Safety, Skills & Improvement
Clinical Skills

The Knowledge Network

# CSMEN – Simulation Publications Update

# Bulletin November 2020

# Use of Simulation in Emergency Medicine

## 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 is used in Emergency Medicine training. 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 for resuscitation training

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: Use of Simulation based Education in Emergency Medicine

**Applying principles from aviation safety investigations to root cause analysis of a critical incident during a simulated emergency.**

Imach, S., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 193-198. 2020.

This is an interesting collaborative article from the Institute for Emergency Medicine and Management in Medicine, Munich and North Western University Feinberg School of Medicine Chicago from several counts. The first is that it applied a structured root cause analysis approach to an incident that occurred during a simulated emergency. Secondly the critical incident occurred as a result of equipment failure delaying the appropriate treatment response by over 2 minutes. Thirdly it identified how different experts can contribute to learning from such an event.

The sentinel event occurred when an immersive simulation was being undertaken to focus on checklists in pre-hospital settings. The simulation scenario in which two paramedics participated involved an adult patient who had a witnessed collapse with a cardiac arrest due to ventricular fibrillation. Following the first shock using an AED, the responders provided CPR. When prompted for a rhythm check the team paused CPR - the analysis of the rhythm then failed due to electrode loss of contact. The AED was then out of synch in its decision making and instructions and gave prompts at the wrong time which delayed the restarting of chest compressions. In addition, the second shock was not administered as one of the paramedics forgot to charge. The correct sequence was established, and an appropriate shock administered after 2.17 minutes delay. For 72% of this time delay CPR was interrupted.

An RCA was undertaken by 3 experts in resuscitation and 1 occupational psychologist several weeks after the incident to provide detachment from the observed incident and debriefing, answering three questions:

- What happened?
- Why did it happen?
- What can be done to prevent it happening again?

They share a fishbone analysis of the incident. In terms why it happened there seemed to be a strong sense of trust in the AED by the paramedics such that they ignored other cues and let the AED be the lead ( automation bias).Two cognitive errors were also identified; fixation error and premature closure of decision making.

In order to prevent this happening again it is suggested training involving trouble shooting measures in AED training should be included. Although this is just one case it does emphasise the need to consider complexity and bias when developing scenarios.

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***Terror and disaster surgical care: Training experienced trauma surgeons in decision making for a MASCAL situation with a tabletop simulation game.*** *Achatz G., et al, European Journal of Trauma and Emergency Surgery : Official Publication of the European Trauma Society, Vol 46, 4, 717-724. 2020.*

*Hospital decision makers must respond to mass-casualty terrorist situations in a defined tactical and strategic approach. Rapid decisions must be made that take into account the special situation and available capacities and resources to maximise the number of survivors even though individual patients may have a poorer functional outcome. As part of the preparation of a Terror and Disaster Surgical Care (TDSC) course, the authors developed a tabletop simulation game based on a comprehensive and structured review of the literature, the opinions of experts, and the results of specialised conferences. This tabletop simulation game is played four times during each TDSC course. As part of the TDSC® course, the tabletop simulation game teaches high-level decision-making algorithms and prepares key hospital personnel for such situations.*

**Effect of simulation training on nurse leadership in a shared leadership model for cardiopulmonary resuscitation in the emergency department.** Armstrong, P., et al, Emergency Medicine Australasia, 2020.

*Empowering a senior nurse in a shared leadership role has been proposed as a more efficient set up for the cardiac arrest team in ED. The emergency physician is then more available to perform tasks such as echocardiography and exclude reversible causes. Simulation provides an opportunity for training and practice of this shared leadership model. A structured simulation training programme in New Zealand, which focused on implementing a nurse and doctor shared leadership model for cardiopulmonary resuscitation (CPR), improved nurse leadership and teamwork performance.*

**Call me maybe... A simulation based curriculum for telephone triage education in a pediatric residency.** Blumberg, J.S., et al, Frontiers in Pediatrics, Vol 8, 283. 2020.

*This study involved the development of an educational curriculum aimed at expanding the pediatric resident skill set in telephone triage. The method of curriculum development was based on Kolb's experiential learning theory. It utilized a combination of resource familiarization, didactic education, and simulation. In the pilot study, residents were divided into two groups-a didactic-first group and a simulation-first group. The didactic-first group received the PowerPoint didactic prior to the simulation, and the simulation-first group received the didactic after the simulation. The study found statistically significant higher evaluation scores in the didactic-first group, and an overall improvement in resident confidence with telephone triage.*

**In situ simulation training in helicopter emergency medical services: Feasible for on-call crews?.** Bredmose, P.P., et al, Advances in Simulation, 7. 2020.

*The aim of this study was to investigate the feasibility of introducing in situ, simulation-based training for the on-call team on a busy helicopter emergency medical service (HEMS) base. It was a one-year prospective study on simulation training during active duty at a busy Norwegian HEMS base. Training was conducted as low fidelity in situ simulation while the teams were on call. Eight scenarios were developed. All scenarios included learning objectives for non-technical skills. Results demonstrated that in situ simulation training for on-call crews on a busy HEMS base is feasible with judicious investment of time and money. The participants were very positive about their experience and the impact of this type of training.*

**Mapping the expert mind: Integration method for revising the ACES medical simulation curriculum.** Cardinal, P., et al, Journal of Medical Education & Curricular Development, Vol 7. 2020.

*This article shares the authors' experience developing an integrated curriculum for the ACES (Acute Critical Event Simulation) program. The purpose of the ACES program is to ensure that health care providers develop proficiency in the early management of critically ill patients. The program includes multiple different types of educational interventions (mostly simulation-based) and targets both specialty and family physicians practicing in tertiary and community hospitals. To facilitate curriculum integration, the authors have developed a knowledge repository consisting of cognitive maps which organize time-sensitive tasks in the proper sequence; the repository serving as the foundation upon which other educational interventions are then built. While this methodology is demanding, authors welcomed the challenge given the scholarly value of their work, thus creating an interprofessional network of educators across Canada.*

**Results from an evidenced-based curriculum design with innovative simulators to prepare providers in caring for those with burn injuries.** Craig, C.K., et al, Journal of Burn Care & Research, 2020.

*A survey was distributed to burn physicians, nurses, therapists, administrators, and survivors; to assess the perceived proficiency of those managing adult and pediatric patients. Procedure simulators were developed and a course was designed and delivered. An after-course survey of participants captured how this course filled identified knowledge gaps. Initial data show that a course, such as this one, provides the education necessary to fill the most commonly reported gaps in knowledge and skills. Further work is being invested to develop disaster management skills, assessment components, and further determine course validity.*

**Simulation training and skill assessment in emergency medicine,** Davis, D. & Warrington, S.J., StatPearls Publishing, 2020.

*This article is intended to be a basic overview and should serve as a starting point for the introduction to the field of simulation education in emergency medicine.*

**Use of simulation training to teach the ABCDE primary assessment: An observational study in a Dutch university hospital with a 3-4 months follow-up.** Drost-de Klerck, A.M., et al, BMJ Open, e032023. 2020.

*This study aimed to investigate short-term and long-term effectiveness of simulation training to acquire a structured Airway Breathing Circulation Disability Exposure (ABCDE) approach for medical emergencies; and to examine which skills were learnt and maintained best. The study at the University Medical Center Groningen found that using simulation training is an effective educational tool to teach physicians the ABCDE primary assessment. Certain crew resource management (CRM) skills decrease over time, so the authors recommend organising refresher courses, simulation team training or another kind of simulation training with a focus on CRM skills.*

**Simulation in the continuing professional development of academic emergency physicians: A Canadian national survey.** Forristal, C., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 2020.

*This study sought to characterize how simulation-based CPD (SBCPD) is being used in Canada and what academic emergency physicians (AEPs) desire in an SBCPD program. Two national surveys were conducted from March to June 2018. Sixty percent of Canadian academic EM sites reported using SBCPD, although only 30% reported dedicated funding support. Academic emergency physician responses demonstrated a median annual SBCPD of 3 hours. Academic*

*emergency physicians identified time commitments outside of shift, lack of opportunities, and lack of departmental funding as their top barriers to participation, whereas department representatives (DRs) thought AEPs' fear of peer judgment and inexperience with simulation were substantial barriers. Content areas of interest for SBCPD were rare procedures, pediatric resuscitation and neonatal resuscitation. Interprofessional involvement in SBCPD was valued by both DRs and AEPs.*

**Simulation training and skill assessment in EMS,** Green, A. & Hug, M., StatPearls Publishing, 2020.
*This brief review seeks to summarize the current literature on the use of simulation in Emergency Medical Services (EMS) education and in skill assessment.*

**Operationalising resilience for disaster medicine practitioners: Capability development through training, simulation and reflection.** Hermelin, J., et al, Cognition, Technology & Work, Vol 22, 3, 667-683. 2020.
*This case study describes the implementation of a set of general resilience management guidelines for critical infrastructure within a Swedish Regional Medical Command and Control Team. The experience from the case study demonstrates the value of combining (1) developmental learning of practitioners' cognitive skills through resilience-oriented reflection and interaction with dynamic complex open-ended problems; (2) contextualisation of generic guidelines as a basis for operational methodological support in the operational environment; and (3) the use of simulation-based training as part of a capability development programme with increasing complexity and realism across mixed educational, training and exercise sessions.*

**Applying principles from aviation safety investigations to root cause analysis of a critical incident during a simulated emergency.** Imach, S., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 193-198. 2020.
*The authors report a case study in which a critical incident occurred during a simulated cardiac arrest managed by a professional emergency medical services (EMS) team. An unexpected, yet technically correct voice prompt from an automated external defibrillator (AED) led to significant delays including timely defibrillation of ventricular fibrillation. In their estimation, such a critical event meets the wider definition of a "Sentinel Event". Full A/V recordings of the incident were available and allowed the authors to conduct an in-depth root cause analysis (RCA) of possible causes of error. They identified faulty decision-making, loss of leadership, and automation bias as possible root causes. They suggest that use of RCA methodology during medical simulation improves understanding of critical incidents and can contribute to training of EMS personnel and education of instructors*.

**Factors influencing team and task performance in intensive care teams in a simulated scenario.** Jonsson, K., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 2020.
*Healthcare teams and their performance in a complex environment such as that of intensive care units (ICUs) are influenced by several factors. This Swedish study investigated the relationship between team background characteristics and team/task performance. The study found that a higher age is important for better team performance when caring for a severely ill patient in a simulation setting in the ICU. In addition, prior team training had a positive impact on task performance.*

**Artificial intelligence and computer simulation models in critical illness,** Lal, A., et al, World Journal of Critical Care Medicine, Vol 9, 2, 13-19. 2020.
*Widespread implementation of electronic health records has led to the increased use AI and computer modeling in clinical medicine. The early recognition and treatment of critical illness*

*are central to good outcomes but are made difficult by, among other things, the complexity of the environment and the often non-specific nature of the clinical presentation. Increasingly, AI applications are being proposed as decision supports for busy or distracted clinicians, to address this challenge. Data driven "associative" AI models are built from retrospective data registries with missing data and imprecise timing. Associative AI models lack transparency, often ignore causal mechanisms, and, while potentially useful in improved prognostication, have thus far had limited clinical applicability. To be clinically useful, AI tools need to provide bedside clinicians with actionable knowledge. Explicitly addressing causal mechanisms not only increases validity and replicability of the model, but also adds transparency and helps gain trust from the bedside clinicians for real world use of AI models in teaching and patient care.*

**Virtual reality triage training can provide comparable simulation efficacy for paramedicine students compared to live simulation-based scenarios,** Mills, B., et al, Prehospital Emergency Care, Vol 24, 4, 525-536. 2020.
*Mass-casualty triage training is traditionally taught via either didactic lectures or table top exercises. Large-scale simulations are heavily resource-intensive, logistically challenging, require the coordination and time of multiple personnel, and are costly to replicate. This study compared the simulation efficacy of a bespoke virtual-reality (VR) simulation with an equivalent live simulation scenario designed for undergraduate paramedicine students. The VR simulation provided near identical simulation efficacy for paramedicine students compared to the live simulation. The authors conclude that VR MCI training resources represent an exciting new direction for authentic and cost-effective education and training for medical professionals.*

**Prospective randomized controlled trial of video- versus recall-assisted reflection in simulation-based teaching on acquisition and retention of airway skills among trainees intubating critically ill patients.** Prakash, S., et al, Critical Care Medicine, 1265-1270. 2020.
*Conventionally, simulation-based teaching involves reflection on recalled events (recall-assisted reflection). Instead of recall, video-assisted reflection may reduce recall bias and improve skills retention by contributing to visual memory. Here, the authors test the hypothesis that when compared with recall, video-assisted reflection results in higher acquisition and retention of skills involved in airway management among junior critical care doctors. Their study found that when compared with recall, video-assisted reflection resulted in similar improvement in airway skills, but better retention over time.*

**The impact of full-scale simulation training based on Kolb's learning cycle on medical prehospital emergency teams: A multilevel assessment study.** Secheresse, T., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 2020.
*The aim of this study was to assess the impact of a specific cardiac arrest management simulation training program inspired by the principles of Kolb's learning cycle. All the staff in a medical prehospital emergency unit participated in this program. In addition to the satisfaction of the participants, the results showed a positive effect on medical knowledge and team behavior and an improvement in the management of patients suffering cardiac arrest.*

**Low-fidelity simulation of medical emergency and cardiac arrest responses in a suspected COVID-19 patient - an interim report.** Wenlock, R.D., et al, Clinical Medicine, e66-e71. 2020.
*The authors argue that simulation can support the development of new guidelines and protocols needed to respond to medical emergencies in patients with suspected COVID-19. They organised seven simulations involving patients with suspected COVID-19 for staff at Brighton and Sussex University Hospitals. The simulations significantly improved the participants' confidence in responding to emergencies in patients with suspected COVID-19. Numerous challenges were identified along the themes of equipment, personnel, communication and procedures. The*

*authors urge NHS trusts nationally to implement simulations to identify problems and develop effective solutions.*