



CSMEN – Simulation Publications Update

September 2020

Bulletin on

Surgery in Simulation Based Education

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 **SURGERY in Simulation based Education**. The articles may be of interest or relevance to your current role in NHS Scotland. The articles may also be of use in your research. The articles are from those journals we currently subscribe to. If there are any 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 more frequent Bulletins with a clear focus on an aspect of simulation. Surgery has been at the forefront of developing technical skills using simulation and are key to providing focused safe learning experiences for participants which they can then transfer to their surgical practice in the workplace.

If you would like to suggest a focus topic or become a reviewer, please also let me know.

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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: Surgery in Simulation based Education

[Systematic review of virtual haptics in surgical simulation: A valid educational tool?](#) Rangarajan K., et al, Journal of Surgical Education, Vol 77, 2, 337-347. 2020.

This paper systematically reviews the evidence for haptic technology in VR simulation in the context of surgical education given the increasing use and interest in this modality.

The main drivers are to find an accelerated surgical training regime which enhances patient outcomes with minimal risk. The effectiveness of simulation training in surgery is well established with low fidelity simulators but the cost benefit of some increasingly complex simulators with haptic capability have not been adequately evaluated. The development of a haptic functionality in simulators with sensory feedback could however be of great value in shortening learning curves.

The authors used PRISMA guidelines in reporting their systematic review of the literature conducted independently by two authors searching EMBASE, MEDLINE add Cochrane. This is represented as a flow diagram. The selection criteria are for Haptic feedback in VR Simulation versus no haptic feedback in VR simulation.

The findings were rated by expert opinion which may introduce bias to the results as only 9 studies were included in the final data synthesis. Most outcome measures included path length, economy of movement, use of cautery. Only one used a global assessment such as OSATS. The studies involved those from across the spectrum of surgical expertise. The majority of studies had 3 or more domains with evidence of limitations as defined by the Cochrane Risk of bias tool.

They found inconsistency in the published evidence on the impact of haptics in VR simulation in surgery. This is not surprising given the different variables measured across the nine studies including the assessments used, the types of simulators and the expertise of those accessing them. One of the questions that needs answering is when maximum benefit can be achieved from haptic feedback in surgical training. The reduction in hours for surgical training suggests that the added value of haptics in all simulation based training requires further evaluation. This is a useful article if you are thinking of a masters project, otherwise I would question reading beyond the abstract.

Professor Jean Ker

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[Simulation in urological training and education \(SIMULATE\) - A multicentre international randomised controlled trial assessing the transferability of simulation-based training in surgery: Protocol and development of interventional training curriculum.](#) Aydin A., et al, BJU International, 18 Mar 2020.

This study protocol describes the first international multicentre randomised controlled trial investigating the effectiveness of simulation-based surgical training and development process of an evidence-based training curriculum, to be delivered as an educational intervention. The trial will recruit urology surgical trainees who must not have performed ≥ 10 of the selected index procedure, ureterorenoscopy. The primary outcome is the number of procedures required to achieve proficiency, where proficiency is defined as achieving a learning curve plateau of 28 or more on an Objective Structured Assessment of Technical Skill (OSATS) assessment scale, on 3 consecutive operations, without any complications.

[A review of physical simulators for neuroendoscopy skills training.](#) Baby B., et al, World Neurosurgery, Vol 137, 398-407. 2020.

It is challenging to learn neuroendoscopy skills from the existing apprenticeship model of surgical education. Training methods that use simulation-based systems have achieved wide acceptance. This review examined the existing physical simulators on the basis of the skills training of neuroendoscopic procedures. It classified the physical training methods developed for neuroendoscopy surgical skills into synthetic simulators and box trainers. The existing simulators were compared based on their design, fidelity, trainee evaluation methods, and validation studies.

[Development of cadaver perfusion models for surgical training: An experimental study.](#) Bellier, A., et al, Surgical & Radiologic Anatomy, 1217-1224. 2019.

The objective of this study was to improve the existing circulation model for surgical simulation on cadavers. It used a three-step experimental approach. The first part tested two variables: the type of circuit and the use of a heater for perfusion. The second evaluated two parameters: the injection fluid and the type of body conditioning (embalmed or freshly dead prepared using different washing techniques). The third was an improvement on the best circulation obtained, which focused on the injection fluid. The study found that using a non-embalmed body with low-pressure washing and a 4-g/L gelatin-based fluid was the most effective technique for cadaver perfusion.

[Barriers and facilitators to deliberate practice using take-home laparoscopic simulators.](#) Blackhall, V.I., et al, Surgical Endoscopy, 2951-2959. 2019.

Several regions in the UK and Ireland have delivered home-based laparoscopic simulation programmes. However, engagement has been poor. This study explored the barriers to engagement. Sixty-three trainees and trainers were interviewed in focus groups. Trainees tended to focus on scoring 'points' towards career progression rather than viewing tasks as associated with personal development, and felt this was perpetuated by the training system. Trainees were unsatisfied with metric feedback and wanted individual feedback from consultants. Trainees perceived consultants as lacking interest in training. Some consultants were unaware of the programmes being delivered and others felt lacking in confidence to deliver the training. The 'point-scoring' culture could be addressed by modified assessment structures, greater recognition and accountability for trainers, and recognition and funding of simulation strategies including in-house skills sessions.

[The importance of teaching clinical anatomy in surgical skills education: Spare the patient, use a sim!](#) Clifton, W., et al, Clinical Anatomy, 124-127. 2020.

Anatomical simulation in the form of "desktop" three-dimensional (3D) printing provides a cost-



effective option while maintaining educational value. This article describes the anatomical and patient-centred approach that led to the establishment of one institution's 3D printing laboratory for anatomical and procedural education.

[Assessment of a virtual reality temporal bone surgical simulator: A national face and content](#)

[validity study](#), Compton, E.C., et al, Journal of Otolaryngology -- Head & Neck Surgery, Vol 49, 1. 2020.

Virtual reality surgical training is a growing field that is increasingly being adopted in Otolaryngology. CardinalSim is a virtual reality temporal bone surgical simulator that offers a high-quality, inexpensive adjunct to traditional teaching methods. The objective of this study was to establish the face and content validity of CardinalSim. It concluded that CardinalSim met acceptable criteria for face and content validity. This temporal bone virtual reality surgical simulation platform may enhance surgical training and be suitable for patient-specific surgical rehearsal for practicing Otolaryngologists.

[Validation of a novel hip arthroscopy simulator: Establishing construct validity](#).

Cychosz C., et al, Journal of Hip Preservation Surgery, Vol 6, 4, 385-389. 2020.

Hip arthroscopy (HA) is technically demanding and associated with a prolonged learning curve. The purpose of this study was to validate a novel HA simulator. Twenty trainees and one sports medicine fellowship-trained orthopaedic surgeon at a single academic institution were recruited to perform a diagnostic HA procedure using the VirtaMed ArthroS hip simulator. The study concluded that the ArthroS hip simulator showed good construct validity, and performance correlates highly with total number of arthroscopic cases reported during training.

[Evaluating how residents talk and what it means for surgical performance in the simulation lab](#).

D'Angelo A.L.D., et al, American Journal of Surgery, 2020.

This paper explores a method for assessing intraoperative performance by modelling how surgeons integrate skills and knowledge through discourse. Senior residents (N = 11) were recorded while performing a simulated laparoscopic ventral hernia (LVH) repair. Audio transcripts were coded for five discourse elements related to knowledge, skills, and operative independence. Participants with poorer hernia repair outcomes had stronger connections between the discourse elements operative planning and asking for information or advice (Operative planning), while participants with better hernia repair outcomes had stronger connections between the discourse elements giving assistant instructions and identifying errors (Operative management). The authors conclude that the ability to integrate multiple operative steps and verbally communicate them significantly correlated with better operative outcomes.

[Validating the transfer of skills acquired on a prostate biopsy simulator: A prospective, randomized, controlled study](#).

Fiard, G., et al, Journal of Surgical Education, 2020.

This study aimed to evaluate the ability of students to reproduce the skills acquired on a prostate biopsy simulator in a real-life situation. The authors concluded that the results support the transfer of skills acquired on the simulator, and the superiority of a training curriculum integrating simulation, and performance feedback.

[Cognitive load and performance in immersive virtual reality versus conventional virtual reality simulation training of laparoscopic surgery: A randomized trial](#).

Frederiksen J.G., et al, Surgical Endoscopy, Vol 34, 3, 1244-1252. 2020.

This study aimed to compare cognitive load and performance in immersive VR and conventional VR simulation training. It found that immersive VR simulation training induced a higher cognitive load and resulted in a poorer performance than conventional VR simulation training in laparoscopy. The authors conclude that although immersive VR offers some potential



advantages over conventional VR, such as more real-life conditions, they would only recommend introducing immersive VR in surgical skills training after initial training in conventional VR.

[How does cadaveric simulation influence learning in orthopedic residents?](#) James H.K., et al, Journal of Surgical Education, Vol 77, 3, 671-682. 2020.

The objectives of this study were to understand how cadaveric simulation impacts learning in orthopaedic residents, why it is a useful training tool, and how skills learnt in the simulated environment translate into the workplace. It was a qualitative research study using semistructured interviews with orthopaedic residents who underwent an intensive cadaveric simulation training course in England. The authors concluded that Cadaveric simulation enhances learning in both technical and nontechnical skills in junior orthopaedic residents; direct transfer of skills to the real-world operating theatre was reported; and cadaveric simulation in the UK training system of orthopaedics may be of greatest utility at around the PGY 4 stage.

[Current status of simulation training in urology: A non-systematic review.](#) Kozan A.A., et al, Research and Reports in Urology, Vol 12, 111-128. 2020.

This review aimed to provide a comprehensive up-to-date picture on urology simulators and the evidence for their validity. It also discusses emerging technologies and future directions. Urologists should embed evidence-based simulation in training programs to shorten learning.

[Systematic review of virtual haptics in surgical simulation: A valid educational tool?](#) Rangarajan K., et al, Journal of Surgical Education, Vol 77, 2, 337-347. 2020.

Haptic, or "force-feedback" technology in VR simulation is a rapidly developing field, however the role of haptics in surgical education and its efficacy is unclear. Eight randomized controlled trials that compared VR training with and without haptics were included plus 1 survey study. Six randomized controlled trials demonstrated that haptic enhanced VR simulation is significantly more effective than without haptics for skill training with a reduced learning curve and faster time to proficiency and task completion, particularly in novice learners. Two studies showed no significant differences in task-assessed parameters between the haptics and nonhaptics cohorts. The survey study suggested haptics negatively affected training with decreased realism.

[The Heidelberg VR score: Development and validation of a composite score for laparoscopic virtual reality training.](#) Schmidt, M.W., et al, Surgical Endoscopy, 2093-2103. 2019.

Virtual reality (VR)-trainers are well integrated in laparoscopic surgical training. However, objective feedback is often provided in the form of single parameters, e.g., time or number of movements, making comparisons and evaluation of trainees' overall performance difficult. The aim of this study was to create a weighted, expert-based composite score, to offer simple and direct evaluation of laparoscopic performance on common VR-trainers. The authors developed a proposed new standard in analysing and reporting VR outcome data - the Heidelberg virtual reality (VR) score. They suggest that the scoring algorithm and the consensus results on the importance of different skill aspects in laparoscopic surgery are universally applicable and can be transferred to any simulator or task.