Service Evaluation of a Covid-19 Critical Care Orientation Programme

Abstract

Background: During the first wave of the UK Covid-19 pandemic, South London had the highest number of Covid-19 patients admitted to critical care. At one hospital, staff being re-deployed to critical care, were invited to attend an orientation to critical care workshop.

Aim: To carry out a service evaluation of the training outcomes from rapidly redeployed staff who completed the workshop during the first wave of the COVID-19 pandemic (March – July 2020).

Methods: Two stages were used, the first was a post-workshop evaluation questionnaire completed immediately after the training, with the second involving a single centre e-survey questionnaire two months later.

Findings: In total 131 healthcare professionals attended the workshop, and 121 (92%) post course evaluations were completed. 116 staff were contacted for the e-survey, with a response rate of 34.4% (n=40). Overall, the training was well evaluated, with the majority of respondents not having had prior critical care experience. 70% (n=28) of respondents had volunteered to work in critical care, but only just over half (n=21, 52.5%) went on to work in critical care.

Conclusion: This article describes the organisational response of one NHS acute hospital to the unprecedented challenges that arose from the Covid-19 pandemic. The service evaluation identified the importance of a pedagogical approach, which not only delivered clinical content, but also allayed anxiety and fears for healthcare professionals preparing to work in a new environment.

Key words: Covid-19, pandemic, blended learning, critical care.

Introduction

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), termed Covid-19, remains a public health emergency of international concern (World Health Organization [WHO], 2020a, 2020b). Its major impact has been on healthcare systems, which have had to rapidly adapt to respond to the high numbers of patients requiring critical care (Wu et al., 2020). As a result healthcare professionals working in non-critical care settings were re-deployed into acute and critical care areas. In the first UK wave of Covid-19, South London had the greatest burden from Covid-19 in the UK, with critical care admissions of confirmed cases exceeding 1,200 (ICNARC, 2020). University Hospital Lewisham (UHL) is a National Health Service (NHS) district general hospital in South London, UK. Prior to the pandemic, the hospital consisted of 470 beds and an 18 bedded critical care unit (8 intensive care (level 3) beds and 10 high dependency (level 2) beds. At UHL critical care capacity was increased to 26 level 3 beds, however, at times capacity peaked over four-fold to 34 ventilated patients. To alleviate pressure and create additional critical care capacity, patients were transferred to neighbouring teaching hospitals which had a much larger pre-pandemic critical care capacity (Isted et al., 2020). This article outlines the results from a service evaluation of redeployed clinical staff at UHL during the first wave (March to July 2020) of the UK COVID-19 pandemic.

Background

England was not alone in facing challenges from the pandemic (King's Fund 2020). In the early stages of the pandemic, recognising the need to increase the nursing workforce, many hospitals rapidly developed and provided short term training courses for healthcare professionals being re-deployed into critical care settings. At UHL, staff with previous critical care experience were identified through a workforce e-survey, following which Human Resources Workforce Team liaised with line managers to ascertain if staff with previous critical care experience or, those willing to volunteer could be re-deployed. Concurrently, staff working in services with dramatically reduced capacity were also identified for re-deployment. However, there was concern that staff redeployed could have presented a risk to patient safety. In addition, a lack of appropriate preparation would have a negative impact on staff struggling to maintain a service while supporting their new peers (UK Critical Care Nurse Alliance [UKCCNA], 2020).

A key mission of all UHL critical care education and research staff is to support patient care. With educators deployed into key clinical roles the lead author (a clinical academic) was tasked with organising, designing and developing a training programme for staff being re-deployed to critical care. A small team of critical care and Outreach nurses volunteered to support the development and delivery of training. Given the need for urgent and rapid acquisition of new knowledge and

competencies, 'just in time' training, was used, this develops and delivers practical critical care knowledge and skills in a short time frame. This approach is an accepted form of training in critical safety settings, for example, military, aviation, with the delivery of time-relevant and work-based education (Goh et al., 2020. Weiner & Rosman, 2019). This training methodology allowed for the development of rapid training resources and on-the-job teaching. This combination proved extremely positive, and within, 36 hours a training programme had been written, peer reviewed and training commenced. As evidence emerged, the programme was adapted to include new recommendations from the WHO and NHS England. It was challenging to deliver the orientation programme within local and national requirements for social distancing (Wanless et al., 2020. Educational Technology, 2021). A blended learning approach was adopted, following recommendations by a Cochrane systematic review, that e-learning alone is associated with only a small positive change in practice when compared to traditional learning and teaching methods (Vaona et al., 2018).

The course provided rapid, targeted COVID-19 specific training, which orientated and prepared staff to work in critical care (table 1). The main aim was to match re-deployed staff to the available staff skill mix and patient acuity, using supervision by trained critical care nurses, to maintain standards and patient safety. To meet UHL minimum requirements, the focus was on key essential care topics, which could be safely carried out by these redeployed, non-critical care trained staff. In consequence, the learning outcomes of the programme focused on the holistic management of Covid-19 with the fundamental aspects of critical care integrated throughout. Advanced critical care interventions such as ventilation strategies, arterial blood gas (ABG) interpretation and manipulation of ventilation setting were deemed the responsibility of staff who were already trained in critical care.

Development of the Training Workshops

Given the high numbers of Covid-19 patients being admitted to critical care, this caused a dilemma. On one hand, management wished to support critical care services by instantly importing identified staff. On the other hand, critical care staff were desperate for this additional support, but knew they did not have the time to carry out the orientation and skills training needed. Resolving this dilemma was challenging, and negotiation between management and practice was a key role.

The education team designed the programme to include activities which facilitated active learning, using a case-study approach, with theoretical and practical (skills) sessions. In addition, to meet social distancing requirements face-to-face content focused on essential 'hands-on' aspects of the training. This reduced the risk of potential transmission of Covid-19 across the staff undertaking training. To support this approach, learning materials were initially made available via the organisational e-learning platform and then for ease of access a dedicated Moodle site was set up.

Over a two and half month period, 131 clinical staff participated in the orientation to critical care workshop. The majority of those trained were nurses, with representation from other Allied Health Professions including operating department practitioners (ODPs), Healthcare Assistants and Support Workers. Physiotherapists supported critical care physiotherapy teams, with a tailor made local induction. This is in line with the national approach to workforce re-deployment of health care professionals to critical care (NHSE, 2020. NHS England and NHS Improvement, 2020). As soon as training commenced, it was evident that a major concern of these volunteers was that they 'would get it wrong', causing them to have fear and uncertainty (Vindrola-Padros et al., 2020). Current and previous studies of nurses redeployed to critical care during a pandemic identified that inadequate training increased stress levels (Ives et al., 2009. Liu et al., 2020) and the confusion caused by continual versions of policies and guidelines added to anxiety and perception of risk (Lam et al., 2013. Camilleri et al., (2020). In consequence, the starting point of the training became allaying their fears, and it was unanimously agreed that this needed to be interactive and face-to-face learning was necessary. 'Myth busting' was used to give them the opportunity to safely voice concerns and challenge misconceptions. This entailed presenting opposing arguments and debates for current issues such as SARS versus Covid-19, myths and facts of transmission and shared discussion of the reality of intensive care and life threatening critical illness.

These sessions revealed that the participants' fears had been exacerbated by the media portrayal around critical care provision and Covid-19. Their perception was of a service without drugs, a lack of personal protective equipment, no ventilators, resulting in people denied treatment and patients left to die alone. The critical care leadership team were keen to provide as much information as they could, and actively worked to dispel these particular myths. Only once these participants accepted the reality of the situation could the training begin. An added advantage of this approach was it served as an icebreaker as participants realised their fears were shared by their peers. The education team made a conscious effort to make sure that all participants had access to available apps and mental health wellbeing resources, and understood their importance, which was epitomised by the phrase 'it's ok to say, I'm not ok'.

Concerns regarding staff safety during training were an ongoing challenge for both participants and the educational team. The hospital course booking system via an administrator was used from the outset; educators used a dynamic risk assessment to adapt training as appropriate, and as national and local guidance changed. Finally, to protect all staff accessing the venues, additional cleaning teams were made available to decontaminate teaching areas after use, and comprehensive decontamination of all equipment used was carried out after each session. There were ongoing discussions regarding the move from blended learning to a fully online training programme. While it is accepted that

Camillerii and colleagues (2020) describe the successful development of a remote online critical care course, with comprehensive technological support, their programme had no practical component. However, at UHL it was decided that while preparatory work could be conducted virtually, the clinical element needed to be delivered and practised in a safe environment, a converted ward, used for simulation and resuscitation training. This provided sufficient space for the practical elements of the programme and facilitated repetition as necessary. The short timescale meant the development of a full online course would have delayed delivery, which in turn would have had an impact on critical care services. The blended learning approach allowed for theoretical content to be delivered virtually, and then clinical skills delivered and assessed in face to face. This also provided participants with resources they could refer to at a later date.

At UHL there was already a mandatory training e-learning and Moodle platform, however, the mandatory training e-learning platform needed technical input to upload and maintain resources. Therefore, the decision was to use the Moodle platform, as this allowed the education team to rapidly develop, revise content, and it also facilitated the addition of interactive quizzes and other resources e.g. guidelines. This was seen as crucial as the updating of resources was necessary during the evolving pandemic. An additional, challenge included participants and students having access to laptops, IT skills and internet connectivity. It is acknowledged that nurses may have limited digitally literacy skills and/or access to a personal computer (Health Education England [HEE], 2015). In consequence, some nurses may have relied on accessing an NHS computer in a clinical setting or training room. This was not possible in a pandemic situation and it has to be noted that the availability of virtual learning content does not mean students will engage with the learning activities (Educational Theory, 2021. HEE, 2015).

An iterative quality improvement cycle was followed to address the continually changing evidence and critical care practice. Examples of changes to the teaching content included end of life care, adaptations in documentation including the move away from electronic prescribing to paper based drug charts. This was authorised by the Governance and Risk Team, due to the high volume of patients and re-deployed staff not being able to access electronic prescribing. Following each session, feedback from facilitators and delegates was collated via a short post-workshop questionnaire. Educators regularly engaged with the frontline critical care teams to identify areas to focus on and to highlight changes in practices that needed to be reflected in training materials. Examples, included the move from invasive ventilation to the use of non-invasive ventilation and the potential rising numbers of patients requiring tracheostomy care, a skill not all staff may be familiar with.

Aim:

The aim was to carry out a service evaluation of the training outcomes from rapidly redeployed staff who worked in critical care during the first wave of the COVID-19 pandemic (March – July 2020).

Methods

There were two parts to the service evaluation. Firstly, an impact evaluation questionnaire immediately after completion of the training. To address the validity and reliability of the data collection tools used, it is accepted that using existing, validated instruments is preferable to developing new tools (Korb, 2012), with new tools needing to be piloted and tested before use. However, due to the short timeframe to implementation the training programme, it was not possible to design and pilot a new evaluation form. In consequence, an evaluation form used post-resuscitation training was adapted and included a Likert scale and free text sections for each topic. As part of the ongoing project monitoring and evaluation all documents were reviewed and adapted in response to feedback, providing an opportunity to change questions as required. However, it was deemed not necessary to change or adapt the questionnaire. It is accepted that while this gave some indication of the outputs, it was completed before they had been in practice.

A single centre e-survey questionnaire was distributed to all healthcare professionals who had participated in the one-day orientation to critical care workshop between March and July 2020, and were identified as working at UHL. The second questionnaire, was based on the first one, but had additional questions on the respondents' experiences in practice. The survey was distributed using onlinesurveys.ac.uk (formerly Bristol on Line). For anonymity a unique URL was used, as this gave the project team no access to respondents' personal details and therefore protected confidentiality. All healthcare professionals with an NHS e-mail contact who took part in the workshop were invited to complete the anonymous questionnaire. The online survey enabled the respondents to complete the questionnaire on an NHS computer, personal laptop or mobile phone. Using the unique URL, the reminder email had to be sent to all potential participants, as the project team did not know whether they had replied or not. It is recognised that reliability (consistency) and validity are essential in questionnaire research (Brannigan & Watson, 2009). Therefore, the questionnaire had previously been evaluated (Carter et al., 2020), any adaptations made by two of the project team, were then piloted for clarity, with consistency of data and appropriateness of response checked by the other authors and compared with the initial questionnaire. Only minor changes were made including correcting typographical errors. The overall questionnaire was accepted following the changes.

The service evaluation was registered with the Research and Development office prior to undertaking the study (Project number 3360. Dated 5th June 2020), with a decision made that they would oversee all aspects of the evaluation. As a result, their decision was that separate NHS National Research Ethics

approval was not a pre-requisite. The Revised Standards for Quality Improvement Reporting Excellence (SQUIRE) (version 2.0) criteria were used as a framework for reporting.

The datasets were uploaded to IBM Statistical Package for Social Sciences (SPSS) software (version 25, IBM, Armonk, NY, UK). Missing data was coded in SPSS and has been presented with each results table. Descriptive statistics (numbers and percentages) were used to analyse the raw data generated. Cronbach's Alpha test was used to check for consistency and reliability for the Likert Scale questions. Thematic analysis was used to analyse responses from open ended questions. Cronbach's Alpha was used to give a comparative indicator of internal consistency.

Results of Course Evaluation

The focus of this section of the results is on the e-survey, as the immediate evaluation had to focus on which sessions they had most appreciated (table 2). As this shows, 121 immediate responses were returned. These were overwhelmingly positive; however, this was pre-clinical experience. One respondent reported the essential skills were 'not useful at all' but that all other areas were appropriate, but offered no feedback in the free text question to explain their answer. The findings from this first evaluation have been included as part of the iterative process for comparison.

Results of the E-Survey

A total of 131 healthcare professionals attended the Orientation to Critical Care Workshop at UHL. 116 NHS email addresses were made available for the e-survey. 40 (34.4%) e-survey questionnaires were completed and analysed. The response rate was deemed an acceptable return (Bryman, 2012).

Just over half (n= 21, 52.5%) had been re-deployed into critical care, which highlights that although staff were identified and completed the orientation course, for several reasons not all staff were able to be redeployed. The majority of respondents were nurses (n=31, 77.5%), Health Care Assistants (n=2, 5.0%), Support Workers (n=2, 5.0%), doctor (n=1, 2.5%), Operating Department Practitioner (n=1, 2.5%), Medical Student (n=1, 2.5%), Health Visitor (n=1, 2.5%) and Midwife (n=1, 2.5%).

- 25 out of 40 respondents (77%) did not have prior critical care experience prior to attending the workshop.
- 28 out of 40 respondents (70%) had volunteered to work in critical care as part of the Covid-19 surge plan.
- 21 out of 40 respondents (52.5%) went on to work in critical care as part of the surge plan. Reasons for not working in critical care included:
  - Not required (n=10, 25.0%)

- Unable to be released due to work commitments (n=2, 5.0%)
- Redeployed to other key areas (n=3, 7.5%)
- Other responses included retirement; already working in a Covid-19 ward; or contracted Covid-19 and on return to work could not be released from their previous key clinical role.

- Length of time working in critical care included:
- <1 week (n=7, 26.9%)
- 1-2 weeks (n=3, 11.5%)
- 3-4 weeks (n=4, 15.4%)
- >5 weeks (n=12, 46.5%)

Participants were asked to look back over the past few weeks and at their experiences, to identify which aspects of the orientation to critical care course they found useful or least useful (table 3 and 4). Table 3 indicated that in all categories, there was one participant who found the clinical skills not to be helpful. However, cross referencing individual topics (table 3) against participants' revealed it was the same respondent, who gave no written reason for their score. It has to be accepted that with a programme designed for a disparate group with a wide range of skills and expertise, it is difficult to meet all learners' expectations (Learning Theory, 2021). That so many, found the majority of sessions relevant and useful, supported use of this 'just in time training' (Pebbles et al., 2020). The Cronbach's Alpha for both the initial and follow up questionnaire, showed an acceptable degree of consistency. The initial questionnaire (table 2) showed a Cronbach's Alpha of 0.880, which shows an acceptable degree of consistency. The second Cronbach's Alpha score (0.959) is higher than the first, which indicates that as the questionnaire was completed once respondents had gained clinical experiences, it impacted on the relevance of each topic taught. Both showed an acceptable degree of reliability and consistency.

Comments from respondents made it clear for the need for ongoing support when in practice and re-fresher training to maintain skills.

> *'I have found the organisation and support outstanding. I have continued to be given training throughout'* (Respondent number (R no. 7)

> *'I have much more confidence in working at critical care setting' (R no. 22)*

'As a sexual health nurse who has not worked on wards for years it was all quite overwhelming and like becoming retrained in a new job rather than a refresher!' (R no. 13).

'If we are likely to have ongoing need for redeployment with Covid-19/future pandemics, would it be helpful to have ICU or ward nursing study days as part of yearly training requirements for those earmarked as 're-deployable' (R no. 15)

Discussion

This evaluation of a Covid-19 orientation to critical care workshop presents a summary of the findings of the evaluation forms completed immediately following the workshop and those who completed an e-survey 2 months after completing the training.

Using 'Just in Time' Training

The Covid-19 pandemic has increased the use of 'just in time training' approach across the care spectrum. For example, Lingum et al., (2021) argue it should be part of a community response to the rapid rise in admissions as hospitals attempted to create capacity. In critical care, Ragazzoni et al., (2020) identified the need for the rapid re-deployment of staff in a hospital in Northern Italy. The authors reported staff had to have competence in specific skills, and to do this the hospital staff attended an initial training programme. This was then followed up with an additional face-to-face training package. Although the length of these training programmes was not identified, the authors did acknowledge given the rapid spread of the disease the training had to be delivered in a 'matter of days' (Ragazzoni et al., 2020). As south London was ahead of first surge in infections in the UK, the opportunity for pre-training and competence assessment was not possible. However, upon reflection, depending on the participants' professional expertise additional training may be needed to build competence.

While it had been agreed that re-deployed nurses would work under the supervision of a critical care nurse, in reality, the term 'critical care nurse' appeared to be open to interpretation. In the height of pandemic, a junior nurse who had completed their critical care induction may have had to work alongside re-deployed staff in a supervisory role (UKCCN, 2020). A situation that is potentially highly stressful for nurses and could challenge patient safety. Retrospectively it is acknowledged that in the exigencies of the first wave of the pandemic, the UKCCN (2020) found this happening across the country, but, they point out this should not occur in normal practice. Although they recognise and accept that in exceptional circumstances such future surges in patient demand, where all other options have been exhausted, this situation may arise.

The role and expectation of re-deployed UHL staff differs from other studies, because a range of different professional groups were involved not just nurses. A 'buddy system' was set up for staff re-deployed to critical care, the system was explained to both critical care staff via the units closed social media page and official emails and for re-deployed staff this was explained in the training sessions. Marks et al., (2021) also developed a buddying model for re-deployed staff placing non-experienced nurses with a critical care specialist nurse. However, at UHL 'buddy's' were allocated each shift, due to constantly changing staffing levels, it was not possible for each redeployed staff member to be permanently attached to the same person. Therefore, the education team acted as the point of contact for re-deployed staff and would work with them and follow up. In addition, recognising the impact of being re-deployed in a pandemic, staff were invited to attend regular vital wellbeing cafés.

National & International Training

Development of the materials at UHL was a challenge, as the education team only met each other, when tasked with the development and delivery of training. At the time there was no available pool of personnel or accessible resources, to support development and implementation. Nor, were there any national recommendations for topics to include or modes for delivery of the workshops for the multiplicity of professional groups and varying skill levels of those being redeployed. Blended learning was chosen as it facilitated the application of theory directly to simulation and ultimately practice (Lawn et al., 2017). However, our findings suggest that because of the mix of skills needed for critical care, with hindsight it may, had time allowed have been appropriate to offer two levels of training. For example, a healthcare support worker or student nurse would not be expected to carry out activities such as medication management and specialist clinical care.

There are now several regional, national and international workshops programmes available for staff being re-deployed (C19 Space, 2020). However, as we move to yet another surge it is important to recognise, that individuals with previous training and experiences should be proactively identified, as many hospitals may not have had the resources to focus on re-training or introducing new programmes. Moving forward there is scope for the development of an online training package to maintain the knowledge and expertise of staff identified as re-deployable who could provide support for future surges in critical care demand. Nevertheless, critical care nursing will always require competencies, for patient safety and individuals must be able to practice in a safe environment prior to undertaking nursing practice (CC3N, 2020). There is evidence that a fully online course does not recognize and address the crucial issue of fear and anxiety for those being redeployed into a high risk area, and that blended learning should be used (Lawn et al., 2017. Vaona et al., 2018). Further, it has

to be noted that there will always be a need to locally adapt / orientate staff who have completed national or international training programmes.

Limitations

From the perspective of the team and the respondents, the main limitation of the training was its length. The team accepted the urgency of the situation, but inevitably as educators would have liked more time to put more depth into each topic and to be able to formally assess competence in participants depending on their role. Although it is accepted that the skill mix would have made assessment a challenge, the participants would also have liked more time.

This service evaluation identified the need to address fears, anxieties and providing support on the ground. Although, this was not evaluated in the service evaluation, nevertheless the wellbeing café's and informal follow up in practice were the training teams' way to offer ongoing support, within the limited resource available. The importance of this was recognised by UHL and wellbeing and formal psychological packages have been implemented for all staff.

Conclusion & Recommendations

This service evaluation has demonstrated the ability and willingness of an organisation to respond to the Covid-19 pandemic and to prepare staff who needed to be redeployed. The training worked, because those who designed the education and training programme came from clinical practice, with a background of supervision and mentorship. The findings from the second questionnaire confirmed the relevance of the topics included. The linking of a clinical academic provided support with programme and content development, a collaboration which reduced the theory–practice gap, despite the short timeframe and the urgent need of the situation.

'Just in time training' has its place in emergency settings, but should not stand alone or be seen as a permanent solution. It is the first step in a rapid response to ever-changing and evolving clinical situations. The evaluation has highlighted the importance of face-to-face contact in extreme situations such as the pandemic, to facilitate reassurance, support and address fears and anxieties. Had this not occurred participants might not have been as receptive to training or to understanding the reality they were about to enter.

Recommendations include the need for a further evaluation 6 to 12 months post completion. Also, that any further evaluations should include the perspective of the critical care nurses working with their newly re-deployed colleagues. It is important to recognise that different professional groups

have different needs. In consequence, further training programmes should include different levels based on professional expectations, for example, some participants requested additional topics such as basic arterial blood gas interpretation and invasive ventilation. Finally, the Covid-19 pandemic is likely to be an enduring challenge for months and even years, resulting in peaks and troughs of patient numbers. Therefore, there needs to be establishment of a formalised workforce plan that balances the needs of the healthcare system against Covid-19.

References

Brannigan K. Watson R. (2009). Reliability and validity in a nutshell. Journal of Clinical Nursing. 18. 23. 3237-3243

Bryman A. (2012). Social research methods. 4th edition. Oxford University Press.

Camilleri M, Zhang X, Norris M, et al. (2020). Covid-19 ICU remote-learning course (CIRLC): Rapid ICU remote training for frontline health professionals during the COVID-19 pandemic in the UK. Journal of the Intensive Care Society. www.ics.ac.uk

Carter C. Mukonka PS. Sitwala LJ. Howard-Hunt B. Notter J. (2020). The development of critical care nursing education in Zambia. British Journal of Nursing. 29. 9. 499-505

Critical Care Networks National Nurse Leads. (2020). National standards for critical care nurse education. Core curriculum and competency development for registered nurses in adult critical care. https://www.cc3n.org.uk/step-competency-framework.html

C19 Space. (2020). Summary. https://c19-space.academy.esicm.org/

Educational Technology. (2021). Ultimate guide to blended learning. https://edtechnology.co.uk/latest-news/ultimate-guide-to-blended-learning/

Goh, K.J., Wong, J., Tien, J. et al. (2020) Preparing your intensive care unit for the COVID-19 pandemic: practical considerations and strategies. Crit Care. 24. 215. https://doi.org/10.1186/s13054-020-02916-4

Health Education England. (2015). Improving Digital Literacy. https://www.rcn.org.uk/clinical-topics/ehealth/every-nurse-an-e-nurse

Intensive Care National Audit and Research Centre. ICNARC report on COVID-19 in critical care 01 May 2020 https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports

Isted A. McDonnell AJ. Jones E. Grundy T. Jeyabraba S. Ali TO. Khorasanee R et al. (2020). Clinical characteristics and outcomes of 85 intensive care patients with Covid-19 in South London: A single centre observational study. Journal of the Intensive Care Society. DOI: 10.1177/1751143720971541

Ives J, Greenfield S, Parry JM, et al. (2009). Healthcare workers' attitudes to working during pandemic influenza: a qualitative study. BMC Public Health. 9. 56. doi:10.1186/1471-2458-9-56pmid:http://www.ncbi.nlm.nih.gov/pubmed/19216738

King's Fund. (2020). Critical care services in the English NHS. https://www.kingsfund.org.uk/publications/critical-care-services-nhs

Korb, K. (2012) 'Conducting educational research: adopting or adapting an instrument', available at http://korbedpsych.com/R09aAdopt.html

Lam, K. K., & Hung, S. Y. (2013). Perceptions of emergency nurses during the human swine influenza outbreak: A qualitative study. International Emergency Nursing. 21. 4. 240– 246.

Lawn, S., Zhi, X., & Morello, A. (2017). An integrative review of e-learning in the delivery of self-management support training for health professionals. BMC medical education, 17. 1. 183. https://doi.org/10.1186/s12909-017-1022-0

Learning Theory. (2021). Andragogy: adult learning theory (Knowles). https://www.learning-theories.com/andragogy-adult-learning-theory-knowles.html#_edn1

Liu Q, Luo D, Haase JE, et al. (2020). The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. Lancet Glob Health. 8. e790–8.doi:10.1016/S2214-109X (20)30204-7

Lingum NR, Sokoloff LG, Meyer RM, et al. (2021). Building Long-Term Care Staff Capacity during COVID-19 through Just-in-Time Learning: Evaluation of a Modified ECHO Model. J Am Med Dir Assoc. 22. 2. 238-244.e1. doi:10.1016/j.jamda.2020.10.039

Marks SP. Edwards S. Jerge EH (2021). Rapid Deployment of Critical Care Nurse Education during the

COVID-19 Pandemic. Nurse Lead. 19. 2. 165-169. doi: 10.1016/j.mnl.2020.07.008.

NHSE (2020). Coronavirus: principles for increasing the nursing workforce in response to exceptional increased demand in adult critical care. https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/specialty-guide-critical-care-workforce-v1-25-march-2020.pdf

NHS England and NHS Improvement (2020). www.england.nhs.uk/coronavirus/returning-clinicians

Pebbles RC. Nicholson IK. Schlieffa J. Peata A. Brewsterc DJ. (2020). Nurses' just-in-time training for clinical deterioration: Development, implementation and evaluation. Nurse Education Today. 84. 104265

Ragazzoni L. Barco A. Echeverri L. et al. (2021). Just-in-Time Training in a Tertiary Referral Hospital during the COVID-19 Pandemic in Italy. Acad Med. 96. 3. 336-339. doi:10.1097/ACM.0000000000003575

UK Critical Care Nurse Alliance. (2020a). UKCCNA Position Statement: Emergency Nurse Staffing for Covid-19: Wave 2 (Nov 2020). https://www.ics.ac.uk/ICS/News_Statements/UKCCNA_Position_Statement

UK Critical Care Nurse Alliance. (2020b). Accountability, delegation and indemnity for the coronavirus adult critical care surge. https://www.cc3n.org.uk/uploads/9/8/4/2/98425184/accountability_delegation_indemnity_final_v1.pdf

Vaona A. Banzi R. Kwag KH. Rigon G. Cereda D. Pecoraro V. Tramacere I. Moja L. (2018). E-learning for health professionals. Cochrane Database of Systematic Reviews. 1. 1465-1858. DOI: 10.1002/14651858.CD011736.pub2

Vindrola-Padros C, Andrews L, Dowrick A, et al. (2020). Perceptions and experiences of healthcare workers during the COVID-19 pandemic in the UK. BMJ Open. 10. e040503. Doi: 10.1136/bmjopen-2020-040503

Wanless S. Winterman E. Chapman S. (2020). Skills teaching in COVID lockdown in the UK: lessons learnt. DOI: 10.2478/pielxxiw-2020-0018

Weiner DL, Rosman SL. (2019) Just-in-time training for disaster response in the austere environment. Clin. Pediatr. Emerg. Med. 220. 95–110

World Health Organization. (2020a). COVID-19 Public Health Emergency of International Concern (PHEIC) Global research and innovation forum. https://www.who.int/publications/m/item/covid-19-public-health-emergency-of-international-concern-%28pheic%29-global-research-and-innovation-forum

World Health Organization. (2020b). Coronavirus. https://www.who.int/health-topics/coronavirus#tab=tab_1

Wu Z. McGoogan JM. (2020). Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China. JAMA. doi:10.1001/jama.2020.2648