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Featured Article

Online Virtual Simulation and Diagnostic Reasoning: A Scoping Review

Elsie Duff, NP, MEd, PhD(c)[a,*], Lynn Miller, DNP, NP[b], Joyce Bruce, RN(NP) MSA, MN (ANP)[c]

[a]*Faculty, Collaborative Nurse Practitioner Program, School of Nursing, Saskatchewan Polytechnic, Regina, SK, Canada*
[b]*Faculty, Primary Care Nurse Practitioner Program, Collaborative Nurse Practitioner Program, School of Nursing, Saskatchewan Polytechnic, Regina, SK, Canada*
[c]*Adjunct Professor University of Regina, Program Head Collaborative Nurse Practitioner Program, School of Nursing, Saskatchewan Polytechnic, Regina, SK, Canada*

KEYWORDS
online virtual simulation;
computer simulation;
simulated patient;
virtual patient;
diagnostic reasoning;
health education;
scoping review

Abstract

Background: Virtual reality technology can range from bedside learning to computerized tools accessed exclusively online; yet there is little evidence of the effectiveness of online virtual simulation for teaching diagnostic reasoning to health care providers. To address this gap, an examination of virtual simulation encounters in the online classroom was undertaken to inform education of a variety of health care providers, including nurse practitioners, registered nurses, and physicians.

Method: Arskey and O'Malley's (2005) framework was the methodology used to conduct the scoping review.

Result: Twelve studies published between 2008 and 2015 were identified from a search of 14 databases. The study sample included physicians and medical students (seven), baccalaureate nursing students (two), associate degree nursing students (one), and providers from other fields such as pharmacists, physiotherapists, sports medicine, forensics, and veterinarians.

Conclusion: Online virtual simulation was comparable or superior to traditional simulation methods where increased engagement with learning occurred in a safe environment with convenient access.

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Learning activities that incorporate subconscious higher order thinking must be implemented in health care providers' curriculum to meet professional and regulatory requirements. Diagnostic reasoning is one such complex process that combines knowledge, skill, experience, and intuition. Nurse practitioners, registered nurses, physicians, and other health care providers use diagnostic reasoning to synthesize patient findings and develop a plan of care (Appel, Wadas, Talley, & Williams, 2013; Bowen, 2006). With a move to online education, challenges arise in teaching diagnostic reasoning in the virtual classroom; however, advances in computer technologies have created exciting

* Corresponding author: elsieduff@gmail.com (E. Duff).

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options for educators and students. Complex online virtual simulation (OVS) learning experiences increase student knowledge and exposure and engagement with the diagnostic reasoning process; yet, there is little evidence of the effectiveness of this technology for teaching and learning diagnostic reasoning (Costello et al., 2014; Tichon, 2012). The purpose of this scoping review was to examine the use of OVS in health care education, identify the technologies used, and evaluate the effectiveness of OVS in teaching diagnostic reasoning.

Key Points

- Examine the existing evidence of the effectiveness of online simulation encounters in the virtual classroom for teaching diagnostic reasoning.
- 12 studies from 14 databases were included in the scoping review with samples of healthcare professionals, physicians, and medical students (7) and nursing students (4).
- Findings included identifying the technologies to create virtual patients, diagnostic reasoning, learner satisfaction and engagement, and utilization factors.

Background

OVS is an interactive reality technology that recreates real-life scenarios. In health care education, OVS replicates real-world encounters in a virtual clinical environment where students progress through a range of decision-making options and/or clinical skills performance (Gaba, 2007). Deliberate practice using OVS technology can reinforce the diagnostic reasoning processes required for clinical practice, especially when effective, real-time formative feedback is incorporated into the experience (Andersen, 2012; Byron, Johnson, Allen, Brilmyer, & Griffiths, 2014; Hooper, Jivram, Law, Michell, & Somasunderam, 2012; Tichon, 2012). In addition, OVS enables students to learn in a safe environment and often allows them to choose the time and place for learning; even from their own homes (Hooper et al., 2012).

Many health care education programs are turning to web-based technologies for course delivery. Between 2013 and 2014, 60.7% of nurse practitioner education programs in Canada used online course delivery (Canadian Association of Schools of Nursing, 2012, 2015). Further, physicians have embraced online education for continuing professional development, yet, schools of medicine have only begun to explore web-based course delivery (Association of Faculties of Medicine of Canada, 2012).

Sample and Method

A scoping review is an approach for reviewing and analyzing research evidence on a broad range of health-related topics that allows for rapid identification of important concepts related to an area of research interest (Arksey & O'Malley, 2005). Arksey and O'Malley (2005) six-part scoping review framework was the methodology used, as it integrates a variety of sources including guidelines, editorials, and gray literature and is useful when there is limited evidence on the topic of interest.

Table 1 Summary of Database Search

Database	Number of Articles Retrieved
Academic Search Complete	7
CINAHL	4
Cochrane Database	10
EMBASE	0
ERIC	4
Medline	25
Nursing and Allied Health	5
ProQuest Dissertation	0
PsychInfo	32
PubMed	38
Sociology Abstract	0
Campbell Library	1
TRIP	0
Web of Science	0
Total	126

Study Search and Selection

The electronic database search resulted in the retrieval of 126 articles (see Table 1) with 12 articles selected for review. English language articles related to OVS and diagnostic reasoning published between 2008 and January 2015 were included. Keywords included computer simulation, online simulation, virtual simulation, virtual reality, virtual classroom, patient simulation, simulation, diagnostic reasoning, critical thinking, clinical judgment, clinical decision making, decision making, health professional, health care person, health care provider, nurse, nurse practitioner, health care student, health occupation, medical professional, medical person, medical provider, medical student, medical occupation, and medical work.

Data Charting and Collating

Zotero reference management software was used for article retention, charting, and summarizing the extracted data. Article summaries included identification of the reviewer, research question(s), study purpose, country of origin, study methodology, participants, measurements used, theories identified, results, limitations, relevance to the research questions, reviewer's recommendation, and a synopsis of the article.

Findings and Discussion

Methodologies used in the selected studies included one systematic review, an integrative literature review, seven