CSMEN – Simulation Publications Update October 2020

Bulletin on Use of Simulation in Covid-19

Welcome

Welcome to the Simulation Publications Update, a service brought to you by CSMEN in partnership with NES Knowledge Services.

The focus for this Simulation bulletin is on how simulation was used during Covid-19. These articles may be of interest or relevance to your current role in NHS Scotland. The articles may also be of use in your research. These articles are from those journals we currently subscribe to. If there are any articles or journals that you would like us to add/consider please let us know.

Until now we have tried to provide approximately 30 links to articles on all aspects of simulation. We are now moving to shorter bulletins focusing on different aspects of simulation.

The articles identified which used simulation during the Covid-19 pandemic show how versatile simulation can be in training and preparing the workforce and in testing new systems in organisations. There are shared experiences and studies from across the globe of some of the challenges faced in providing simulation based training, while observing social distancing and changed guidelines to practice. There are several studies comparing the benefits and constraints of adapted procedures and several articles highlight the use of in situ simulation.

If you would like to suggest a focus topic or become a reviewer, please also let me know. Jean.ker@nes.scot.nhs.uk

The plan is to widen this service to focus on topic areas and to monitor its use and effectiveness, so feedback would be much appreciated.

This bulletin has been developed by Jean Ker Clinical Lead CSMEN, in partnership with Alan Gillies from NES Knowledge Services.

Access to journals

Different journals have different processes for login so please follow the instructions for accessing the full text of the articles through the links provided.

On your behalf, NES Knowledge Services subscribes to some journals direct and others via aggregators (i.e. journal collections or full text databases). We use something called a 'link resolver' to link you via the best route using your NHS Scotland OpenAthens password.

Some journals can detect that you're logging in from NHS premises, so won't ask for the OpenAthens password, but if you're accessing from home you may have to login.

None of the links should require you to set up a separate login – where there are login boxes for personal accounts, look for an OpenAthens or 'institutional login' option as well, which will accept your OpenAthens password.

Focus: Covid-19 Use of Simulation based Education

COVID-19 crisis, safe reopening of simulation centres and the new normal: Food for thought.
Ingrassia, P.L., et al, Advances in Simulation, 13. 2020.

This is a useful paper for all those who are responsible for re-opening simulation training facilities post Covid-19 to read. The paper acknowledges the unprecedented context of the pandemic and its impact on simulation based training. However, from its evidence base the authors have identified what they describe as 10 focus points or recommendations simulation centres should consider when re-opening:

1. Establish a Covid -19 task force for SBE
   a. undertake risk assessment
   b. Be adaptable and inclusive
2. Consider use of space
   a. Focus on infection control requirements
   b. Ensure air exchange system
3. Identify conditions of access
   a. Screening questions for all accessing
   b. Clear communication system for staff faculty and participants
4. Have clear guidance on personal hygiene precautions and PPE
   a. Alcohol hand gel/ Posters
   b. Masks and Doffing area
5. Have systems in place to manage social distancing
   a. Marking system on floor and posters
6. Consider safe management of staff
7. Review cleaning and dis-infection
   a. Useful table of cleaning agents for manikins shared
8. Test new system set up
9. Identify and share management challenges
   a. Faculty availability
   b. PPE availability with Budget adjustments for additional consumables
   c. Readjust flow and opening times
10. Review emergency plans and procedures

The article was most reassuring as it supported from an international perspective all the evidence based changes we have implemented here at the NHS Louisa Jordan National Skills Education Hub.

Professor Jean Ker

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[Review of big data analytics, artificial intelligence and nature-inspired computing models towards accurate detection of COVID-19 pandemic cases and contact tracing](#)**,** Agbehadji, I.E., et al, International Journal of Environmental Research & Public Health, 07 24. 2020.
This paper presents a review of computing models that can be adopted to enhance the performance of detecting and predicting the COVID-19 pandemic cases. We focus on big data, artificial intelligence (AI) and nature-inspired computing (NIC) models that can be adopted in the current pandemic. The review suggested that artificial intelligence models have been used for the case detection of COVID-19. Similarly, big data platforms have also been applied for tracing contacts. However, the nature-inspired computing (NIC) models that have demonstrated good performance in feature selection of medical issues are yet to be explored for case detection and tracing of contacts in the current COVID-19 pandemic.

[Simulation role in preparing for COVID-19](#). Aldekhyl, S.S. & Arabi, Y.M., Annals of Thoracic Medicine, Vol 15, 3, 134-137. 2020.
One of the major aspects of effective infection control and prevention is healthcare team training and system troubleshooting. Simulation-based education appears to be a practical and flexible instructional design to achieve variable levels of knowledge, skills, and attitude training. In this paper, we aim is to provide a brief scheme on how simulation-based training can be employed in COVID-19 pandemic preparedness efforts. In addition, we will be sharing our multidisciplinary simulation experience in critical care at the National Guard Health Affairs, Saudi Arabia.

[Comparison of the effectiveness and comfort level of two commonly used mask ventilation techniques in a simulated model](#). Althunayyan S.M., et al, Respiratory Care, 11 Aug 2020.
The aim of this study was to compare the effectiveness and comfortability of 2 commonly used mask ventilation techniques. A randomized crossover study was performed to compare the 2-handed C-E and 2-handed V-E techniques on a simulation model. Respiratory therapists were recruited by convenience sampling to hold the mask during mechanical ventilation with a fixed tidal volume (VT) of 50 mL, a rate of 12 breaths/min and a PEEP of zero were provided. Each participant performed a 2-min ventilation session, with a total of 24 breaths for each technique. In our study, the median VT did not differ significantly between the 2 techniques. However, the C-E technique seemed to be superior to the V-E technique in terms of the number of effectively delivered breaths and comfortability. Further studies are recommended for basic airway management techniques.

[Data and debriefing observations on healthcare simulation to prepare for the COVID-19 pandemic](#). Andreae, M.H., et al, Data in Brief, 106028. 2020.
We report on data and debriefing observations in the context of an immersive simulation conducted to (a) train clinicians and (b) test new protocols and kits, developed in table-top exercises without prior clinical experience to fit anticipated clinical encounters in the setting of the rapidly expanding COVID-19 pandemic. We simulated scenarios with particular relevance for anesthesiology, perioperative and critical care, including (1) cardiac arrest, (2) emergency airway management, (3) tele-instruction for remote guidance and supervision, and (4) transporting an intubated patient. Using a grounded theory approach, three authors (MHA, DLR, EHS) developed emergent themes. First alone and then together, we sought consensus in

uncovering overarching themes and constructs from the debriefings. We thus performed an informal qualitative thematic analysis based in a critical realist epistemological position.

The effects of personal protective equipment on airway management: An in-situ simulation. Ansari U., et al, Trends in Anaesthesia and Critical Care, 2020.
Public Health England guidance for aerosol generating procedures (AGP) requires the donning of personal protective equipment (PPE). We evaluated airway management skills using an in-situ emergency simulation. The scenarios were video recorded and scored by two independent assessors using a skill specific checklist. A total of 34 airway management procedures were evaluated. The checklist involved 13 steps with a maximum score of 26. The median (IQR [range]) checklist score was 25 (24-25 [20-26]). Four teams failed to intubate the trachea and proceeded to manage the airway using a supraglottic airway device. The mean (SD) intubation time was 47.9 (16.5) seconds and two anaesthetists (7%) required a second attempt. Our results show that airway management can be carried out successfully whilst donned in PPE. However, additional training in using newly introduced devices such as a McGrath video laryngoscope is of paramount importance.

A simulation approach to measure critical safety behaviors when evaluating training methods for respirator education in healthcare workers. Beam, E.L., et al, American Journal of Infection Control, 869-874. 2020.
Participants were asked to perform the donning and doffing of an N95 respirator to camera. Then they were randomized to a video alone or a reflective practice intervention. After the intervention they repeated the donning and doffing to camera. A critical safety behavior scoring tool (CSBST) was developed to compare the performance of the participants over time at pretest, post-test and 1 month later for follow-up. The reflective practice intervention group was found to have significantly higher scores on the CSBST at post-test and follow-up than the video alone group. In the reflective practice intervention group, the participants perceived they were better at performing the N95 donning and doffing than the experts scored them.

Clinical simulation strategies for knowledge integration relating to initial critical recognition and management of COVID-19 for use within continuing education and health-related academia in brazil: A descriptive study. Brandao, C.F.S., et al, Sao Paulo Medical Journal = Revista Paulista De Medicina, 2020.
The COVID-19 pandemic has led to an immense need to develop training on case recognition and management, with a focus on patients' and health professionals' safety at several levels of healthcare settings in Brazil. This was a reflective theoretical descriptive study on an educational program based on clinical simulation, with four practical phases at different performance and complexity levels. Wearing, handling and adequately disposing of personal protective equipment, along with specific respiratory procedures in different healthcare settings up to intensive care for seriously infected patients were addressed.

Translational simulation for rapid transformation of health services, using the example of the COVID-19 pandemic preparation. Brazil, V., et al, Advances in Simulation, 9. 2020.
Rapid changes to care pathways and processes needed for protection of staff and patients may be facilitated by a translational simulation approach-diagnosing changes needed, developing and testing new processes and then embedding new systems and teamwork through training. However, there are also practical constraints on running in situ simulations during a pandemic-the need for physical distancing, rigorous infection control for manikins and training equipment and awareness of heightened anxiety among simulation participants. We describe our institution's simulation strategy for COVID-19 preparation and reflect on the lessons learned-for

simulation programs and for health services seeking to utilise translational simulation during and beyond the COVID-19 pandemic.

[Lessons learned in preparing for and responding to the early stages of the COVID-19 pandemic: One simulation's program experience adapting to the new normal](#). Brydges, R., et al, Advances in Simulation, 8. 2020.
Use of simulation to ensure an organization is ready for significant events, like COVID-19 pandemic, has shifted from a "backburner" training tool to a "first choice" strategy for ensuring individual, team, and system readiness. In this report, we summarize our simulation program's response during the COVID-19 pandemic, including the associated challenges and lessons learned. We also reflect on anticipated changes within our program as we adapt to a "new normal" following this pandemic.

[Multiplex ventilation: A simulation-based study of ventilating 2 patients with a single ventilator](#), Chatburn, R.L., et al, Respiratory Care, Vol 65, 7, 920-931. 2020.
The overwhelming demand for mechanical ventilators due to COVID-19 has stimulated interest in using one ventilator for multiple patients (ie, multiplex ventilation). Despite a plethora of information on the internet, there is little supporting evidence and no human studies. The risk of multiplex ventilation is that ventilation and PEEP effects are largely uncontrollable and depend on the difference between patients' resistance and compliance. It is not clear whether volume control ventilation or pressure control ventilation is safer or more effective. We designed a simulation-based study to allow complete control over the relevant variables to determine the effects of various degrees of resistance-compliance imbalance on tidal volume (VT), end-expiratory lung volume (EELV), and imputed pH. These experiments confirmed the potential for markedly different ventilation and oxygenation for patients with uneven respiratory system impedances during multiplex ventilation. Three critical problems must be solved to minimize risk: (1) partitioning of inspiratory flow from the ventilator individually between the 2 patients, (2) measurement of VT delivered to each patient, and (3) provision for individual PEEP.

[Investigating effects of healthcare simulation on personal strengths and organizational impacts for healthcare workers during COVID-19 pandemic: A cross-sectional study](#). Cheung, V.K., et al, Integrative Medicine Research, Vol 9, 3, 100476. 2020.
This cross-sectional study aimed at evaluating impacts of healthcare simulation training, either in-situ or lab-based, on personal strengths of healthcare workers (HCWs) and organizational outcomes during the COVID-19 pandemic. COVID-19 Taskforce was established to formulate standardized scenario-based simulation training materials in late-January 2020. Post-training questionnaires made up of 5-point Likert scales were distributed to all participants to evaluate their personal strengths, in terms of i) assertiveness, ii) mental preparedness, iii) self-efficacy, iv) internal locus of control, and v) internal locus of responsibility. Conclusion: Healthcare simulation training enhanced healthcare workers' personal strengths critical to operational and clinical outcomes during the COVID-19 pandemic.

[Just-in-time simulation to guide workflow design for coronavirus disease 2019 difficult airway management](#). Daly Guris R.J., et al, Pediatric Critical Care Medicine, E485-E490. 2020.
The coronavirus disease 2019 pandemic has required that hospitals rapidly adapt workflows and processes to limit disease spread and optimize the care of critically ill children. As part of our institution's coronavirus disease 2019 critical care workflow design process, we developed and conducted a number of simulation exercises, increasing in complexity, progressing to intubation wearing personal protective equipment, and culminating in activation of our difficult airway team for an airway emergency. In situ simulations were used to identify and rework potential

failure points to generate guidance for optimal airway management in coronavirus disease 2019 suspected or positive children.

Enhancing departmental preparedness for COVID-19 using rapid-cycle in-situ simulation. Dharamsi, A., et al, Journal of Hospital Infection, 604-607. 2020.
In response to coronavirus disease 2019 (COVID-19), a rapid-cycle in-situ simulation (ISS) programme was developed to facilitate identification and resolution of systems-based latent safety threats. The simulation involved a possible COVID-19 case in respiratory failure, using a mannequin modified to aerosolize phosphorescent secretions. Thirty-six individuals participated in five ISS sessions over 6 weeks, and a further 20 individuals observed these sessions. Debriefing identified latent safety threats from four domains: personnel, personal protective equipment, supply/environment and communication. These threats were addressed and resolved in later iterations. Ninety-four percent of participants felt more prepared to care for a potential case of COVID-19 after the ISS.

Cognitive load and performance of health care professionals in donning and doffing PPE before and after a simulation-based educational intervention and its implications during the COVID-19 pandemic for biosafety. Diaz-Guio, D.A., et al, Infezioni in Medicina, Vol 28, suppl 1, 111-117. 2020.
We conducted a prospective before-and-after design that used clinical simulation as a research methodology in a clinical simulation center of Colombia. A simulation-based educational intervention with two cases related to COVID-19 was proposed in the emergency room and the intensive care unit. We conducted a workshop for donning and doffing of personal protective equipment (PPE) and a debriefing after the first case. In the pre-test, 100% of participants failed donning and doffing PPE, 98.4% were contaminated. The mean cognitive load was high (7.43+/-0.9 points). In the post-test, 100% were successful in donning the PPE and 94.8% in doffing; only 9.8% were contaminated. The mean of the cognitive load was low (4.1+/-1.4 points), and the performance was high (7.9+/-1.1).

Use of in situ simulation to evaluate the operational readiness of a high-consequence infectious disease intensive care unit. Fregene T.E., et al, Anaesthesia, Vol 75, 6, 733-738. 2020.
We ran high-fidelity, in-situ simulation of high-risk procedures on patients with COVID-19 in a negative-pressure side room on our intensive care unit (ICU). Our aim was to identify potential problems, test the robustness of our systems and inform modification of our standard operating procedures for any patients with COVID-19 admitted to our ICU. The simulations revealed several important latent risks and allowed us to put corrective measures in place before the admission of patients with COVID-19. We recommend that staff working in clinical areas expected to receive patients with COVID-19 conduct in-situ simulation in order to detect their own unique risks and aid in the creation of local guidelines of management of patients with COVID-19.

Does my personal protective equipment really work? A simulation-based approach, Hughes, P.G., et al, Medical Education, Vol 54, 8, 759-760. 2020.
The article describes a simulation-based approach which examined the effectiveness of personal protective equipment (PPE) during the COVID-19 pandemic. Topics covered include the utilization of a non-toxic fluorescent solution during the PPE training of health care personnel, the reason room lights were turned off prior to doffing, and the indication of the presence of fluorescent solution on the learner's skin.

COVID-19 crisis, safe reopening of simulation centres and the new normal: Food for thought. Ingrassia, P.L., et al, Advances in Simulation, 13. 2020.

This paper discusses how to safely reopen simulation facilities (SF) in the post-lockdown phase. It outlines 10 focus points and provides operational tips and recommendations consistent with current international guidelines to reopen SF safely. The tips have been laid out taking into account two main factors: (a) the SF audience, mainly consisting of undergraduate and postgraduate healthcare professionals, who might face exposure to COVID-19 infection, and (b) for many simulation-based activities, such as teamwork training, adequate physical distancing cannot be maintained.

[COVID-19 outbreak response for an emergency department using in situ simulation](#). Jee, M., et al, Cureus, Vol 12, 4, e7876. 2020.
This study aims to describe the utility of in situ simulation in identifying system errors and latent safety hazards in response to preparation for the expected COVID-19 surge. The emergency department and anesthesiology department of Galway University Hospital conducted a series of multidisciplinary, in situ simulations to rapidly identify operational errors and latent safety hazards in response to this outbreak. Each simulation involved an interdisciplinary response to a suspected/COVID-19 patient. The cases were used as a training opportunity for staff and ultimately a platform to expeditiously implement system changes in response to deficits identified during the simulations.

[Endovascular simulation as a supplemental training tool during the COVID-19 national emergency](#). Kesselman, A., et al, Clinical Imaging, 72-73. 2020.
The ongoing COVID pandemic raises many concerns as our healthcare system is pushed to its limits and as a consequence, Interventional Radiology training may be compromised. Endovascular simulators allow trainees many benefits to build and maintain endovascular skills in a safe environment. Our experience demonstrates a methodology to maintain IR training with use of didactic and simulation supplementation during the COVID-19 pandemic, which may be helpful for incorporation at other institutions facing similar challenges.

[Health care team training and simulation-based education in obstetrics during the COVID-19 pandemic](#). Kiely, D.J., et al, Journal of Obstetrics & Gynaecology Canada: JOGC, Vol 42, 8, 1017-1020. 2020.
Health care team training and simulation-based education are important for preparing obstetrical services to meet the challenges of the COVID-19 pandemic. Priorities for training are identified in two key areas. First, the impact of infection prevention and control protocols on processes of care (e.g., appropriate and correct use of personal protective equipment, patient transport, communication with patients, etc). And second, the effects of COVID-19 pathophysiology on obstetrical patients (e.g., testing and diagnosis, best use of modified obstetric early warning systems, etc). However, such training is more challenging during the COVID-19 pandemic because of the requirements for social distancing. This article outlines strategies (spatial, temporal, video-recording, video-conferencing, and virtual) to effectively engage in health care team training and simulation-based education while maintaining social distancing during the COVID-19 pandemic.

[Improving stroke care in times of the COVID-19 pandemic through simulation: Practice your protocols!](#). Kurz, M.W., et al, Stroke, 2273-2275. 2020.
This article describes the authors' experience with simulation training for COVID-19 stroke treatment protocols. One week of simulation training allowed us to identify numerous latent safety threats and to adjust our institution-specific protocols to mitigate them. It also helped our physicians and nurses to practice relevant tasks and behavioral patterns (eg, proper donning and doffing PPE, where to dispose potentially contaminated equipment) to minimize their infectious exposure and to adapt to the new situation. We therefore strongly encourage other

hospitals to adopt simulation training to prepare their medical teams for code strokes during the COVID-19 pandemic.

[In-situ simulations for COVID-19: A safety II approach towards resilient performance](#). Lakissian, Z., et al, Advances in Simulation, 15. 2020.

This is a quality improvement initiative: daily in situ simulations were conducted across various departments at the American University of Beirut Medical Center (AUBMC), a tertiary medical care center in Beirut, Lebanon. These simulations took place in the hospital with native multidisciplinary teams of 3-5 members followed by debriefing with good judgment using the modified PEARLS (Promoting Excellence and Reflective Learning in Simulation) for systems integration. All participants completed the simulation effectiveness tool (SET-M) to assess the simulation. Debriefings were analyzed qualitatively for content based on the Safety Model and LST identification, and the SET-Ms were analyzed quantitatively. This intervention allowed us to detect previously unrecognized LSTs, prepare our personnel, and offer crucial practical hands-on experience for an unprecedented healthcare crisis.

[Process-oriented in situ simulation is a valuable tool to rapidly ensure operating room preparedness for COVID-19 outbreak](#). Lie, S.A., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 225-233. 2020.

In this article, we highlight learning points from our proactive use of in situ simulation as part of plan-do-study-act cycles to ensure operating room facility preparedness for COVID-19 outbreak. We found in situ simulation to be a valuable tool in disease outbreak preparedness, allowing us to ensure proper use of personal protective equipment and protocol adherence, and to identify latent safety threats and novel problems that were not apparent in the initial planning stage. Through this, we could refine our workflow and operating room setup to provide timely surgical interventions for potential COVID-19 patients in our hospital while keeping our staff and patients safe.

[Preparing maternity for COVID-19: A translational simulation approach](#). Lowe, B., et al, Australian & New Zealand Journal of Obstetrics & Gynaecology, 628-632. 2020.

Translational simulation - simulation that is integrated and focused on emerging clinical priorities - offers numerous opportunities to aid in pandemic preparation. We describe our approach to preparing our institution's maternity services for the COVID-19 pandemic using translational simulation. We suggest lessons for providers of maternity services, and for those who support them through simulation activities.

[Effect of implementing simulation education on health care worker comfort with nasopharyngeal swabbing for COVID-19](#). Mark, M.E., et al, Otolaryngology - Head & Neck Surgery, 271-274. 2020.

A simulation training exercise was designed as a departmental initiative to improve competency performing nasopharyngeal swabs during the COVID-19 pandemic. Sixty-one health care workers attended teaching sessions led by the Department of Otorhinolaryngology on proper nasopharyngeal swab technique. After a brief lecture, participants practiced their swab technique using a high-fidelity airway simulation model. Pre- and postintervention self-evaluations were measured via standardized clinical competency questionnaires on a 5-point Likert scale. Postintervention scores improved on average 1.41 points (95% CI, 1.10-1.73) out of 5 from a mean score of 3.13 to 4.54 (P < .0001). This reflects a large effect size with a Glass's delta value of 1.3.