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Review Article

# Nursing Students Managing Deteriorating Patients: A Systematic Review and Meta-Analysis

Kristine Haddeland, RN, MSc<sup>a,\*</sup>, Åshild Slettebø, RN, PhD<sup>a</sup>, Patricia Carstens, MS<sup>b</sup>, Mariann Fossum, RN, PhD<sup>a</sup>

<sup>a</sup>Centre for Caring Research – Southern Norway, Faculty of Health and Sports Sciences, University of Agder, Kristiansand, Norway

<sup>b</sup>College of Medicine, Sorrell Clinical Simulation Lab, University of Nebraska Medical Center, Omaha, NE, USA

## KEYWORDS

simulation;  
manikin;  
nursing education;  
judgment;  
problem solving;  
deteriorating patient

## Abstract

**Background:** The objective was to summarize knowledge and systematically collect and quantify meta-analytical results regarding the effects of high-fidelity simulation in nursing education to improve students' ability to recognize and respond to deteriorating patients.

**Methods:** In total, 4048 citations were screened, 40 articles were selected for full-text screening, and 14 articles were included. Six articles were subsequently included in the meta-analysis.

**Results:** Knowledge and performance increased after simulation. Four studies reported an increase in self-confidence.

**Conclusion:** Findings support that studies with high-quality research designs and improved measurement practices are required to produce generalizable evidence concerning the effectiveness of simulation.

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Nurses must contend with rapid changes in technology and ways of managing complex illness in today's dynamic health care environment (Eyikara & Baykara, 2018). This requires the application of an innovative approach to nursing education. High-fidelity simulation (HFS) is used to improve nursing students' skills in the recognition and

early detection of physiological deterioration (Cooper et al., 2010; Fisher & King, 2013). In HFS, students have opportunities to learn and practice clinical skills in a simulated clinical environment using clinical scenarios and high-fidelity patient manikins, which have been replicated as closely as possible to the real-life situation. Instructors can control the manikin's responses, and the manikin can respond to interventions provided by the student (Aqel & Ahmad, 2014). The simulated environment provides a safe environment that gives students a hands-on opportunity to care for a patient without fear of harming that

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\* Corresponding author: [kristine.haddeland@uia.no](mailto:kristine.haddeland@uia.no) (K. Haddeland).

patient. Students also learn from observing other students and from feedback during debriefing sessions. Simulation is considered an active learning strategy that is learner centered, with the educator acting as a learning facilitator (Jeffries, 2016).

### Key Points

- Use of high-fidelity simulation (HFS) in nursing education may improve students' skills in the recognition and early detection of physiological deterioration.
- Objectives, briefing, student support, feedback, and debriefing are important features for effective learning in HFS.
- Studies with high-quality research designs are needed to produce generalizable evidence concerning the effectiveness of HFS.

Facility-based patient safety initiatives have decreased the number of available student nurse placements (Lee, Kelley, Alfes, Bennington, & Dolansky, 2017; Shin, Jin-Hwa, & Jung-Hee, 2015), which in turn limits the students' hands-on experiences and restricts opportunities to engage in clinical decision-making. Current literature has highlighted the fact that a gap exists between the expectations that colleges have for recently graduated nurses and those held by leaders in the practice (Burgess, Buc, & Brennan, 2018; Huston et al., 2018). Therefore, the increased use of simulated learning in nursing education might be a strategy to address this gap (Huston et al., 2018).

During an undergraduate program in nursing, it is vital that students learn how to accurately observe, recognize, and respond to the management of patients' physiological deterioration (Cooper et al., 2010). The theoretical background for this review was the Nursing Education Simulation Framework, which was developed to guide the design, implementation, and evaluation of simulations used in nursing education (Jeffries, 2016). According to Jeffries (2016), simulation design should incorporate five features: objectives, fidelity, problem solving, student support, and debriefing. Although the body of knowledge surrounding HFS in undergraduate nursing education is growing, there is still a need for high-quality research that can establish a cause-and-effect relationship between HFS and learning. Recent research revealed significant differences in assessment methods leading to a wide variety of measurement outcomes (Doolen et al., 2016). Summarizing the existing knowledge regarding the effects of HFS in this study gathers more information that provides more insight into these limitations. This study serves as an important preparation for planning a future randomized controlled trial (RCT) study. The development of a complex intervention inevitably requires the preparation of a systematic review of the existing evidence to inform all steps of the development and evaluation processes (Köpke, Noyes, Chandler, & Meyer, 2015). The

objective of this particular systematic review was to summarize knowledge as well as to systematically collect and quantify meta-analytical results regarding the effects of HFS used in nursing education to improve students' ability to recognize and respond to deteriorating patients. Regarding this particular work, the specific research questions were as follows:

- 1) What are the features of HFS interventions that lead to effective learning?
- 2) Which instruments are used to measure the outcomes in the intervention studies?
- 3) What are the effects of HFS interventions on students' knowledge, performance, and self-confidence?

## Methods

### Search Strategies

To begin, factors including population, intervention, comparison, and outcome framework were used to focus the research questions (Booth, Sutton, & Papaioannou, 2016). Appropriate keywords in various combinations were identified in close collaboration with a university librarian (Table 1). We searched CINAHL, Medline, Embase, PsycINFO, ERIC, the Cochrane Library, and SveMed+. The same keywords were used for all searches with the exception of SveMed+. Because SveMed+ is a smaller Nordic database, we broadened the search and used only the keywords in concepts one and two. The final database searches were conducted on November 24 (2016), with an update on February 20 (2018). In total, 4048 matches were identified after duplicates were removed.

### Eligibility Criteria

Kirkpatrick's framework for evaluating the effectiveness of training programs (1998) may be used as a guide for assessing simulations (Schumann, Anderson, Scott, & Lawton, 2001). It consists of four levels of measuring: (a) the reactions of the students, (b) the amount of learning achieved by the students, (c) the degree to which the behavior of students in other settings reflect what they have learned, and (d) the extent to which results are improved (Schumann et al., 2001). One inclusion criterion in this study was that the studies had a pretest and posttest design and that they were at level two of measuring in accordance with Kirkpatrick's framework.

In this study, HFS and manikin have been chosen to be used synonymously because the inclusion criterion describes HFS as including the use of a manikin. HFS is defined as "simulation experiences that are extremely realistic and provide a high level of interactivity and realism for the learner (INACSL, 2013) and can apply to any mode or method of simulation, for example, human,

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