



# CSMEN – Simulation Publications Update

## Bulletin May 2021

### Randomised Controlled Trials and Use of Simulation

#### 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 Randomised Controlled Trials RCTs have been used to study aspects of simulation-based education. 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 those which used RCTs in the study of 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](mailto: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: Randomised Controlled Trials and Use of Simulation based Education**

[Positive communication behaviour during handover and team-based clinical performance in critical situations: A simulation randomised controlled trial.](#) Bertrand, B., et al, British Journal of Anaesthesia, 2021.

This single centre RCT assessed the impact of an intervention on positive communication behaviour (both verbal and non-verbal components) on stress response and clinical performance of an anaesthetic team in a simulated scenario of anaesthetic related paediatric laryngospasm after a handover. Laryngospasm is a frequent potentially serious complication of paediatric anaesthesia.

This study was a prospective RCT with two parallel arms and a blinded assessment of communication behaviour undertaken in Grenoble, France. The anaesthetic team consisted of two people (a resident and a nurse which reflects work practices in France).

Sim junior was the simulator used and at 2 minutes into the scenario the surgeon makes the incision which is followed by airway obstruction due to laryngospasm. The scenario ends when the surgeon is asked to resume the procedure. The scenarios for each of the 32 teams were recorded. Each team was randomly paired and allocated to intervention or control group using stratified cluster randomisation (dependent on experience) which was concealed using a coding system. The intervention took place during the handover where positive and non-positive verbal and non-verbal (examples are given in table 1) communication was used. Communication behaviour of each team was assessed using a clinical performance scoring tool by an independent observer unaware of the allocation. In addition, HR was recorded at key time intervals as physiological response to stress and using the State Trait Anxiety Inventory at arrival and end of the simulation.

Results suggested the positive communication behaviour during handover improves team based performance in a simulation based critical situation.

There are a few limitations of this RCT which are highlighted in the article in relation to it being a single centre study with a small number of volunteer participants. The main concerns would be perhaps portraying negative communication to the control group and the lack of variety of critical situations to assess generalisability to other scenarios. I did like the emphasis on the principles of kindness, confidentiality and a safe learning environment to make mistakes in simulation that was shared with all participants.

Professor Jean Ker  
Associate Postgraduate Dean, Clinical Skills (CSMEN)



**[Is individual practice in an immersive and interactive virtual reality application non-inferior to practicing with traditional equipment in learning systematic clinical observation? A randomized controlled trial.](#)**

Berg, H. & Steinsbekk, A., BMC Medical Education, 123. 2020.

The aim was to investigate if individual self-practice of the ABCDE approach (Airways, Breathing, Circulation, Disability, Exposure) in an immersive and interactive virtual reality (VR) application gave non-inferior learning outcome compared to using traditional equipment (TP) in first year medical and nursing students. The primary outcome was the number of students who documented all the eight predefined observations in the ABCDE approach in the correct order in a practical test on an advanced simulator manikin with a time limit of 5 min, done immediately after the self-practice. The study found that individual self-practicing the ABCDE approach in VR was non-inferior to individual self-practicing with traditional equipment.

**[Use of simulation to measure the effects of just-in-time information to prevent nursing medication errors: A randomized controlled study.](#)**

Berg, T.A., et al, Simulation in Healthcare: The Journal of the Society for Medical Simulation, 2020.

A novel systems thinking approach using a pediatric simulation and student nurses were used to evaluate the benefit of applying just-in-time information (JITI) to reduce medication errors. A smart device app was developed to provide JITI medication administration information. The study population included 38 teams having 2 to 3 senior nursing students on each team. The intervention groups that made significant use of the JITI app demonstrated improved performance for medication administration over the control group. Familiarity with the app was pivotal to how frequently it was used and to the success of the groups in administering medications. Although those with access to the app having limited training successfully executed the simulation 27.3% of the time, those with extended training had a success rate of 77.8%.

**[Positive communication behaviour during handover and team-based clinical performance in critical situations: A simulation randomised controlled trial.](#)**

Bertrand, B., et al, British Journal of Anaesthesia, 2021.

The authors aimed to evaluate the effect of positive communication during medical handover on the subsequent team-based clinical performance in a simulated critical situation. They also assessed the effect of positive communication behaviour on stress response. This single-centre RCT involved anaesthesia teams composed of a resident and a nurse in a high-fidelity scenario of anaesthesia-related paediatric laryngospasm after a standardised handover. During the handover, similar information was provided to all teams, but positive communication behaviour was adopted only for teams in the intervention group. Primary outcome was team-based clinical performance, assessed by an independent blinded observer, using video recordings and a 0-to 100-point scenario-specific scoring tool. The study concluded that positive communication behaviour between healthcare professionals during medical handover improved team-based performance in a simulation-based critical situation.

**[Comparative value of a simulation by gaming and a traditional teaching method to improve clinical reasoning skills necessary to detect patient deterioration: A randomized study in nursing students.](#)**

Blanie A., et al, BMC Medical Education, Vol 20, 1, 53. 2020.

The objective of this RCT was to compare the respective educational value of simulation by gaming



(SG) and a traditional teaching (TT) method to improve clinical reasoning (CR) skills necessary to detect patient deterioration. 2nd year nursing students were randomized into two groups: Simulation by gaming “SG”: the student played individually with a serious game consisting of 2 cases followed by a common debriefing with an instructor; Traditional Teaching “TT”: the student worked on the same cases in text paper format followed by a traditional teaching course with a PowerPoint presentation by an instructor. No significant educational difference (based on script concordance tests) was observed between training by SG and the TT course, either immediately or 1 month later. However, satisfaction and motivation were found to be greater with the use of SG.

#### **Simulation strategies to increase nursing student clinical competence in safe medication**

**administration practices: A quasi-experimental study**, Craig, S.J., et al, Nurse Education Today, Vol 96, 2021.

Evidence suggests that use of a structured medication safety enhancement (MSE) simulation program can significantly improve student knowledge and competency in safe medication administration. Third-year BSN students were randomized into intervention or control groups. Control groups participated in standard training while the intervention group received additional clinical simulation experience and debriefing sessions focused on medication safety practices. Students who received the medication safety enhancement intervention performed significantly better in a subsequent simulation than students who did not have prior simulation experience. Findings suggest that educators should consider high fidelity simulation to engage students in understanding and implementing medication safety practices in the clinical setting.

#### **Speaking up against hierarchy: A simulation geared towards nursing students**. Da Silva, C., et al, Cureus, Vol 12, 12, e11977. 2020.

A randomized controlled trial was conducted with undergraduate nursing students who were randomized to a traditional paper case study (control group) or an interactive pre-simulation activity (intervention group). The results showed significant differences in the use of the two-challenge rule by students in the intervention group compared to those who completed the paper case study (control group). Additionally, students in the intervention group were more self-confident and satisfied with the entire simulation intervention than the control group.

#### **Usefulness of an intrapartum ultrasound simulator (IUSim™) for midwife training: Results from an RCT**. Di Pasquo E., et al, Fetal Diagnosis and Therapy. 2020.

The authors conducted a randomized study to determine whether a training session on a dedicated simulator (IUSim™) would facilitate the midwives in learning the technique of transperineal intrapartum ultrasound. Six midwives with no prior experience in intrapartum ultrasound were randomly split into 2 groups: 3 of them were assigned to the “training group” and 3 to the “control group.” The training group were taught to measure 2 sonographic parameters during a 3-h practical session conducted on IUSim™ under the supervision of an expert obstetrician. In the training group, the measurement quality of the angle of progression and the head-perineum distance was significantly higher in comparison with the control group, while the image quality of both measurements was comparable between the 2 groups.

#### **Simulation-based training for increasing health service board members' effectiveness: A cluster randomised controlled trial**. Faulkner, N., et al, BMJ Open, e034994. 2020.

There is a paucity of research on how to improve the functioning of health service boards. The authors examined the impact of simulation-based training on health service board members' perceptions of their skills in communicating during board meetings and their perceptions of board



meeting processes. Twelve boards in Australia were randomized to either a 2-hour simulation-based training session training or a wait list control group. Pre- and post-intervention data were collected and analysed from 57 board members. Skills and confidence in communicating during board meetings was higher after a 2-hour simulation-based training session training. Board meeting processes were also improved after training.

**[Effects of situational simulation and online first-aid training programs for nurses in general medical wards: A prospective study](#)**, Hsieh, P., et al, Nurse Education Today, Vol 96, 2021.

This study explored the effects of first-aid skills and knowledge between situational simulation training and online teaching. A first-aid knowledge test (FAKT) and a first-aid skills test (FAST) were used to measure the participants' learning outcomes. There were no significant differences in the changes in FAKT and FAST scores after intervention between situational simulation training and online teaching groups. However, for the subgroup of participants who scored <75% on the FAST pretest, better improvements only occurred in the situational simulation training, but the situational simulation training program had higher costs than the online teaching program.

**[Impact of virtual reality anatomy training on ultrasound competency development: A randomized controlled trial](#)**. Hu, K., et al, PLoS ONE, e0242731. 2020.

The authors designed a VR-enhanced ultrasonography training program and utilized a plane transection tool to interact with a 3D VR model of the human body which facilitated the 3D conceptualization of the spatial relationship of anatomical structures. Third-year medical students were randomly divided into an intervention and control group. Participants in the intervention group had significantly higher scores in ultrasonography task performance tests than the control group. They also had greater improvement in ultrasonographic image identification MCQ tests. The authors conclude that VR-enhanced anatomical training could be of significant benefit in ultrasonography training by promoting a better understanding of the spatial relationships of anatomical structures and the development of early psychomotor skills transferable to the handling of ultrasonographic probes.

**[The effect of numbered jerseys on directed commands, teamwork, and clinical performance during simulated emergencies](#)**, Kim, Y., et al, Journal for Healthcare Quality: Promoting Excellence in Healthcare, Vol 43, 1, 24-31. 2021.

Communication and teamwork are essential during inpatient emergencies such as cardiac arrest and rapid response (RR) codes. The authors investigated whether wearing numbered jerseys affect directed commands, teamwork, and performance during simulated codes. Eight teams of 6 residents participated in 64 simulations. Using the numbered jerseys during simulations was associated with increased use of directed commands and better teamwork. Time to performance of clinical actions was similar except for longer time to defibrillation in the jersey group.

**[Quality of chest compressions on a dental chair -- A randomized simulation trial as observation in support of a procedure proposal](#)**. Klosiewicz T., et al, Signa Vitae, Vol 16, 2, 175-181. 2020.

The authors aimed to evaluate the quality of chest compressions performed on a dental chair in case of cardiac arrest in a dental office. Sixty paramedic students were randomly assigned to the control group, in which resuscitation was performed on the floor or to the experimental group, in which compressions were performed on a dental unit. There were no significant differences in numbers, rate, depth of chest compressions or in chest recoil between groups. The authors conclude that performing chest compressions on a dental chair might be as effective as on the



floor. On this basis, they propose a procedure for safe and efficient performance of CPR in a dental office.

**[Use of GoPro point-of-view camera in intubation simulation-A randomized controlled trial.](#)** Koh, W., et al, PLoS ONE, e0243217. 2020.

Teaching endotracheal intubation is uniquely challenging due to its technical, high-stakes, and highly time-sensitive nature. This study aimed to evaluate the effectiveness of a GoPro, a small, lightweight, high-resolution action camera, in improving intubation teaching for novice learners in a simulated setting. Year 4 medical students underwent a standardized intubation curriculum and a formative assessment, then randomized to receive GoPro or non-GoPro led feedback. After a span of three months, participants were re-assessed. No statistically significant differences were found between the GoPro group and the non-GoPro group at summative assessment. Almost all found the GoPro effective for their learning. Common themes in the qualitative analysis were: the ability for an improved assessment, greater identification of small details that would otherwise be missed, and usefulness of the unique point-of-view footage in improving understanding.

**[Comparative evaluation of tube first versus video laryngoscope first techniques in a normal and simulated difficult airway model: A randomized controlled trial,](#)** Lee, W.T., et al, AANA Journal, Vol 88, 6, 479-483. 2020.

The purpose of this study was to determine if the time required to intubate an airway and the number of gaze changes by the laryngoscopist could be decreased by using a novel video laryngoscope technique. Sixteen experienced Certified Registered Nurse Anesthetists were recruited to intubate a manikin with a normal or difficult airway using both the laryngoscope first technique and a new endotracheal tube first technique (4 intubations total) in a randomized sequence. Although no significant difference was noted in the time to intubation between intubation techniques, the number of gaze changes was found to be significantly fewer in the tube first technique. The authors conclude that incorporating the endotracheal tube first technique into an education curriculum could increase patient safety by decreasing the time to secure a difficult airway.

**[Effectiveness of immersive virtual reality on orthopedic surgical skills and knowledge acquisition among senior surgical residents: A randomized clinical trial.](#)** Lohre, R., et al, JAMA Network Open, e2031217. 2020.

This study aimed to evaluate whether immersive virtual reality (IVR) improves learning effectiveness for surgical trainees and to validate a VR rating scale through correlation to real-world performance. An IVR training platform provided a case-based module for reverse shoulder arthroplasty (RSA) for advanced rotator cuff tear arthropathy. Participants were permitted to repeat the module indefinitely. The IVR group completed training 387% faster considering a single repetition. Surgical training with IVR demonstrated superior learning efficiency, knowledge, and skill transfer.

**[Can anxiety in undergraduate students in a high-fidelity clinical simulation be predicted? A randomized, sham-controlled, blinded trial.](#)** Martin-Rodriguez, F., et al, Nurse Education Today, 104774. 2021.

The aim of the study was to develop a predictive model capable of determining which students will present high levels of anxiety. Students were randomly assigned to four scenarios and played one of two possible roles. The type of scenario or the role played had no effect on anxiety. Age and systolic blood pressure were being protective factors against anxiety. The authors conclude that





the anxiety level developed during simulation could be predicted, and that the application of this predictive model combined with appropriate techniques to deal with increased anxiety levels could improve the learning process of medical students during simulations.

**[Effects of a transformative learning theory based debriefing in simulation: A randomized trial.](#)** Oh, Y., et al, Nurse Education in Practice, 102962. 2021.

Mezirow's transformative learning theory (TLT) uses critical reflection in providing care to patients, which involves clinical judgment in nursing. The aim of this study was to compare the effects of TLT-versus a non-TLT-based debriefing protocol on knowledge, problem-solving process, critical thinking disposition, and clinical judgment in nursing students. Debriefing protocols based on Mezirow's TLT for the experimental group and gather-analyze-summarize-based debriefing for the control group were used for four weeks. Scores of the TLT group were significantly higher than those of the control group in the problem-solving process, critical thinking disposition, and clinical judgment of reflection.

**[Procedural virtual reality simulation training for robotic surgery: A randomised controlled trial.](#)** Raison N., et al, Surgical Endoscopy. 2021.

This study assessed the effectiveness of procedural VR compared to basic skills VR in minimally invasive surgery. Learning curve analysis demonstrated improvements in technical skill for both training modalities although procedural training was associated with greater training effects. Any VR training resulted in significantly higher GEARS scores than no training. Procedural VR training was found to be more effective than both basic VR training and no training. The authors conclude that a structured programme of procedural VR simulation is effective for robotic training with technical skills successfully transferred to a clinical task in cadavers.

**[Virtual standardized patients vs academic training for learning motivational interviewing skills in the US department of veterans affairs and the US military: A randomized trial.](#)** Reger, G.M., et al, JAMA Network Open, e2017348. 2020.

Despite the need for effective and scalable training in motivational interviewing (MI) that includes posttraining coaching and feedback, limited evidence exists regarding the effectiveness of using virtual (computerized) standardized patients (VSPs) in such training. This study evaluated the efficacy of training with a VSP on the acquisition and maintenance of MI skills compared with traditional academic study. Participants assigned to VSP training had significantly greater posttraining improvement in technical global scores, relational global scores and the reflection-to-question ratio. The authors conclude that the VSP MI skill outcomes were better than those achieved with academic study and were maintained over time.

**[Learning how to break bad news from worked examples: Does the presentation format matter when hints are embedded? results from randomised and blinded field trials.](#)** Schmitz, F.M., et al, Patient Education & Counseling, Vol 103 No 9, 1850-1855. 2020.

Video-based worked examples enable medical students to successfully prepare for breaking-bad-news (BBN) encounters with simulated patients (SPs). This is especially true when examples include hints that signal important content. This paper investigates whether the beneficial effect of hints only applies to video-based worked examples or also text-based examples. The study concludes that, independent of their presentation format, worked examples with hints best foster students' BBN skills learning. In addition to video, text-based worked examples can effectively prepare students for BBN simulations if hints are included. This offers an affordable alternative to video examples, as text examples can be generated with less effort.



**Mixed reality for teaching catheter placement to medical students: A randomized single-blinded, prospective trial.** Schoeb, D.S., et al, BMC Medical Education, 510. 2020.

This study evaluated a step-by-step mixed reality (MR) guidance system for instructing a practical medical procedure - bladder catheter placement. One group were given their instructions by an instructor, while the other group were instructed via an MR guidance system using a Microsoft HoloLens. Learning outcome was assessed via a standardized OSCE (objective structured clinical examination) and the MR group's result was significantly better. The self-evaluations revealed no difference between groups, but the control group gave higher ratings when evaluating the quality of instructions - the MR system assessment showed less usability. The authors conclude that MR is a promising tool with the potential for superior learning outcomes, but advances in MR technology are necessary to improve the usability of current systems.

**Stress management training improves overall performance during critical simulated situations.**

Sigwalt, F., et al, Anesthesiology, 198-211. 2020.

The hypothesis of this work was that Tactics to Optimize the Potential, a stress management program, could improve resident performance during simulation. Residents participating in high-fidelity simulation were randomized into two parallel arms (Tactics to Optimize the Potential or control) and actively participated in one scenario. Only residents from the Tactics to Optimize the Potential group received specific training a few weeks before simulation and a 5-min reactivation just before beginning the scenario. Those trained with Tactics to Optimize the Potential showed better overall performance and a decrease in stress level during high-fidelity simulation.

**Effects of bag mask ventilation and advanced airway management on adherence to ventilation recommendations and chest compression fraction: A prospective randomized simulator-based trial.** Vogt L., et al, Journal of Clinical Medicine, Vol 9, 7 Article Number: 2045. July 2020.

The role of advanced airway management (AAM) in cardiopulmonary resuscitation (CPR) is currently debated as observational studies reported better outcomes after bag-mask ventilation (BMV), and the only prospective randomized trial was inconclusive. This study compared AAM and BMV with regard to adherence to ventilation recommendations and chest compression fractions in simulated cardiac arrests. The authors conclude that AAM is associated with higher chest compression rates than BMV but leads to significant hyperventilation and lower adherence to ventilation recommendations. They suggest that cumulative effect of deviations from ventilation recommendations in both BMV and AAM has the potential to blur findings in clinical trials, and that training and teaching of CPR should include awareness of hyperventilation associated with AAM and measures to prevent it.