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Featured Article

Clinical Virtual Simulation in Nursing Education

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Abstract

Background: The introduction of simulation has produced significant improvements in nursing education. The technological evolution gives way to new opportunities through new pedagogical strategies. Some limitations found in high-fidelity simulators can be overcome by clinical virtual simulation (CVS). However, little is known about students' perceived ease, usefulness, and intention to use this new pedagogical strategy applied to nursing education. The aim of this study is to assess the ease, usefulness, and intention of pregraduate nursing students to use a clinical virtual simulator.

Method: An exploratory, descriptive, and cross-sectional study was conducted using a quantitative approach. A nonprobabilistic sample of 426 pregraduate students was recruited from a Portuguese nursing school. The data were collected through a questionnaire (10-point Likert scale) based on the Technology Acceptance Model.

Results: The results showed an average of perceived ease to use the simulator of 8.99 ($SD \pm 1$) and a perceived usefulness and intention of 9.60 ($SD \pm 0.55$) to use the clinical virtual simulator in pregraduate nursing education. Results also showed an average of 9.55 ($SD \pm 0.73$) for relevance and an average of 9.71 points ($SD \pm 0.59$) for the facilitator role of CVS in nursing education.

Conclusion(s): The pregraduate nursing students revealed perceived ease, usefulness, and intention to use CVS as an important complementary strategy for their nursing education programmes.

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The rapid technological development has highly impacted nursing education with an emerging paradigm shift in the perceptions of students and teachers. For nursing students and teachers, the use of information and communication technologies (ICTs) has become a daily life activity.

The ease and usefulness of the use of technologies influence the education paradigm and encourage nursing professors to adopt constructive approaches in nursing education, with the nursing professor playing the role of a learning facilitator rather than a simple "lecturer."

Currently, many pregraduate nursing students are living in a new technological era, in which high-technology innovation is a demand and reality. Teachers are aware of this new emerging trend and are strongly committed to introducing state-of-the-art technological tools into nursing education. ICT educational tools' accessibility and usability have changed the way students face learning processes and

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have challenged and motivated them to actively engage in education. Prensky (2001a,2001b) pioneered the discussion about learning differences between digital native and digital immigrant, and this subject has raised the consensus or opposition of several authors (Koutropoulos, 2011). However, rather than emphasizing differences between groups or technological skills, the emphasis must be placed on technology capable of providing nursing students with user-friendly educational materials, aligned with the course/programme objectives.

Key Points

- Data show students' perceived ease in the use of clinical virtual simulation (CVS) in nursing education.
- Data show students' perceived usefulness in the use of CVS in nursing education.
- Students show intention to the use CVS in nursing education.
- Nursing students consider the clinical virtual simulator an important tool for their nursing education.
- Nursing students consider that the clinical virtual simulator acts a facilitator of their nursing education.

Nursing education has adopted educational strategies based on the theory of constructivism (Heimann et al., 2013). This theory advocates that knowledge is the product of the interaction between the individual and the environment and focuses on students as active learners, capable of attributing individual meanings to their personal experiences and building their own knowledge over time.

The discussion of the exposure to clinical experiences underlies the development of nurses' professional performance from novice to experts, an idea beginning in 1984 with Benner's writings (Benner, 1984). Benner's theories support our assumption that providing students with learning opportunities and confronting them with different virtual clinical scenarios, closely monitored by nursing teachers to help reflection in and on action, may likely enhance the development of clinical reasoning skills prior to the contact with a real patient. This strategy may function as a knowledge accelerator and most importantly contribute to future nursing practice based on safer and higher quality standards.

Simulation technologies adapted to nursing education were first introduced in the 1950s, with low-fidelity models gradually evolving to modern high-fidelity tools. Since then, these innovative technologies have been massively adopted to support knowledge acquisition and technical skills development. Notwithstanding, we are still facing difficulties to recreate reality through clinical scenarios in nursing education (Lopreiato, 2016) that support the development of clinical reasoning skills (Alfaro-LeFevre, 2010; Benner, Sutphen, Leonard, & Day, 2010; Meakim et al., 2013; Tanner, 2006) and enhance the safety and quality of clinical judgement (Del Bueno, 1994; Dillard, Sideras, Carlton, & Lasater, 2009; Jackson, Ignatavicius, & Case, 2004; Lasater, 2007; Meakim et al., 2013; Tanner, 2006). The high-fidelity simulators still present some disadvantages associated with the limited number of clinical scenarios available and a less dynamic clinical context simulation. These high-fidelity simulators require specific physical spaces, which causes problems for institutions with space management and highly demanding conservation financial resources. These constraints limit the availability of simulators for students' training outside the class environment. All these aspects compete with the financial constraints of a large number of nursing students and policy decision making to reduce public expenditure on higher education.

Currently, the developments in digital and virtual technology have eased the way to recreate reality using virtual patients depicted on a computer touch screen (clinical virtual simulation [CVS]). The CVS is the recreation of reality depicted on a computer screen and involves real people operating simulated systems. It is a type of simulation that places humans in a central role by exercising motor control skills, decision skills, or communication skills (Healthcare Simulation Dictionary, 2016).

The current technological developments have provided professionals with a new innovating tool, underpinned by a dynamic physiologic algorithm that combines clinical simulation and virtual reality simulation (Lopreiato, 2016), with problem-based learning and game design, all assembled in a three-dimensional technological tool. This immersive, dynamic learning environment not only encourages but also requires active and critical action-based learning.

The clinical virtual simulator Body Interact™ (http://bodyinteract.com/product/) builds competence in making clinical diagnoses, retaining knowledge, and integrating basic science concepts and proven medical and nursing protocols into clinical problems. The technology offers students and professionals alike a realistic experience with a life-like virtual patient, from diagnosis to treatment. This technology complements the current learning strategies in health education and is likely to contribute to a more rapid and effective learning process.

This CVS enables learning through experience or "how to think" and how to perform in real-world scenarios and patient-centric challenges. It is also adaptable across dozens of preconfigured and totally dynamic clinical scenarios (cardiology, endocrinology, neurology, respiratory, infectious diseases, trauma, pregnancy, and paediatrics). The technology also enables tracking of individual or group sessions, with a complete set of tools for learning management.

Existing evidence suggests the improvement of student's knowledge transferability acquired in the classroom (Tschannen, Aebersold, McLaughlin, Bowen, & Fairchild, 2012) through virtual simulation, even in the most complex clinical situations such as management of signs and symptoms and in areas such as inclusivity (Tiffany & Hoglund, 2016). Notwithstanding, it is still not possible to firmly

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