**THE EFFECTIVENESS OF USING HUMAN PATIENT
SIMULATION MANIKINS IN THE TEACHING OF
CLINICAL REASONING SKILLS TO
UNDERGRADUATE NURSING STUDENTS: A
SYSTEMATIC REVIEW**

Samuel Lapkin
BN University of Newcastle (2007), RN (NSW)

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Samuel Lapkin

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1 Abstract

1.1 Background

Nurses with effective clinical reasoning skills have a positive impact on patient outcomes. Conversely, those with poor clinical reasoning skills often fail to detect impending patient deterioration thus compromising patient safety. Human patient simulation manikins are being used extensively both nationally and internationally in the education of health professionals. There is evidence suggesting that these types of technologies are effective in teaching psychomotor skills and student satisfaction with simulation approaches is generally high. However, the extent to which human patient simulation manikins are effective in the teaching of clinical reasoning skills to undergraduate nursing students is less clear.

1.2 Objective

The aim of this systematic review was to identify the best available evidence on the effectiveness of using whole-body high-fidelity human patient simulation manikin to teach clinical reasoning skills to undergraduate nursing students.

1.3 Inclusion criteria

The review included all randomised controlled trials that assessed the effectiveness of high fidelity human patient manikins in educating undergraduate nursing students.

Studies that included health professionals were excluded unless data for nursing students were analysed separately. The primary outcome measure was clinical reasoning, as assessed by methods such as objective structured clinical examinations and questionnaires. Other outcome measures included student satisfaction, knowledge acquisition, and psychomotor skill performance.

1.4 Search strategy

Using a systematic search strategy designed for each database, the following electronic databases were searched for the period 1999 -2009: CINAHL, Cochrane Database, Dissertation and Theses, EMBASE, ERIC, MEDLINE, Ovid database, Proquest Nursing Journals, PsycINFO. Hand searching of the reference lists of included studies and conference proceedings were undertaken to identify further studies.

1.5 Methodological validity

Two independent reviewers' assessed the methodological quality of each study selected for retrieval prior to inclusion using the critical appraisal tool from the Joanna Briggs Institute.

1.6 Data collection and synthesis

Data were extracted from studies using the standardised data extraction tool from Joanna Briggs Institute. Due to the quality of available studies, statistical pooling was not possible and the findings are therefore presented in narrative form.

1.7 Results

Eight studies were selected for inclusion in this review. The results indicate that the use of human patient simulation manikins improves knowledge acquisition and enhanced students' satisfaction with the learning. There is lack of unequivocal evidence on the effectiveness of using high-fidelity human patient simulation manikins in the teaching of clinical reasoning skills to undergraduate nursing students.

1.8 Conclusion

Further research is required to ascertain the effectiveness of the use of human patient simulation manikins as an educational strategy to improve clinical reasoning skills of

undergraduate nursing students. The importance of this research is underscored by the potential for patient outcomes to be improved through improved clinical reasoning skills in graduate nurses.

2 Definition of terms

Clinical reasoning

In the nursing literature, terms such as clinical reasoning (CR), clinical judgement, problem solving, decision-making and critical thinking are frequently used interchangeably (Tanner, 2006; Thompson & Dowding, 2002). For the purpose of this review, the term CR will be defined as the process by which nurses collect cues; process the information; come to an understanding of a patient problem or situation; plan and implement interventions; evaluate outcomes and reflect on and learn from the process (Hoffman, 2007; Levett-Jones, et al., in press; Tanner, Padrick, Westfall, & Putzier, 1987).

Fidelity

Fidelity refers to the extent to which the simulation model resembles a live human.

Low fidelity human patient simulation manikins

Low fidelity HPSMs are static models or task trainers primarily comprised of rubber body parts which are used to practice of clinical skills such as intravenous cannulation, urinary catheterisation and basic life support (Issenberg, Gordon, Gordon, Safford, & Hart, 2001; Seropian, Brown, Gavilanes, & Driggers, 2004).

Medium fidelity human patient simulation manikins

Medium fidelity human patient simulation manikins (HPSMs) are full body manikins that have embedded software and can be controlled by an external, hand held device. They have more realism than the low-fidelity HPSMs. An example is Laerdal's Nursing AnneTM with VitalSim capability, a manikin used in nursing education to introduce and develop more complex skills such as auscultation of heart, breath and

bowel sounds and identification of life-threatening cardiac dysrhythmias using electrocardiograph (Seropian, et al., 2004).

High fidelity human patient simulation manikins (HPSMs)

High fidelity HPSMs are life sized computerised manikins with realistic anatomical structures and high response fidelity (Alinier, Hunt, Gordon, & Harwood, 2006). They can mimic diverse parameters of human anatomical physiology, for example changes in cardiovascular, pulmonary, metabolic and neurological systems, and have the ability to respond to nursing or pharmacological interventions in real time (Beyea & Kobokovich, 2004; Holcomb, et al., 2002; Nehring, Lashley, & Ellis, 2002; Seropian, et al., 2004). Examples of HPSMs include Laerdal SimMan Universal Patient Simulator (SimManTM) and METITM manikins.

Simulation

Although there are numerous definitions of simulation, the one described by Gaba has been adopted for this review. Gaba (2007) defines simulation as a technique used “to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner” (p. 126).

3 Glossary of statistical symbols and terms

Symbol	Term	Description
<i>p</i>	probability value	The probability that a statistical result would occur by chance if a NULL hypothesis was true. When probability values are less than .05, observed scores can be described as “significantly different” since there is a low likelihood of obtaining these observed scores by chance alone.
N	sample size	Total number in sample
SD	standard deviation	A measure of the spread/dispersion of scores around the mean score.
n	sub-sample size	Total number in sub-sample