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Review Article

Development of Crisis Resource Management Skills: A Literature Review

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KEYWORDS

crisis resource management;
high-fidelity simulation;
literature review

Abstract: The use of crisis resource management principles (CRM), including problem solving, situational awareness, resource utilization, communication, and leadership, have been thought to reduce adverse patient outcomes and lead to greater teamwork in healthcare settings. Education programs using high-fidelity simulation (HFS) has become an increasingly popular strategy to teach these skills. There is little evidence however demonstrating the effectiveness of this type of education on actual performance of these skills. In order to explore the effectiveness of HFS education on development of CRM skills, a literature review was undertaken to identify evidence available in the healthcare literature. Thirty-one articles were identified that met criteria for this review. Articles were highly variable in methods, population used, educational intervention, evaluative method, and results. The following paper outlines a summary of these results, including synthesis of findings and recommendations for research in this area.

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Although numbers and percentages vary, a vast number of patients die from what are perceived as preventable errors (Rudy, Polomano, Murray, Henry, & Marine, 2007). To avoid these errors, health care professionals must have knowledge of threats to patient safety and experience in caring for patients when extraordinary clinical problems arise. Recently, a focus in application of crisis resource management (CRM) principles has been thought to reduce adverse patient outcomes and lead to greater teamwork in crisis events (Messmer, 2008).

CRM is a set of principles that encompass a range of cognitive and interpersonal skills aimed at creating an environment of improved efficiency, teamwork, and safety (Gaba, 2010; White, 2012). Key CRM skills include (a) problem solving, (b) situational awareness, (c) resource utilization, (d) communication, and (e) leadership. Education programs that focus on these CRM skills have been shown to have a positive impact on learner competence in handling crisis events (Kim, Neilipovitz, Cardinal, Chiu, & Clinch, 2006). By teaching health care providers CRM foundational skills, the cognitive and interpersonal skills that allow them to critically analyze and respond in crisis situations will be developed as well (Andersen, Jensen,

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Lippert, & Ostergaard, 2010; Bearman et al., 2012; Gordon, Mendenhall, & Blair O'Connor, 2013; Pearson & McLafferty, 2011; White, 2012). So, how can experience with CRM skills be created? How can professionals practice responses with deteriorating patients without jeopardizing safety? In recent years, growing numbers of health care professions have turned to simulation as a way to answer these questions.

Key Points

- Simulation is a popular way of teaching crew resource management skills.
- Mixed evidence exists proving efficacy of simulation programs teaching crew resource management skills.
- A literature review of 31 relevant articles yielded variable results.

High-fidelity simulation (HFS) has become a popular method of teaching CRM skills. One form of HFS uses advanced human-patient simulators, which are computerized manikins that “can mimic diverse parameters of human physiology, such as changes in cardiovascular, pulmonary, metabolic, and neurological

systems” (Lapkin, Levett-Jones, Bellchambers, & Fernandez, 2010, p. e 209).

Gaba (2010) identified that “the most frequent question now asked about CRM and teamwork training in health care, and especially for that using simulation, is ‘where is the evidence?’” (p. 4). A literature review was undertaken to identify available evidence on the effectiveness of HFS education interventions on development of CRM skills, meaning, have learners translated behaviours learned in the simulation environment into performance of CRM skills? This was addressed via the following question: what evidence is there to demonstrate the effectiveness of HFS learning programs on health care professionals’ acquisition and performance of CRM skills?

A summary of this evidence, including synthesis of findings and recommendations for research in this area, will be outlined.

Review of the Literature

Search Strategy

The search included studies carried out with participants from health care disciplines. All types of research, including qualitative and quantitative studies, were included if the following criteria were met.

- a) There was use of HFS learning programs in the study.
- b) The study included an intervention affecting performance of a CRM skill.
- c) Outcomes measured included one of the CRM skills: problem solving, situational awareness, resource utilization, communication, and/or leadership.

- d) Studies were published in English, between 2003 and 2016, and available electronically.

Articles were also excluded if they were descriptive, opinion papers, or commentaries or if results were only available as abstracts.

Search Outcomes

An original search of citations available from 2003 to 2014 yielded 225 papers from PubMed, CINAHL, and Scopus using the following search strategy:

(MH “Computer Simulation”)OR(MH “Simulations”)OR(MH “Patient Simulation”)AND (MH “Problem Solving+”)OR(MH “Decision Making+”)OR(MH “Decision Making, Organizational”)OR(MH “Leadership”)OR(MH “Communication+”)OR(MH “Critical Thinking”)AND(MH “Education, Nursing+”)

There were 30 papers that were not available for review through the University of Manitoba library access system or Google, including 17 unpublished theses. Remaining abstracts were then read, and 81 papers were excluded where inclusion criteria were not met. The remaining papers were then read in full, examined, accepted, or rejected. Articles were excluded if the educational forum used did not include HFS as defined above (e.g., patient actors, task trainers, virtual reality); CRM educational outcomes were not evaluated; they were descriptive, opinion papers, or commentaries; results were only reported in conference abstracts; or they were not available through electronic search mechanisms. This initial search yielded 20 papers for review.

The search was repeated to include citations from 2013 to 2016. One year of overlap was done (2013-2014) to ensure databases searched yielded late submissions from the final year of the initial search. Using the same criteria and databases, 594 citations were produced, with an additional eleven studies added to this review, for a total 31.

Characteristics of Studies

The 31 studies retrieved were examined using the following categories: methods, sample, educational intervention, assessment measures, and results. Each of these categories will be discussed in some detail, and summaries of this information are presented in Table.

Methods

Seven studies had an experimental design, including two randomized, controlled, and blinded studies (Morgan, Kurrek, Bertram, LeBlanc, & Przybyszewski, 2011; Ten Eyck, Tews, Ballester, & Hamilton, 2010), one two group by two times mixed model design (Sullivan-Mann,

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