The following is a list of resources related to virtual simulation.

The Society for Simulation in Healthcare does not prescribe or recommend any particular virtual construct, modality, or method based on the information contained herein. Decisions about designs of simulation activities are left to the individual healthcare simulationist and the teams with which they work to design and deliver simulation activities.


- **Introduction:** High-value care (HVC) suggests that good history taking and physical examination should lead to risk stratification that drives the use or withholding of diagnostic testing. This study describes the development of a series of virtual standardized patient (VSP) cases and provides preliminary evidence that supports their ability to provide experiential learning in HVC.

- **Methods:** This pilot study used VSPs, or natural language processing–based patient avatars, within the USC Standard Patient platform. Faculty consensus was used to develop the cases, including the optimal diagnostic testing strategies, treatment options, and scored content areas. First-year resident physician learners experienced two 90-minute didactic sessions before completing the cases in a computer laboratory, using typed text to interview the avatar for history taking, then completing physical examination, differential diagnosis, diagnostic testing, and treatment modules for each case. Learners chose a primary and 2 alternative “possible” diagnoses from a list of 6 to 7 choices, diagnostic testing options from an extensive list, and treatments from a brief list ranging from 6 to 9 choices. For the history-taking module, both faculty and the platform scored the learners, and faculty assessed the appropriateness of avatar responses. Four randomly selected learner-avatar interview transcripts for each case were double rated by faculty for interrater reliability calculations. Intraclass correlations were calculated for interrater reliability, and Spearman ρ was used to determine the correlation between the platform and faculty ranking of learners’ history-taking scores.


- **Introduction:** Remotely facilitated *simulation*-based training (RF-SBT) is less positively appraised than face-to-face, locally facilitated *simulation*-based training (LF-SBT), despite being considered as an acceptable alternative. This study compared the perceptions of learners after RF-SBT and LF-SBT to explain differences between the two and identify relevant theories that would guide future practice.

- **Methods:** Telephone interviews were conducted with 21 newly graduated doctors and nurses who completed a standardized *simulation* course delivered in both RF-SBT and LF-SBT formats.


- **ABSTRACT:** Early recognition of intraoperative critical events is essential in optimizing the health outcomes of surgical patients. Use of simulation in nurse anesthesia education allows students to practice recognizing changes in the patient’s condition in a safe learning environment. Second- and third-year student registered nurse anesthetists were randomly assigned to 2 groups to explore differences in recognizing intraoperative myocardial infarction (MI) using high fidelity mannequin simulation vs virtual simulation. One group participated in a virtual simulation first,
followed by a high-fidelity mannequin simulation. The other group participated in a high-fidelity mannequin simulation first, then virtual simulation. Second-year students recognized an intraoperative MI faster when using high-fidelity mannequin simulation than when using virtual simulation. However, there was no significant difference among third-year students in the time it took to recognize a critical event when using high-fidelity mannequin simulation vs virtual simulation. These findings indicate that both simulation modalities are useful in evaluating student registered nurse anesthetists’ timely recognition of intraoperative critical events such as MI. However, for students with less didactic and clinical practicum experience in the program, such as second-year students, the use of high-fidelity mannequin simulation for recognizing an intraoperative MI may be more beneficial than virtual simulation.


- **ABSTRACT:** As virtual simulation is burgeoning, faculty and administrators are asking for evidence of its effectiveness. The objective of this systematic review was to identify how virtual simulation impacts nursing student learning outcomes. Applying the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines, 80 studies were reviewed. Results indicate that most research (n = 69, 86%) supported virtual simulation as an effective pedagogy to support learning outcomes while highlighting gaps and areas of bias. Adding search terms could have expanded the findings. The body of evidence supports virtual simulation as an effective pedagogy. Future studies should use more robust research designs, prioritize curricular integration of virtual simulation, and determine best practices in virtual simulation methodology.


- **BACKGROUND:** Virtual patients are interactive digital simulations of clinical scenarios for the purpose of health professions education. There is no current collated evidence on the effectiveness of this form of education.

- **OBJECTIVE:** The goal of this study was to evaluate the effectiveness of virtual patients compared with traditional education, blinded with traditional education, compared with other types of digital education, and design variants of virtual patients in health professions education. The outcomes of interest were knowledge, skills, attitudes, and satisfaction.

- **METHODS:** We performed a systematic review on the effectiveness of virtual patient simulations in pre- and post registration health professions education following Cochrane methodology. We searched 7 databases from the year 1990 up to September 2018. No language restrictions were applied. We included randomized controlled trials and cluster randomized trials. We independently selected studies, extracted data, and assessed risk of bias and then compared the information in pairs. We contacted study authors for additional information if necessary. All pooled analyses were based on random-effects models.


ABSTRACT: Traditional, ineffective forms of passive education are crumbling under the demands of learners who have grown up digital. Computer and communication capabilities, critical to so many of our simulation tools, are expanding rapidly. These technological advances will usher in a new age of learning technologies for simulation and beyond. This chapter focuses on simulation capabilities enabled by rapidly advancing computer and gaming technologies including virtual reality, haptics, and virtual environments. Ultimately, we believe these emerging technologies will profoundly alter the way we learn in healthcare.


Summary Statement: This article explores the combination of live, virtual, and constructive (LVC) simulations in healthcare. Live, virtual, and constructive simulations have long existed in the military, but their consideration (and deployment) in medical and healthcare domains is relatively new. We conducted a review on LVC—its current application in the military domain—and highlight an approach, challenges, and present suggestions for its implementation in healthcare learning. Furthermore, based on the state of the art in simulation in healthcare, we suggest that a combination of two simulation types (LV, VC, LC) at the time may be a simpler approach to the community at large.


ABSTRACT: The Objective Structured Clinical Examination (OSCE) is used in nurse practitioner (NP) education programs to evaluate students’ clinical competency. The OSCE was developed to be done with students on campus in a simulation laboratory, but for online NP programs, an on-campus environment is a barrier to the use of OSCEs. The virtual OSCE eliminates this barrier and provides an effective method of implementing OSCEs and evaluating student competencies in online NP education.


Introduction: Simulated practice, both face-to-face and computer-based, is well established within healthcare education, allowing rehearsal and refinement of clinical skills. Virtual reality is a new and relatively untested method of delivering simulation learning.

Methods: The databases CINAHL, Medline, Psychinfo, PubMed and the University of Portsmouth ‘Discover’ database were searched between 4th June 2018 and 7th July 2018 using the terms: pre-registration, pre-licensure, “pre-registration”, “pre licensure”, trainee, student, students, nurs*, virtual-reality, VR, “virtual reality”, “augmented reality”, clinical, skill*, competenc* and mastery. Inclusion and exclusion criteria relating to type of paper, population, intervention, comparison and outcome were selected. Selected articles were appraised using the Centre for Reviews and Dissemination guidelines. As clinical psychomotor skill mastery requires the application of theoretical knowledge to a motor skill in a range of contexts, outcomes relating to these elements (namely knowledge, cognitive gain, skill performance, skill success and time to complete) were analysed.


Abstract: The article identifies and explores the essential techniques necessary for modern military training simulations. It provides a brief historical introduction followed by discussions of: system
architecture; simulation interoperability; event and time management; distributed simulation; and verification, validation, and accreditation. This is followed by fundamental principles in modeling and specific military modeling domains. The growth in government sponsored simulation programs has drawn engineers and scientists from other fields. These practitioners bring valuable skills, but lack an appreciation for the historical and technical foundations of simulation. The article familiarizes readers with important areas and gives them an appreciation for the complexity of developing large simulations. We suggest that a need exists for academic and commercial courses that focus on this topic. The article may serve as a template for one such course.


**ABSTRACT:** Despite the formulation of best practice guidelines for in-person simulation, there has been uncertainty regarding debriefing practices for virtual experiences. This study explores the following debriefing practices: self-debrief only; self-debrief followed by a small-group debrief; and self-debrief followed by a large-group debrief. A focus group study methodology consisting of a convenience sample of first-year nursing students (n = 19) was conducted. Study results included four themes: developing process; promoting safe debriefing spaces; fortifying knowledge; and engaging in reflection. This study provides insight into the advantages of an immediate self-debrief after a virtual gaming simulation and the value of maximizing reflection by adding a group debrief. • Debriefing options are needed after a virtual simulation is played outside of class. • This focus group study explored three debriefing methods: self-debrief; self-debrief followed by a small-group debrief; self-debrief followed by a large-group debrief. • Self-debrief is a viable option for an immediate debrief after a virtual simulation. • Effective debriefing after a virtual simulation may be achieved through combining self-debrief with a group debrief.


- Background: Best practice guidelines exist for debriefing, but only a little is known on how these align with the unique attributes of virtual simulation. This study explores self-debriefing, virtual debriefing, and in-person debriefing methods after a virtual gaming simulation.

- Methods: A focus-group-study methodology was employed with a convenience sample of 24 nursing students. The study was theoretically informed by the 3D Model of Debriefing.