were audio-recorded and transcribed verbatim. Research ethics approval was provided by [*blinded for peer review*] Research Ethics Committee and the HRA (IRAS ID XXXXX).

Data analysis

Analysis was conducted by [*names blinded for peer review*] independently for confirmability, aligning with the requirements for findings to be corroborated by another researcher (Lincoln and Guba, 1985). A framework analysis approach (Pope, 2000; Ritchie & Spencer, 1994) was adopted to rapidly generate findings appropriate for implementation into policy. Framework analysis is highly suited to applied policy research given the focus on specific questions, predesigned sample and limited time frame (Srivastava and Thompson, 2009), in this case ICU staffing during the first two surges of the

COVID-19 pandemic. The framework was refined by [*blinded for peer review*] during data collection, and during analysis. Framework analysis comprises five stages: familiarisation, defining a thematic framework, indexing, charting and mapping/ interpretation (Pope *et al*., 2000). Interview data were analysed individually with line-by-line coding using the framework and then cross-case analysis applied to draw out comparisons (convergent and divergent themes) (Miles and Huberman, 1994).

Rigour

Study design and conduct were underpinned by Lincoln and Guba's (1985) 'trustworthiness' principles (credibility, transferability, dependability and confirmability of findings). The interviewers (xx & XX) had regular meetings during data collection and analysis. Early analysis was reviewed by the whole research team and analytical memos were shared. To ensure a strong connection between the analysis and clinical perspectives, emerging themes were discussed with a clinical stakeholder group.

FINDINGS

Framework analysis resulted in six themes, with a temporal dimension as depicted at Figure 1. Examples of data excerpts for the themes are presented at Table 3. Quotations are annotated with participant number and type.

INSERT FIGURE 1 HERE

INSERT TABLE 3 HERE

Enhanced pre-pandemic strengths and challenges

This theme set the scene in terms of the ways in which individual ICUs functioned before the pandemic, summarised by this participant as: "*the units* [ICUs] *we were worried about <u>before</u> COVID, we were even more worried about <u>during</u> COVID…*" (P7/ODN). The existing ICU culture, particularly in terms of staff support and approach to care, was perceived to have an impact on ICU and redeployed staff; where it was positive, it was: "*the only thing that got them through COVID*" (P2/ODN). This was echoed across the ODN Director/Lead Nurse interviews, illustrating their helicopter view, and broad oversight of how ICUs differed in their network. The strength of existing collaboration across the network was also evidenced in the speed with which new ICU transfer services (to facilitate rapid patient transfers between ICUs that had exceeded capacity) were established (P5/ODN), and the willingness of ICUs to provide mutual aid (P4/ODN) to smooth demand (P10/ODN). In the second wave, mutual aid was evident across all of the networks represented, to manage bed demand and the lack of nurses available from other specialties.

Existing relationships between individual ICUs and the rest of the hospital were key. For example, existing staff rotation patterns between wards and ICU (P1/STP) were considered, including ODN leads' awareness of the bigger picture "*ensuring we don't deplete the rest of the Trust* [of staffing] *at the same time*" (P5/ODN).   Redeployed staff preconceptions about working in ICU were also highlighted:

> "*some of the redeployed staff – ah – were quite clear that they had been told to come to ICU and it was the last place in the – on earth that they wanted to be. They never wanted to work in ICU and particularly not during a surge.*[. . .] *But a considerable number of people were, if not overjoyed to be there, really willing to work hard and do the best job that they can*." (P11/ODN)

The existing workforce situation, particularly vacancies and the ability to meet the national standards, was a dominant issue (P3/ODN, P7/ODN). Although the lack of evidence for using registered nurses or ICU trained registered nurses was acknowledged (P11/ODN, P6/NHSE&I), it was clear that any deviation from usual nurse:patient ratios was greeted with '*angst*' (P1/STP) or fear: "*They were panicking about it*" (P3/ODN), an issue which was not always addressed in a timely manner by the respective organisations:

> "*They were frightened by it* [the pandemic staffing model] *at first when they saw it, and the staffing ratios. They were panicking about it. But I think perhaps the emphasis should have been more around that the additional workforce will be well-prepared to help you* (P3/ODN)."

There was also frustration expressed around lack of recognition that the defining factor for bed number expansion was not availability of ventilators but availability of staff (P4/ODN).

Impact on workforce

An over-riding theme across the interviews was the perceived impact on staff wellbeing with phrases such as '*causing huge psychological harm to staff*' (P8/ODN) and '*harrowing*' (P9/ODN). In wave 2 this was exacerbated in some Trusts by pressures, from hospital bank and external nursing agencies, for nurses to take on additional shifts to cover shortfalls (P5/ODN). The long-term effects were also reported in terms of retirement, described by one network lead nurse as '*an exodus of near-retirement staff*' (P9/ODN).

The impact was also talked about in terms of overall numbers of staff, despite one network identifying that some ICUs were '*overrun with staff come the end of the first wave*' (P11/ODN) and had to turn redeployed volunteers away. The picture was quite different in the second wave as most usual hospital services continued for longer and support staff were not always available for redeployment. Additional staff from non-NHS sources, such as military, were not able to access patient records, so assumed different roles from other support staff (P5/ODN). One network director also reported that the term 'ICU nurse' was used more broadly in wave 2, to include agency nurses with an ICU background, who may have had no local or recent ICU experience (P12/ODN). The changed skill-mix at the bedside was a major concern, particularly the need for junior ICU nurses to lead teams of redeployed staff who often were more experienced/senior or came from a different speciality such as dental nursing. Participants also reported the distress experienced by junior staff when they had to talk with families about end of life care via an iPad (P9/ODN). The previous experience of redeployed staff was a major factor in reported overall workload for the ICU (P10/ODN), for instance prior ICU skills, although, regardless of their experience, the redeployed staff '*really going above and beyond was what enabled that* [pandemic staffing model] *model to work'* (P11/ODN). The impact of COVID on the wider hospital workforce was acknowledged, in particular the burden of ICU admission decision-making for respiratory teams (e.g. P4/ODN, P8/ODN), dissonance between the perspectives of ICU (nurse and medical) managers and hospital managers in terms of staffing expectations, and the need to conceptualise the ICU team much more broadly than traditional notions of what an ICU team encompassed (P3/ODN, P12/ODN). Despite all these concerns, there was also an air of optimism from some participants, with COVID unlocking a '*mindset of possibilities*' and different ways of working across the team or the network (P5/ODN, P1/STP).

Impact on care

An over-riding impact raised across the interviews was adverse events such as pressure injuries, nosocomial infections and medication errors, resulting from lower skill-mix with non-ICU staff having '*no concept of what's urgent and what's not urgent*' (P4/ODN). This was also reflected in the prolonged use of prone positioning, identified as a '*huge confounding factor* [for adverse events]*'* (P6/NHSEI) and the shift from '*proactive to reactive care*' (P12/ODN). There was an acknowledgement that adverse events often were not documented because there was '*no time for Datix* [adverse event recording system]*'* (P9/ODN) meaning that '*we won't know the full impact*' P6/NHSEI. There was a reluctance to share these experiences at network meetings because of the concern that '*they'll think our ICU's rubbish*' (P12/ODN), hence the scope for learning is limited.

Concern about dropping standards was also expressed: '*If we allow standards to drop now, how will we ever get them back*?' (P8/ODN) with a fear that working with lower numbers of ICU nurses was '*kind of normalised – a bit*' (P10/ODN).

A second major concern about impact on care related to families because nurses were '*working the opposite of the way we're used to working, from patient and relative perspective*' (P1/STP). There was concern that the family were not part of the experience as they might be usually – '*the sights, sounds, smells of ICU*'(P1/STP) – which may result in family not understanding '*why* [their] *husband or wife is so frail or angry or depressed or psychotic and why they've got these nightmares or altered memories*' (P1/STP).

> "*All of those principles that we hold dear. Well, the door's closed.[. . .] So, they're dealing with something – a black hole almost – that must be very difficult to make sense of.*"
> *(P1/STP)*

Alongside this there was an acknowledgement that families' expectations were different - '*… you did the best you possibly could and we're grateful.*' (P6/NHSEI) and that the impact of transfer to another hospital was minimised for the family: '*from a relatives point of view they just had to ring a different hospital* (P5/ODN). Other positive impacts on care were described in terms of innovative practices, for example for rehabilitation (P3/ODN), workforce agility across professional boundaries, such as teams of surgeons to prone patients (P10/ODN) and using a mobile endotracheal intubation team approach to make best use of the existing skills of redeployed staff (P4/ODN).

Learning as we go

The dominant sub-themes related to rapid learning from changes to ICU nurse:patient ratios under the emergency nurse staffing model and '*changes in the way work is delivered*' (P6/NHSEI), for example the teams approach highlighted in previous themes. It was also clear that the impact of personal protective equipment (PPE) was not initially appreciated. There were also divergent views between managers and clinicians about bed modelling (P1/STP). There was clear learning about the skills of the redeployed staff who joined the ICU team, the need to sustain education and relationships with redeployed staff and the focus on provision for staff wellbeing. The central role of the networks was emphasised in this theme enabling ICUs to learn from each other, with examples of specific therapies such as new modes of delivering non-invasive ventilation, and how teams were working in different ICUs. The visibility of, and rapid evidence dissemination from NHS leaders was emphasised, the limits of evidence available was widely acknowledged.

'One size doesn't fit all'

The name given to this theme was repeated across interviews; it was clear that COVID highlighted the variations between networks, identified in terms of ICU beds/100,000 population, and between ICUs, in terms of demand (P10/ODN, P7/ODN). There was emphasis both from within London and outside that *'the London model* [a specific approach to adjusting nurse:patient ratios] *doesn't work everywhere'* (P5/ODN, P13/Commissioner), with emphasis placed on the impact of regional geography (P13/Commissioner). Problems with applying centrally-determined models in ICUs of different layouts and estates configurations was also emphasised, in particular lack of '*line of sight'* (P7/ODN) for supervision of staff. This led participants to comment that the '*bottom line'* for ICU capacity might be different for ICUs of the same bed number (P10/ODN). In the second wave, this was affected by the capability of health services to provide non-invasive respiratory support outside of critical care; in smaller hospitals these patients would likely need to occupy an ICU bed (P4/ODN). The size of individual ICUs also impacted the scope to expand the workforce (P8/ODN, P12/ODN) and whether there was a dedicated therapy workforce (P13/Commissioner). Ongoing education support for redeployed staff, to keep them up to date for future COVID surges, was also variable (P9/ODN, P10/ODN); however, one network director did report investment in redeployed staff who didn't return to ICU in Wave 2 (P12/ODN).

Challenging central tenets of staffing

This theme echoes some of the content of other themes (for example Theme 1 'existing workforce difficulties' and theme 2 'mindset of possibilities') but with a clear emphasis on what this means for ICU nurse staffing in future. The need to have *'someone'* in each ICU bed space, to provide vigilance, reassurance and communication, was clearly articulated but questions were raised about the unique skills of an ICU nurse and the potential for nurses and other healthcare professionals from other specialties, such as operating department practitioners, redeployed surgeons, non-ICU qualified nurses and upskilled support workers, to be part of the nursing workforce during the pandemic. There were legacy questions in relation to this as well; how could these staff be retained as part of a flexible workforce to manage with future surges in critical care demand? There was a clear sense that some ICUs were unlikely to revert to the pre-pandemic ICU nurse staffing model with 1:1 nurse:patient ratios for level 3 patients and 1:2 for level 2 patients. Staffing models such as team nursing (a team of nurses and support staff, which might include non-nursing staff, caring for a group of patients) and buddying (one nurse + one support person for two level 3 patients) were reported to be '*less stressful because the ICU nurse knows she has one person with her all the time'* (P5/ODN). There were also different perspectives on the appetite for change, *"don't think there's a general desire to – to move away from, kind of, the current model."* (P11/ODN) and clear calls for an

evidence-based model: *'we need to stick to GPICS2 until science tells us otherwise'* (P9/17). The opportunity to learn from workforce changes and different approaches to team work introduced for COVID was emphasised (P3/ODN, P5/ODN) alongside the importance of considering staff needs when redesigning staffing models (P12/ODN). This was emphasised more strongly in Wave 2, with the need for an ICU career structure to prevent attrition and provide appropriate reward for staffing (P2/ODN).

DISCUSSION

This study has drawn on data from ten participants in senior roles in English critical care networks, covering over 145 ICUs, to understand how the pandemic affected existing ICU nurse staffing models. This was supplemented by interviews with regional and national policy makers. There are key implications centring on defining and understanding the impact on capacity to expand and rapidly provide ICU services in response to a surge situation, like a pandemic, on staff and on patient outcomes.

The COVID-19 pandemic has shone a light on existing strengths and weakness for ICU nurse staffing, namely the culture of the ICU; where the climate of ICU was positive pre-pandemic this facilitated positive working, particularly for redeployed staff. The ICU culture has several layers, at a nurse level, unit and organisational level, as the data emphasises. Scholtz et al, (2016), in describing ICU nurse culture in ethnographic work in South Africa, alluded to the need of ICU nurses to rapidly adjust, with sometimes negative personal consequences, and the ability to create almost sibling-like teamwork to foster a strong culture in ICU. Based on work developed and tested across Europe and in the United States, Guidet and Glez-Roma (2011) identified how the shared values, beliefs and assumptions underlying a unit have a significant impact on how it functions. Moreover, nurses may choose to work in ICU for a range of reasons, including teamwork, autonomy and in-depth patient-focus, which was threatened in the pandemic, and, in turn, is likely to have an effect on issues of retention and recruitment. A recent UK survey highlighted the high human cost to the ICU workforce during the pandemic, in part due to the staffing, alongside high mortality (Greenberg et al., 2021). As we have seen in this study and in data from other international qualitative studies (Cadge et al., 2020; Moradi et al., 2021), not all redeployed staff embraced the ICU culture. More broadly, COVID-19 presented a challenge to pervading cultures in ICU, forcing people to confront and move away from traditional models of working and staffing, disrupting ICU culture, this was at a pace not in anyone's control. Our study supports that of other international literature highlighting the

importance of good staff relationships during such crises (Cadge et al., 2020) and of effective organisational support (Moradi et al., 2021).

The resulting impact on workforce and on care has been profound, with many unknown consequences, such as a negative impact on patient safety through (largely unreported) adverse events. While mortality from COVID-19 in ICUs is well described across countries (Quah & Phua 2020), morbidity in relation to the pandemic staffing models is not clear. In the first wave, usual practices for reporting were lifted temporarily, meaning that many incidents were not reported (Denning et al., 2020), despite the higher severity of illness and intervention requirements of COVID-19 patients (ICNARC 2020). Providing high-quality support for redeployed staff may be associated with improved safety perception in future pandemics (Denning et al., 2020). In this study, participants described clinical incidents and measures taken across the network to ensure these were swiftly addressed across the region, to prevent occurrences elsewhere. The need for proactive and responsive working extended beyond individual incidents and staff agility was demonstrated by models in which staff moved across organisations, and indeed regions, to deal with local surges in demand. An author team from 14 countries (Arabi et al., 2021) describe how ICUs will never be the same, echoing participants' opinions in this study. They suggest ICUs must be prepared to accommodate surges of patients and ICU staffing models should allow for fluctuations in demand.

This study has delineated some of the mechanistic ways in which regions have responded to these demands, such as redeployment programmes and buddying for redeployed staff. The study has emphasised the wide-ranging factors to be considered when re-designing staffing models, from the local solutions to region-wide and national responses to staffing. Evidence for staffing models is weak (Butler et al., 2019), with none for ICU, therefore our respondents and nurse leaders in other countries chose to address staffing in a pragmatic way, supported by national guidance (NHSE, 2020a, Marshall et al., 2020; The Ohio State University, 2020).

 The study has emphasised the critical importance of not aiming for the one size fits all approach, particularly because ICU are widely heterogenous in terms of skill mix, staffing numbers, hospital estates and patient populations admitted to ICU. It was clear that, before the pandemic, there was much more variation in the way in which ICUs manage nurse staffing in England than the national guidance (FICM, 2019) might suggest.

The theme of *learning as we go* has delineated the range of practices and measures put in place to try to meet the demand, and how learning from successful and unsuccessful practices was shared. A number of new nurse staffing approaches have emerged during the pandemic, including the

buddying and team approaches identified by our participants and an on-call model (Jin et al., In press). Data from this study presents a challenge to the traditional tenets of ICU nurse staffing in England, moving from 1:1 for level 3 and 1:2 for level 2 patients, as per professional guidance (FICM, 2019) to completely different models across the country. Despite a call to return to pre-pandemic staffing models from the highest levels in the NHS (Chief Nursing Officer, 2021), it is unlikely this will be achievable where there was a pre-pandemic shortfall of ICU nurses nationally (CC3N, 2020a), and in the context of a national programme for rapid ICU bed expansion to be sustained post-pandemic (NHSE, 2021). Regions and ICUs are likely to look for different solutions, which need to be underpinned by research evidence.

Most importantly, there is a human cost to all of this. Staff wellbeing has emerged as a key concern, both in our findings and more generally across media and professional body reporting of COVID impacts. A recent survey of 709 ICU health care professionals across nine hospitals, including 344 (49%) nurses, found that 168 (49%) met the criteria for probable post-traumatic stress disorder (PTSD) and a similar number had moderate depression (167/49%) (Greenberg et al., 2021). These data were collected in June and July 2020, a similar timeframe to our data collection, and reflect the concerns of our participants. Data from other UK (Rattray et al., 2021) and international studies (for example Sampaio et al., 2021) further support these findings, which collectively have important implications for future nurse recruitment and retention.

A systematic review of 13 qualitative studies reporting data on nurses' experiences during a pandemic emphasises the need for Governments, policy makers and nurse leaders to work together to design workforce models that prevent loss of the nursing workforce (Fernandez-Castro 2020). Whilst descriptive accounts of workforce models employed around the world, and the experiences of nurses during the COVID pandemic, are beginning to appear (for example, LoGiudice and Bartos, 2021; Robinson and Stinson, 2021), there remains little evaluative data to guide future decision making. Robust research, testing the impact of nurse staffing models, informed by our data and that of others (for example, Akgün et al., 2020; Cadge et al., 2021) is urgently required. There is a need to better understand the impact of a more agile, flexible nursing workforce not only on patient outcomes but also on outcomes such as nurses' perceptions of their professional identity, their role as a member of a team and how these impact on their intentions to stay within different contexts. Whilst Wynne et al. (2021) argue that critical care nursing practice in developed nations is fundamentally similar, further research exploring the impact of context and culture, on how well staffing models work at a local, national, and international level is clearly warranted.

Limitations

Data collection was deliberately focused on those responsible for overseeing staffing model changes at a regional level; hence the findings are slightly removed from the impact felt by clinical staff delivering care.

Data collection took place primarily between July and September 2020 with follow up in February 2021. At this point, it was not clear to what extent ICUs may return to pre-existing models especially if there were no further surges in COVID19 activity.

CONCLUSION

The COVID-19 pandemic necessitated rapid changes to existing workforce models and ratios, with the notions of what critical care nursing is being challenged as a result of a large volume of non-critical care nursing staff being redeployed into critical care. Critical care regional leaders in this study have highlighted the need for a collective response and solution to ensure critical care services can meet exceptional demands, such as in a pandemic, including through deployment of staff to areas and units in greatest need. The factors identified as influencing nurse staffing models, such as impact on care practices and the workforce in ICU, need to be built into the development and testing of future staffing models and there needs to be more robust research to underpin these models.

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Figure 1 potential impact of pre- COVID and COVID experiences on future nurse staffing models

- Delegation skills
- Non-ICU staff experience
- Impact beyond ICU
- Mindset of possibilities

- Unrecorded adverse events
- Contrasting ICU experience for patient and family
- Speed of innovation

- Culture
- Relationship with wards/depts.
- Network-wide models
- Workforce difficulties
- Leadership

Existing strengths and challenges

Workforce impact | Care impact

Shifting sands – opportunity for re-set

Learning as we go | One size doesn't fit all

Challenging central tenets

- What do we need the unique critical care RN skills for?
- What impact did the changed workforce model actually have?
- Reflect staff and patient needs in staffing models

- 1:6 not possible
- Under-estimated PPE impact
- Assumptions about skills
- Unknown future

- London model doesn't work everywhere
- ICU geography/line of sight
- Size: scope to flex, pool of reservists,
- KIT for reservists

Table 1   Glossary of Terms as used in this paper

(pre-pandemic) Nurse staffing model	Numerical model used to calculate the number and skill-mix of nurses required in the staffing establishment, and on each shift, for an individual ICU. In England this is based on the acuity of the patient with one nurse for every patient deemed to be at level 3 (the sickest critically ill patients requiring ventilator support or more than one organ failure) and one nurse for every two patients with only one (non-respiratory) organ failure (FICM 2019).
Nurse staffing tools	More detailed approaches used on a patient-by-patient basis. These are based on either estimates of the condition of the patient or measures of nursing activities or interventions (Greaves et al 2018)
Nurse:patient ratio	The number of patients deemed suitable for management by one nurse (FICM 2019).
Pandemic staffing models	Adjusted staffing models based on, for example, one ICU nurse caring for a greater number of patients and/or the nursing team supplemented by nurses from other specialties or support staff (NHSE 2020a, NHSE 2020b).

Table 2   Participant roles (N=14)

Role	n
Operational Delivery Network (ODN) Director	6
Operational Delivery Network (ODN) Lead Nurse	5
National Policy Lead	3
Regional Policy Lead	2
Note: Some participants had multiple roles	

Table 3   Analysis framework: themes, codes and illustrative data excerpts

Codes	Illustrative data excerpts
Theme 1 Enhanced pre-pandemic strengths and challenges	
Pre-existing ICU culture	*Those differences, and difficulties, in the Unit culture are only enhanced once you get pressure on a system* (P8/ODN) *Very much the leadership was – sort of – visible. They had a fantastic team culture. And I think that was the only thing that got them through COVID 'cause if it was run by the same people as when I did the first peer review, I think it would have fallen over*. (P2/ODN) *The Units* [that managed this really well] *were those that had a lot of staff returning, and it reflects very much the cultures of the Units concerned.*(P7/ODN)
Existing relationship with rest of the hospital	*We have quite a lot of people in the Trust who have critical care skills and we do do a rotation with a couple of our wards to build that skill. So, in fact we were able to increase our staffing quite quickly to almost 1:1 status* P1/5 *We've got a – quite a good culture for, like, treatment escalation plans across the network so people are assessed anyway before ICU admission, even before Covid.* (P2/21)
Contrast between redeployed staff in motivation	*Some of the redeployed staff – ah – were quite clear that they had been told to come to ICU and it was the last place in the – on earth that they wanted to be. They never wanted to work in ICU and particularly not during a surge. So, some of them were completely – erm… But a considerable number of people were, if not overjoyed to be there, really willing to work hard and do the best job that they can*. (P11/19)

Cross-network collaboration	*We were able to set up a quick ambulance retrieval service and went and got those patients and put them in the hospitals* [with beds] (p5/11)
	It's exciting the way we pulled together and actually staff were – we also got agreement in across the region that any staff could work in any ICU (P5/11)
	Trust A, as I say, got to about one to two, one to three but we did decompress them a bit. We did mutual aid by moving patients from Trust B and Trust A to Trust C. Partly for staffing and partly for equipment so getting patients off anaesthetic machines and onto proper ventilators. And most importantly giving patients access to continuous renal replacement therapy when they were too unstable to use dialysis.. P4/9
	If we've got the facility to smooth demand then – then what is – what's not acceptable? Erm. And that's something actually that we're working on with our control and command piece as to what's the trigger to say, 'We have to move this patient from Hospital A to Hospital B.'? (P10/19)
Existing workforce situation	A *big factor was where you were in your* [staffing] *establishment before COVID and if your band 6 cadre was your biggest hit area, why is that, and what's going to be different about COVID'* P7/19
	All our critical care units were meeting GPICS2 standards…. we had very few Units who were challenged with nursing vacancies' P3/2 ODN
	I think everyone does recognise that actually there isn't massive evidence that you need an RN – erm – well, for quite a fair amount of the time (P11/27)
	I think the only – only thing that perhaps created the angst was that sense of the 1:6 or the modelling of the beds. But we recovered that really quickly. I think we got the right people involved fairly quickly but it could have grown into something much more difficult. P1/12
	They were frightened by it [the emergency staffing model] *at first when they saw it, and the staffing ratios. They were panicking about it. But I think perhaps the emphasis should have been more around that the additional workforce will be well-prepared to help you* (p3/27).
	This was the massive argument against the one to six models which got really very heated in some of our calls and things. You know – there's no point in doing intensive care if you're in a random fashion killing people because you can't provide safe care. As opposed to saying, 'This is how much intensive care we can do properly – it might not be quite how we'd normally want to do it but it's good enough' and actually it's better to triage and to be more selective about which patients you put on a ventilator because at least there's some logic to that. There is – it's based on what

	we think is in the patient's best interests. Rather than trying to ventilate everybody with respiratory failure…..– there was absolute resistance to any concept that it might be better to have more robust triage of who gets on a ventilator than to build Nightingale Hospitals. And they just couldn't get it. Or they wouldn't get it. It was just – you know – I spent two weeks of my life really with the local Nightingale discussions going round and round in circles. Why don't they understand that this is the defining factor? It's not the ventilator. It's not the physical bed. It's actually the staff. (P4/14 & 15)
Theme 2 Impact on workforce	
Psychological impact	I've not spoken to one nurse or doctor from critical care who's said 'this has been a positive experience'… they've all found it harrowing (P9/ODN) I don't know quite that some of them [staff] have got over it yet. (P10/ODN) It has caused so much trauma for people (P11/ODN)
Forced earlier retirement	A lot of people have retired. (P2/17) I think it's made them realise perhaps they're not prepared to deal with these unprecedented circumstances. It was very difficult, and it might have just pushed them to think earlier about retirement (p3/5)
Bedside skill-mix	A lot of the band 5 nurses for instance had no experience of trying to run – run teams (P11/ODN) Having a lot of staff who were unqualified in critical care was a huge burden on those nurses to supervise them and to ensure that their patient was safe. And going back to the skill mix – you know – a lot of those junior band 5 critical care nurses really struggled with that (P12/ODN)
Redeployed/Non-ICU staff experience	It made a bit of a difference as to where your redeployed staff came from so that if you had complete novices – erm – I think there was a struggle. (P10/ODN) another thing is regular debriefs and a review for those non-critical care staff to ask how are they doing and give them feedback about how they're doing (P11/ODN).
Wider impact, beyond ICU	Some of the respiratory teams were making early triage decisions – that was a huge weight of responsibility on them… and they don't have the same peer support that an intensivist would have … (P8/ODN) It's possible that someone made a clinical decision that it was inappropriate to refer a patient to intensive care 'cause actually the burden of all of this has fallen on the respiratory physicians. (P4/18) I think it's about having that really good, collaborative relationship about how you work differently as a team [of critical care and redeployed staff]. . . .But realising you are a team and you've got to have a different way of working. (P3/4) Huddles – to workload plan in teams (P12/25)

	Because we won't be returning to what we had. The ED will not return to what it was. And our COVID wards are going to – I'm calling it 'a state of readiness', where we do joint briefings, stepping away from the acute response and moving into a state of readiness and restoration. And we've never done it before. So, we haven't got established mechanisms to use have we? We're creating them as we go along and not maybe having time to share across the teams as much as we'd like to. (P1/STP/Chief Nurse)
Dissonance between ICU managers and hospital management	*I think everybody in critical care knows what we need. It's being strong enough to, sort of, fight the management within the hospitals because it's them that sort of just don't get it.* (P2/ODN) *Delays in recognition of need to stop elective work* (P11/ODN) *One of the sad things is that the rest of the Trust seem to have forgotten what it was like and as soon as there's a down time the nurses are being moved back – critical care nurses are being moved to cover the wards again*. (P12/ODN) *I've asked all the units to provide us with their restoration plans and their blue/green streams and how they can – how they're planning to work. The differences between what Trusts, through their executive teams, are submitting as their restoration plans and what the clinicians think they're doing on the ground…. Really interesting the sort of disconnect between people on the ground are actually just getting on with a plan that'll work and different players are thinking, 'Well, that doesn't look neat and tidy. This looks better so we'll do it this way.'* (P4/ODN) *You were releasing your own normal stuff to go off to train at the Nightingale Hospital. I think coordination. And I mean the Nightingale – it was meant to open on the Monday, and they were still training people on the Sunday night. So, fortunately we never used it.* (P5/19)
Mindset of possibilities	it's exciting the way we pulled together and actually staff were – we also got agreement in across the region that any staff could work in any unit (P5/11) *Some of that was kind of the energy. Some of that was testing their skills. They felt they were working to the top of their licence. Which you don't always have the opportunity to do every day but they felt that they were. They felt the level of respect increased. Both between the professions and with each other. They felt that it really coalesced them as a group and a unit. That they were more forgiving of each other and more compassionate. it's – as you said – released a mindset of actually there's some possibilities. Don't assume we can't do something.* P1/11

Theme 3 Impact on care	
Increase in adverse events	*…and lots of them said that they hadn't reported everything on Datix…* (P11/ODN) *These were exceptional circumstances and, whilst we could do it* [manage with less ICU-trained nurses], *there is* [anecdotal] *evidence from critical incidents that other things have suffered.* (P12/7). *The units that have properly surged that I've spoken to across the country, were certainly running into pretty big problems with safety and incidents… I know in London nosocomial infection started to become a real issue again* (P4/CRG) *We've also had medication errors… The non-critical care nurse sees the syringe finishing and says, 'Oh, yeah. That syringe finished about 10 minutes ago.' All of that rescue stuff having to go on! And if you don't know it, you don't know it. You've no concept of what's urgent and what's not urgent and you just can't assimilate all of that in – in a – you know – in a week's training. You can't. You can't understand what's important.* (P4/ODN) *They gave paracetamol IV instead of oral or the other way around. . .* (P12/8)
Impact of proning on adverse events	*I don't know how much work has come out of reviewing the use of proning, but proning patients is associated with – it's really obvious, I've heard it I don't know how many times – huge numbers of pressure ulcer, gastric feed retention. and because patients are so – dependent on being prone, they're often on there for far longer than we used to do it.* *I think that's a huge confounding factor because no matter how many nurses you have – 1:1 or whatever – you may not be able to impact on* [those events] *until you get the stability of the patient and the oxygen levels sorted* (P6/NHSEI)
Different experience for patient and family	*Patients won't know how it was for family; family won't have 'experienced' the sights, sounds and smells of ICU.* P1/4 *We worked in a way that was almost the opposite of the way we're used to working from patient and relative perspective.. All of those principles that we hold dear. Well, the door's closed. Relatives were not able to be part of that experience and so they didn't live through that experience. So, they're dealing with something – a black hole almost – that must be very difficult to make sense of. Some had access to telephones. Some had access to video link which they found very distressing because you haven't got someone with their arm around you have you? You're at the end of – this. And you see your beloved in a dreadful… 'Cause they looked – they looked awful. They were so ill. They swelled up and all of that stuff. when someone's in ITU and you can see them day-to-day you understand why they are so physically frail and why they have a psychosis. Or why they're depressed and you understand that and you can deal with it. You won't be able to make sense of it and we've not been able to do the follow-up that we would normally do. So, I think a*

	lot – we're going to see emerging a lot of longer-term distress and mental health issues associated with this traumatic event that they didn't really get support for. P1/7
	We don't know how it was for families P6/6
	[discussing transfer] *The beauty of that was there were no relatives allowed to visit so actually from a relatives point of view they just had to ring a different hospital. It wasn't a big strain for them* (P5/11)
	I found it extraordinary that families were so – so very positive about what I would have considered to be a very negative thing which is that they weren't allowed into the critical care units. And – and – and – you know – it is horrific, I think, for families not to be with their loved ones when they need to be. And yet, when it came to it we – the feedback was – was – was amazing and it's almost like, 'We trusted you. We handed over our – our loved one to you…' '… you did the best you possibly could and we're grateful.' And – you know – there lies a problem really because then you've got to understand what it is that – you know – is it about matching what families want, or families expectations? So, you know – sometimes, before, families – you could give them the moon and they still weren't happy – and there's something about that – that is the difficulty. Did their expectation get matched? P6/17
	That was one of the most time-consuming bits of the days…. you'd sort of find yourself in the evening, about to go home, thinking, 'Actually, I've still got five more families I haven't updated.' Because there's so much information out in the public domain, so much of which was totally wrong, that you could easily have a half-hour conversation with every family, every day P4/10
Positive impact	*Most practices, sort of been a little bit enhanced and escalated to get them through and recovered as quickly as possible and not sort of have that – sort of – nice ease and, 'Let's take our time' and 'We've got the ability to take our time.' I think it's been very, 'Let's get them recovered as quickly as possible and get them out and well, as quickly as we can.* (P3/19)
	Definitely having teams of people to do some of the care [helped to make the staffing model work] *So, when people had proning teams… it made a significant difference. We didn't have that in all of our units. I don't quite know why.* P10/13
	You're using a skillset of people who don't normally do intensive care to do the bit that they do normally do and can do very well. The other advantage that we foresaw of doing that is if you had a MERIT team that meant you were only – and this is very utilitarian in terms of the ethics – but it meant you were exposing probably three people – an ODP, a nurse and a medic to the highest risk of contamination procedures. P4/9
Theme 4 'Learning as we go'	

Changes in ICU nurse:patient ratios	*I think they managed as well as they could have done. I think we've got a lot of learning out there. As in, I think the 1:6 is not doable.* (P2/p16) *We should never ever move towards a ratio of 1:6… and I think having it in a document whereby it's almost like a step by step progression to this level of ratio. In hindsight probably isn't helpful* (P10/21) *The advice went as far as saying you could go up to 1:6. Well, forget that. Completely forget that. That is just not possible. we tried it at Nightingale. Even with our best efforts it just isn't – it isn't doable. 1:4 is just about doable with some fairly strong structures around it* (P6/9) *1:2 is not the new norm* (p2/19)
Change in ways of working	*This change in the way workforce – the change in the way work is delivered. So, having – you know – teams that come to prone and turn – and technical experts that come and do your ventilator and your haemofilter or your – and for us it was a haemo – a – a proper haemodialysis machine rather than a filter at the bedside. But those kind of things make it all doable. Whether they add value to the patients' overall experience is – is difficult.* P6/10
Different perspectives on bed modelling	*Some of the modelling initially created quite a bit of angst from the anaesthetists who felt that perhaps we as managers didn't fully understand the implications of establishing a clean unit and a COVID unit…… we got a clinical group together to discuss that really openly…. But it took us, I'd say, two or three weeks to feel like the team felt they had been heard. We had a plan that they agreed with. We had a bed number that they agreed with and that they felt safe.* P1/5
Under-estimated impact of PPE	*A lot of anxiety amongst the intensivists, concerned about PPE particularly and how that affects ability to function. So, if you're donning and doffing that has an impact on productivity and efficiency as well as pace, at all levels of experience.* P1/5
Assumptions about skills and need to sustain relationships	*It's shown the critical care staff what valuable skills the non-critical care workforce have brought to them* (p3/6). *we made* [incorrect] *assumptions about the transferable skills of Theatre staff'* P8/15 *it would be good if we can retain those relationships* [with redeployed staff] *and that knowledge that we built up.* (P3/5) *This has been a bit of a wake-up call for some of them and they think, 'Oh, s'truth, they do earn their money' type of thing. They* [ICU nurses] *are not just sitting at the end of the bed which some people thought that that's what they did.* (P2/18) *hopefully there is a bit more understanding but once we go back to normal, people's memories are short.* (P2/19)
Staff wellbeing	*I think people are very aware of – erm – the potential for burnout etcetera. I think, within COVID time there wasn't anything they could do about it. . .because they were all so pushed. But most units are now trying to look at something for staff.* (P12/19)
Network role	*I think we were quite lucky being so far north, because we learnt from the south* [about use of NIV in COVID patients]. (P2/20)

	it was a Mexican wave wasn't it? But you weren't quite sure where it was gonna pop up next (P12/21) *across the network, basically we made the assumption that you'd lose about 30% due to sickness, shielding, unable to work 'cause they can't fit an FFP3 mask – whatever it is. You claim that 30% back by other nurses working additional shifts and doing more than standard hours. But we never really got above 1:3* (P4/8)
NHS CNO/CMO leadership	*I think who it* [guidance about managing COVID] *comes from is important isn't it? And actually there were some really positive actions from our chief nurse and our chief medical director and chief of infection control and so on. They were front and centre actually right from day one and that was really important. We had that touch point on a daily or weekly basis. Again, really important. NHSI and NHSE were visible by Teams. They were on the phone. That was really positive. Felt listened to. They were also saying, 'Look, we know this is moving fast but this is the best intelligence we have at the moment.'*P1/12
Theme 5 'One size doesn't fit all'	
Huge variation across ICUs and across shifts	*Very variable. The first thing to say is that some units were still on 1:6* [ICU nurse:patient ratio] *where other units were at 1:4 or 1:6* (P10/ODN) *One ICU was at 1:6 until we could arrange some transfers to get those patients moved….. We were a bit slow to do that because we were assuming that everywhere else was going to reach the same sort of level of activity and they didn't…. Actually what we really learnt was that there was very unequitable demand across the network.* P10/10 *Of course, some Units don't know what COVID was and others were doing 20 hour days, transferring 60-80 patients a day because of capacity, decompressing sites, five or six patients out of ICU at a time to help them decompress..* (P7/ODN) *There were some particularly problematic shifts right at the start where, for instance, a unit might have – I think it was like 10 patients – and have four ITU nurses to look after the 10 – four nurses to look after those patients full stop. There was no-one else.* (P11/15)
The London model doesn't work everywhere	*London is a completely different kettle of fish because they can stand on their roof and see their hospitals through – within the square mile that they live in.* (P5/24) *It was very much, 'This is the London model that we expect all other regions to adopt…' … and, actually, that didn't really work for our network geography…... So, there was a real push to be taking critical care patients. Well, how do you move that number of patients across that level of geography? It might have worked in* [name of city]… *where you've got the dense population but that doesn't really work in other parts of the network* (P13/Commissioner)
Impact of ICU layout	*our biggest hit ICU their first expansion took them into a third area of critical care so they had three split sites over two different levels of the hospital – how do you staff that safely?* (P7/ODN) *It made it very difficult from a supervision supervisory capacity. We didn't see the shift leader for hours… we probably only had eight patients I think. But it was just that one shift leader* [covering 4 areas] *…another problem with different care areas where you're having to take off PPE and put PPE on to go from one to the other.* (P10/ODN)

	And it may be that for ICU A, this is their bottom line and for ICU B the bottom line might be slightly different because their geography is different – the geography of their unit is different and those sorts of things. (P10/ODN)
Size of ICU and Trust	*There's a larger pool, and greater range, of reservists in the larger Trusts* (P8/ODN) *We know where there's OTs and physios that that rehab starts earlier in the pathway. But there's not the dedicated therapy workforce – not many ICUs have a dedicated PT and OT workforce - so there're often physios and OTs that work across the Trust, rather than being assigned directly to critical care. There was some good work that quite a few of the larger trusts have demonstrated that if you – that you can actually reduce length of stay, both in critical care but in the wider patient pathway, by having more physio and OT. It is cost-neutral.* P13/Commissioner
Initial and ongoing education support for reservists	*It started off as two days. Dropped to one day and then dropped to five hours so we could run it twice a day to get the numbers of people through. It was very practical. Largely for instance, about just recording observations so that people could arrive on the unit able to do something* (P11/22) *Very different models, actually, across the patch. There are units who have said that they don't have the personnel to keep this reservist pool of staff up to date and their priority at the moment is supporting the staff within critical care.* P10/12
Theme 6 Challenging central tenets	
Need human 'presence' in each bed	*"Patients need to have 'someone' there but does it always have to be a nurse with critical care skills?"* P6/4 also P6/15 *The positive things that I pick up from COVID I would really like to see go forward are this cross professional working. – the understanding that being 1:1 for a patient may not mean you have to do absolutely everything for that patient. I know lots of traditional – and I include myself in that –intensive care nurses love that aspect of the job, you know. – I think you'd be really hard-put to prove that that makes a difference. I think where it does make a difference is on the cusp and where changes are occurring. So, you're extubating a patient or you're – you know – working up towards moving out of ICU and those kind of things. Because there's no doubt real expertise makes a difference there.* P6/10

Uniqueness of critical care nursing	*What is the unique skill set that a critical care nurse brings to the bedside?* (P6/NHSEI) *If we – if we can identify that there is a uniqueness of a nurse, then I might stand corrected. But I'm not entirely sure nowadays we can actually do that.* (P5/21) *I don't care who cares for me as long as they know what they're doing. . .it's the qualification that makes the difference rather than the registration* (P5/6) *The new models don't take account of the fact we'll be in the same situation in the future* (P11/39) *The person at the bedside needs to be someone with a specific skillset* [not necessarily a nurse] (p11/41)
What skills have others brought to the bedside?	*Many of us have used ODPs during the COVID crisis but we've never used them routinely to look after intensive care patients but actually they have all the skills. They have all the advanced skills we could use* (P5/23) *There's a lot of work you do, as an ICU nurse, that isn't actually your job, the filling in of forms, sending bloods off, completing the daily bed bureau, that could all be done by admin staff* (P5/Wave 2/5) *The critical care charge nurses – they were juggling all this different expertise - that role was vital, absolutely vital …and mostly the people who did it well were not necessarily the most experienced or the – you know – the kind of – the most well-trained or whatever. They were people who had a sense of balance and responsibility and understood the limits of their expertise but were very able to sort of flex it so that where – where they were working with a junior consultant they could offer more to them and less to someone who's very experienced. And the only time I saw them really stressed was when we were so stretched for – you know – patients were so sick all the time. And I think that is something else to bear in mind is there's a limit. You know. There is a boundary for everyone and what is that? That – that would be really interesting as well is to ask when that boundary is reached. Not because people traditionally think, 'Oh. I should have 1:1 and I haven't got 1:1.' That wasn't usually the case, it was far more subtle than that.* P6/19
Need to understand what difference the workforce changes made	*'we can't completely row back from this'* P6/5 *'reservists weren't 24/7'* P8/15 *"critical care nurses like to think of themselves as being very open and receptive to anything, but I think this has shown a slightly different side to things.* (P3/7) *Previous to COVID we didn't really move patients…. It was interesting initially when we started – when we set up – people didn't want to let go of their patients….it's not fair on the staff or the patients and I'm sure the patients would have been getting that quality of care but it's not fair on the staff as well that one unit's really busy and sort of absolutely round the clock and flat out not getting a break.* P13/Commissioner

Opportunity to reset models with COVID	*COVID has given us the opportunity to start to look at those different ways of working. (p5/4);* *Realising you are a team and you've got to have a different way of working (P3/4)* *We need to move away from the medical levels of care for our staffing allocation; we need to find some different acuity tool.* (P12/43) *Fundamentally everyone I speak to recognises that we need a better model. We need a model. A nationally recognised model. And that actually sometimes you need to put the effort in to get what you want. And we all know that only by testing something will you know whether it is the workable solution that you wanted it to be.* P10/20 *Maybe because London experienced such extremes and I think – you know – there's a lot of people – certainly from a senior level – it's important to say, I haven't spoken to the average band 5. So, what I'm hearing from is mainly nurse leads in – in critical care. and I think the feeling there is that it is doable* [moving away from a 1:1 nurse;pt ratio*]. It is necessary and it can be done in a safe way.* P6/NHSEI *I think something COVID has shown us is that we can be fleet of foot. We can do things differently and it can be okay. And actually there can be benefits to it.* P1/11 *Need to remember the historical context… Why are we trying to diminish the value of nursing by saying, 'Oh, well it was okay in the past but it's not okay going forward. ' Is this just about saving money? And all you're doing is spreading the nurses more thinly at a time when they've just come through a very difficult experience and you've not yet had time to share the learning. So, what are we basing these decisions on?* P1/11 *Int: is there a bottom line, in terms of staffing, that, as a network, you would be advocating?* *P10: I think that's a difficult one to answer given the number of variables… like geography. If it were just a case of how many staff versus how many patients, you could probably come up with an answer but when you throw into the mix the number of areas that you might be covering and the supernumerary, supervisory support…..*