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Featured Article

IV Insertion Simulation: Confidence, Skill, and Performance

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KEYWORDS
clinical judgment;
IV insertion;
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outcomes

Abstract

Background: High-fidelity computer-assisted simulation devices have been introduced as a way to improve student confidence and performance. However, these devices have not been verified to improve intravenous (IV) insertion skills in a patient care experience.

Method: An experimental randomized controlled study was conducted to determine whether instruction supported by high-fidelity computer-assisted simulation technology enables a student to access veins more confidently and efficaciously than does the use of current latex arm task-trainer technology. The sample included 94 junior baccalaureate nursing students. Skill, confidence, and actual IV insertion into a patient were evaluated by means of skill return demonstration, confidence survey tool, and clinical self-reporting.

Results: Univariate analyses of the skill scores found no statistically significant difference in return demonstration skill by simulation instruction method used ($p = .7$). Similarly, no significant difference was seen in the student confidence score versus simulation method. The ability to insert an IV into a patient did not correlate with either instruction device used.

Conclusion: Although high-fidelity computer-assisted simulation has helped in many areas of student education, it does not appear to assist students in IV insertion in either skill ability or confidence.

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Introduction

In response to an acute shortage of nurses in the workplace, schools of nursing have increased the number of students in their programs (Allen, Schumann, Collins, & Selz, 2007; Buerhaus & Norman, 2001; Curl, Smith, Chisholm, Hamilton, & McGee, 2007; Joint Commission on Accreditation of Healthcare Organizations, 2002; Krichbaum et al., 2007; Tanner, 2001). This increase in student numbers has meant new challenges in securing and maintaining adequate clinical experiences that support nursing education (Kline, Hodges, Schmidt, Wezeman, & Coye, 2008). More schools are turning to simulation technology to augment and enhance their clinical education as it promises to create lifelike experiences while minimizing risk to patients during student learning experiences (Sharp & Fisher, 2008). The use of lifelike manikins with computer

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interface—manikins that speak, appear to breathe, and have pulses—is an endeavor to provide a realistic experience for students (Alinier, Hunt, Gordon, & Harwood, 2006; Childs & Sepples, 2006; Moorthy, Vincent, & Darzi, 2005). The assumption underlying this use of educational technology is that fidelity to an actual clinical experience during the simulated care experience can improve the preparation of the student prior to a clinical encounter (Bradley & Postlethwaite, 2003).

Key Points
- Simulation supports nursing education.
- Students enjoy simulated opportunities.
- Does simulation increase skill.

A question remains, however, about how efficacious the simulation technology is in providing students with practice experiences that will increase confidence and skill acquisition. This question becomes even more important as schools of nursing must invest in the acquisition and maintenance of simulation equipment in an era of reduced funding. Is the expensive high-fidelity computer-assisted equipment necessary for teaching specific skills such as IV catheter insertion? Can the use of such a device improve skill acquisition better than a task-training device such as the latex arm can? Previous research is limited in verifying that the newer, computer-assisted devices improve the acquisition of insertion skills when measured against a patient care experience. This study addresses these questions.

Background

The introduction of the National Council of State Boards of Nursing research study titled *The Effect of High-Fidelity Simulation on Nursing Students' Knowledge and Performance: A Pilot Study* notes that "the art and science of recreating a clinical scenario in an artificial setting . . . has been an important aspect of nursing program curriculums for decades" (Gomez & Gomez, 1987, as cited in Hicks, Coke, & Li, 2009, p. 1). Studies have shown that simulation experiences are well accepted by students (Alinier, 2003) and provide satisfactory learning exposure prior to actual patient encounters in the clinical setting (Hicks, et al., 2009). Simulation also assists in developing confidence in skill performance (Lasater, 2007a). Dagnone, Mcgraw, Pulling, and Patteson (2008), as well as Jarzemsky and McGrath (2008), found that the use of simulation improved critical thinking by providing the student an opportunity to process information in complex clinical scenarios while allowing the student a safe environment to practice skills essential for nursing practice.

Simulation is an accepted substitute for some patient experiences (Bradley & Postlethwaite, 2003). Wolf (2008) found that in the emergency department, practice with simulation devices has been shown to increase student confidence, and with increased confidence, students report better success in the clinical setting. The ability to practice specific skills such as IV insertion in a real clinical situation is limited and subject to constraints of availability or opportunity. Therefore, laboratory practice with devices such as an artificial limb with lifelike features is a widely accepted method for students to hone skills in various practice techniques (Dagnone et al., 2008; Wolf, 2008).

When describing simulation models, fidelity denotes how accurate a copy is to its source. Fidelity in health care simulation refers to how similar the device is to the human form and to practice conditions (Jeffries, 2007). For example, in a low-fidelity simulation method of instruction, the student is presented with a verbal description of a hypothetical work situation and then asked to describe how he or she would deal with the situation.

This is in contrast to the student's performing the actual actions he or she would take (Motowidlo, Dunnette, & Carter, 1990). Situational interviews (e.g., case study) and paper-and-pencil management situations are both examples of low-fidelity simulations.

High-fidelity simulations are used for instruction of specific skills. Examples include plastic models of body parts on which to practice urinary catheter insertion, dressing changes, nasogastric tube placement, and so forth. These task trainers are used for instruction in specific skills. The latex-covered "arm" with obvious veins for IV insertion instruction and practice is another example of a task trainer (Jeffries, 2007).

Advanced simulation equipment has incorporated technology through computer-assisted applications. Through structured student learning experiences, these devices have been introduced as a way to improve student confidence and performance (Haigh, 2007). Examples include the technologically advanced computerized manikin known as the human patient simulator and Laerdal's Virtual I.V.™ device used to teach IV catheter insertion. With the advancement of technology, the realism has increased. Manikins now contain microphones and can ask for assistance via the device operator and question the student as a patient would question the attending nurse (Kim, Neilipovitz, Cardinal, Chiu, & Clinch, 2006). The realism afforded by these devices has allowed learning to take place in a controlled environment that is believed to benefit students, faculty, and, most of all, patients. The controlled environment can serve as a "safe place" to learn and practice skills and decision making about patient care.

Student confidence has a significant impact on the students' perception of clinical success. Their lack of confidence can affect every interaction with the patient and weaken the students' self-efficacy and therefore their self-esteem (Goldenberg, Andrusyszyn, & Iwasiw, 2005). Perceptions of self-efficacy, self-esteem, and self-confidence affect student ability to assume the nurse role. As students grow into a nurse role, often the perception of success in the clinical role is critical to their advancement (Tanner, 2006).

The insertion of an IV catheter is one of the most challenging skills taught in nursing school (Good, 2003).