

USE OF SIMULATIONS IN NURSING EDUCATION: AN INTEGRATIVE REVIEW

UTILIZAÇÃO DA SIMULAÇÃO NO ENSINO DA ENFERMAGEM: REVISÃO INTEGRATIVA

EL USO DE LA SIMULACIÓN EN LA FORMACIÓN DE ENFERMERÍA: REVISIÓN INTEGRADORA

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ABSTRACT

Objective: To understand how simulation has been used in nursing education. **Method:** This work is an integrative review of prior literature published between 2008 and 2012. Of the 1,837 studies found, 54 were selected for analysis. **Results:** The studies were distributed in 31 journals. The year 2010 presented the highest number of articles, most of which were published in the United States. Three main categories emerged from this analysis: simulation uses different types of simulators; simulation is used to develop different skills; and clinical simulation is more than the simple use of a simulator. **Discussion:** Different types of simulators are used in nursing education for the development of various competences. Simulation goes beyond the simple use of the simulator and involves strategies, techniques, processes, and tools. **Conclusion:** the use of simulation in nursing education has gained ground as an active teaching methodology that offers safe, experience-based learning.

Keywords: Nursing Education; Simulation; Nursing.

RESUMO

Objetivo: conhecer como a simulação vem sendo utilizada no ensino de Enfermagem. **Método:** revisão integrativa da literatura de publicações no período 2008-2012. Dos 1.837 estudos encontrados, 54 foram selecionados para análise. **Resultado:** os estudos estavam distribuídos em 31 periódicos; o ano de 2010 apresenta o maior número de publicações, a maioria nos Estados Unidos. Da análise emergiram três categorias: a simulação utiliza diferentes tipos de simuladores; a simulação é utilizada para desenvolver diferentes competências e a simulação clínica é mais do que o simples uso de um simulador. **Discussão:** diferentes tipos de simuladores são utilizados no ensino de Enfermagem, para o desenvolvimento de variadas competências. A simulação vai além do simples uso do simulador e envolve estratégia, técnica, processo e ferramenta. **Conclusão:** o uso da simulação no ensino de Enfermagem vem ganhando espaço como metodologia ativa de ensino que proporciona uma aprendizagem experiencial de forma segura.

Palavras-chave: Educação em Enfermagem; Simulação; Enfermagem.

RESUMEN

Objetivo: Conocer la utilidad del simulacro en la enseñanza de enfermería. **Método:** revisión integradora de las publicaciones de la literatura entre 2008 y 2012. Se seleccionaron 54 de los 1.837 estudios para análisis. **Resultados:** se trata de estudios publicados en 31 revistas; en 2010 hubo mayor cantidad de publicaciones, principalmente en los Estados Unidos. A partir del análisis, surgieron tres categorías: en el simulacro se utilizan distintos tipos de simuladores, el simulacro se utiliza para desarrollar distintas habilidades y el simulacro clínico es más que el uso de un simulador. **Discusión:** Los distintos tipos de simuladores en la educación de enfermería se emplean para desarrollar varias competencias. El simulacro va más allá del simple uso del simulador e implica estrategia, técnica, proceso e instrumento. **Conclusión:** el uso del simulacro en el curso de enfermería ha ganado terreno como metodología de enseñanza activa que proporciona aprendizaje experiencial de manera segura.

Palabras clave: Educación en Enfermería; Simulación; Enfermería.

INTRODUCTION

Education in the healthcare field is strongly influenced by technology. The speed with which information is now transmitted requires innovative teaching methods that can keep up with the pace of this evolution and provide critical, creative education to students, moving away from the older, more traditional methods affiliated with repetition and memorization.¹ Active teaching and learning methods have become a viable possibility for change in this paradigm, in that they are based on changing the role of the educator to that of the learner, assuming a collective, inclusive, facilitating, open work dynamic in learning. Students take on the knowledge of reality process based on their experiences and interpretation of the world around them, bringing their education and expectations closer to a given context.²

Some historical events have a way of changing the direction of society and its development. In the case of nursing and its professional field, there is a growing movement toward patient care centered on ethics, collective principles, and safety. Patient safety became the focus of discussion after the release of the report "To Err is Human: Building a Safer Health System" in 1999 by the American Institute of Medicine, in which it was estimated that between 44,000 and 98,000 patients die each year in the United States due to medical errors. As a result, concern over the education of healthcare professionals has grown and the use of simulation in their education has begun to gain attention.³

Simulation as a teaching method is growing in popularity in universities around the world, becoming more and more common in undergraduate Nursing courses,⁴ and can be defined as a "situation or place created to allow a group of people to experience the representation of a real event, for the purpose of practicing, learning, assessing, or understanding systems or human actions".^{5,19}

There are different means of using simulation in healthcare education. In the nursing field, it is common to use skills and simulation laboratories for training procedures on mannequins, but that has not always been the case. Nurses trained between 1970 and 1980 in Brazil and Portugal drew their first blood sample from a classmate, and more complex procedures were practiced for the first time directly on patients.⁶

With the technological resources available today, it is possible to provide simulated learning that is capable of helping students develop professional skills before they begin taking care of real patients, thus contributing to a critical, creative, and responsible education.⁶ In this light, the present study aimed to understand how simulation has been used in undergraduate studies in nursing.

METHOD

This work is an integrative literature review, characterized as a way to obtain the synthesis of a particular theme by bringing together varied research sources in a systematized fashion.⁷ This review observed the following steps: a) the selection of the research question, b) a literature search, c) the characterization of the studies, d) the analysis of the findings, e) the interpretation of the results, and f) a review synthesis.⁸ The following question was used to gather information in the literature: "How is simulation being used in undergraduate studies in nursing?"

The search was conducted in the following databases: Education Resources Information Center (ERIC), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Literature in Health Sciences (LILACS), and the Medical Literature Analysis and Online Retrieval System (MEDLINE / PubMed), in May 2013. The collection period covered five years (2008-2012). Inclusion criteria included full texts, available online in English, Portuguese, and Spanish. Free terms based on Descriptors in Health Sciences (DeCs) were used (Figure 1). The first search retrieved 1,837 papers; however, after applying the first filter (year, full text, and language), the number of papers was trimmed down to 132. After reading the abstracts, the second filter was applied, i.e., exclusion criteria: editorials, letters, opinion articles, research projects, comments, abstracts in proceedings, essays, duplicate publications, theses, dissertations, TCC, official documents from national and international programs, books, literature reviews, and reflection articles. Papers that did not expound on the use of the simulation strategy and research not pertaining to undergraduate students in nursing were also excluded. A total of 78 studies were excluded, with the final sample consisting of 54 documents.

The articles were read in full and organized on a spreadsheet containing the following information: author, title, year of publication, journal, country, descriptors or keywords, aim, conclusion, type of simulator, content, and reference. Studies were identified using an alphanumeric code: number (1-54) and a letter indicating the type of simulator (O: Virtual learning object, M: mannequin, P: simulated patient, X: mixed methods, C: comparison of methods, and R: role-play) (Figure 2).

Data were analyzed quantitatively by descriptive statistics using percentages and frequency and by operative proposal for a qualitative data analysis⁹ in three phases: (1) pre-analysis, in which data are analyzed and described; (2) exploration of the material, whose data are coded and organized into representative categories; and (3) treatment and interpretation, in which some inferences are made about the data that are similar to the relevant literature.

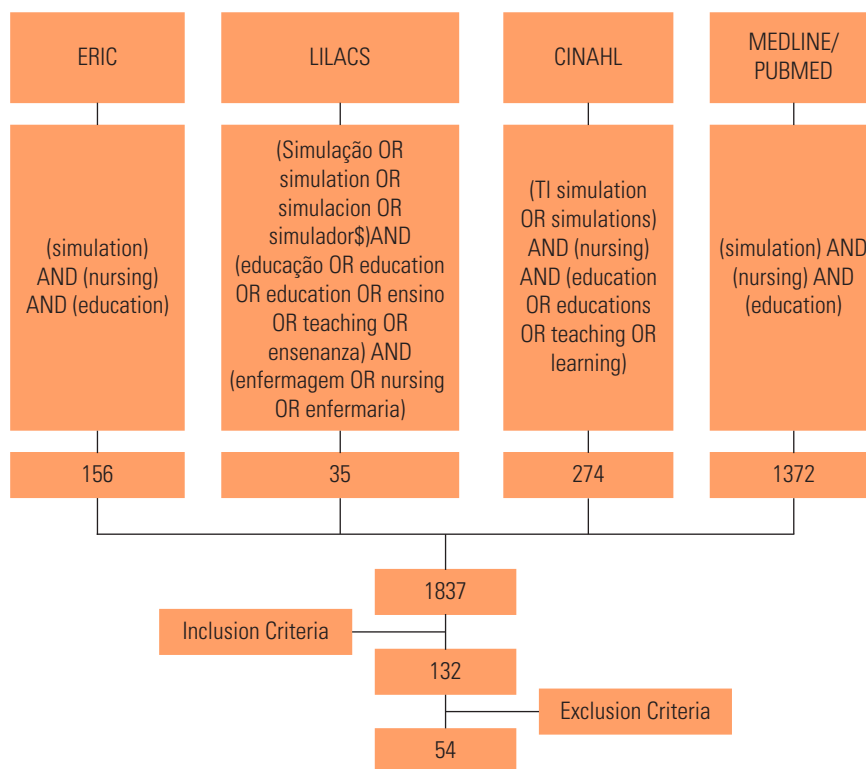


Figure 1 - Flowchart of database searches – Florianópolis; 2013.

RESULTS

The 54 selected studies are shown in Figure 2, broken down by author, article title, and journal in which they were published (Table 1).

Table 1 - Studies on the use of simulation in nursing education broken down by author, article title, journal, and country (2008-2012)

| Code | Author | Title | Journal | Study Site |
|------|----------------------------|---|--|------------|
| 1O | Aebersold M, <i>et al.</i> | Innovative Simulation Strategies in Education. | Nursing Research and Practice | USA |
| 2O | Alvarez AG, Sasso GTMD. | Application of virtual learning object, for simulated evaluation of acute pain in nursing students | Rev Latino-Am. Enfermagem | Brazil |
| 3M | Ann Blum C, <i>et al.</i> | Teaching caring nursing to RN-BSN students using simulation technology. | International Journal for Human Caring | USA |
| 4M | Baker C, <i>et al.</i> | Simulation in interprofessional education for patient-centred collaborative care. | Journal of Advanced Nursing | Canada |
| 5M | Bambini D, <i>et al.</i> | Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. | Nursing Education Perspectives | USA |
| 6O | Barbosa SFF, Marin HF. | Simulação Baseada na WEB: Uma ferramenta para o ensino de Enfermagem em terapia intensiva. | Rev Latino-Am. Enfermagem | Brazil |
| 7M | Blum CA, <i>et al.</i> | High-fidelity nursing simulation: impact on student self-confidence and clinical competence. | International journal of nursing education scholarship | USA |
| 8M | Brydges R, <i>et al.</i> | Comparing self-guided learning and educator-guided learning formats for simulation-based clinical training. | Journal of Advanced Nursing | Canada |
| 9O | Cogo ALP, <i>et al.</i> | Objetos educacionais digitais em enfermagem: avaliação por docentes de um curso de graduação. | Rev Esc Enferm USP | Brazil |

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Table 1 - Studies on the use of simulation in nursing education broken down by author, article title, journal, and country (2008-2012)

| Code | Author | Title | Journal | Study Site |
|------|----------------------------------|--|--|------------|
| 10O | Dearing KS, Steadman S. | The Challenging stereotyping and bias: a voice simulation study. (OVA) | Journal of nursing education | USA |
| 11O | Dearing KS, Steadman S. | Enhancing intellectual empathy: the lived experience of voice simulation. | Perspectives in psychiatric care | USA |
| 12M | Santos MC, <i>et al.</i> | Recontextualização da simulação clínica em Enfermagem baseada em Basil Bernstein: semiologia da prática pedagógica. | Rev Gaúcha Enferm | Brazil |
| 13M | Elfrink VL, <i>et al.</i> | Using learning outcomes to inform teaching practices in human patient simulation. | Nursing education perspectives | USA |
| 14X | Fero LJ, <i>et al.</i> | Critical thinking skills in nursing students: comparison of simulation-based performance with metrics. | Journal of Advanced Nursing | USA |
| 15M | Gantt LT. | Using the Clark simulation evaluation rubric with associate degree and baccalaureate nursing students. | Nursing education perspectives | USA |
| 16M | Gantt LT, Webb-Corbett R. | Using simulation to teach patient safety behaviors in undergraduate nursing education. | The Journal of nursing education | USA |
| 17M | Garrett B, <i>et al.</i> | High-fidelity patient simulation: Considerations for effective learning. | Nursing education perspectives | Canada |
| 18X | Guhde J. | Using online exercises and patient simulation to improve students' clinical decision-making. | Nursing Education Perspectives | USA |
| 19O | Guise V, <i>et al.</i> | What can virtual patient simulation offer mental health nursing education? | Journal of psychiatric and mental health nursing | Finland |
| 20M | Hauber RP, <i>et al.</i> | An exploration of the relationship between knowledge and performance-related variables in high-fidelity simulation: Designing instruction that promotes expertise in practice. | Nursing education perspectives | USA |
| 21M | Husebo SIE, <i>et al.</i> | A comparative study of defibrillation and cardiopulmonary resuscitation performance during simulated cardiac arrest in nursing student teams. | Scandinavian Journal of Trauma, Resuscitation and Emergency medicine | Norway |
| 22P | Hutchinson SW, <i>et al.</i> | Implementing a multidisciplinary disaster simulation for undergraduate nursing students. | Nursing education perspectives | USA |
| 23M | Kameg K, <i>et al.</i> | The impact of high fidelity human simulation on self-efficacy of communication skills. | Issues in mental health nursing | USA |
| 24X | Kaplan BG, <i>et al.</i> | Effects of Participation vs. Observation of a Simulation Experience on Testing Outcomes: Implications for Logistical Planning for a School of Nursing. | International Journal of Nursing Education Scholarship | USA |
| 25X | Kaplan BG, <i>et al.</i> | Use of an emergency preparedness disaster simulation with undergraduate nursing students. | Public Health Nursing | USA |
| 26M | Kardong-Edgren SE, <i>et al.</i> | The integration of simulation into a clinical foundations of nursing course: student and faculty perspectives. | International Journal of Nursing Education Scholarship | USA |
| 27M | Klaassen J, <i>et al.</i> | The New Nexus: Legal Concept Instruction to Nursing Students, Teaching Learning Frameworks, and High Fidelity Human Simulation. | Journal of Nursing Law | USA |
| 28M | Kuiper RA, <i>et al.</i> | Debriefing with the OPT model of clinical reasoning during high fidelity patient simulation. | International Journal of Nursing Education Scholarship | USA |
| 29M | Kurtz CP, <i>et al.</i> | The master student presenter: peer teaching in the simulation laboratory. | Nursing Education Perspectives | USA |
| 30M | Liaw SY, <i>et al.</i> | Research in brief - Interprofessional learning in undergraduate education through simulation crisis team training. | Singapore Nursing Journal | Singapore |
| 31M | Maginnis C, <i>et al.</i> | Transfer of learning to the nursing clinical practice setting. | Rural and Remote Health | Australia |
| 32X | Marken PA, <i>et al.</i> | Human simulators and standardized patients to teach difficult conversations to interprofessional health care teams. | American journal of pharmaceutical education | USA |
| 33M | Marmol MT, <i>et al.</i> | Curativo de cateter central em simulador: efeito da presença do tutor ou da aprendizagem autoinstrucional. | Rev. Latino-Am. Enfermagem | Brazil |
| 34M | Maxon PM, <i>et al.</i> | Enhancing nurse and physician collaboration in clinical decision making through high-fidelity interdisciplinary simulation training. | Mayo Clinic | USA |

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Table 1 - Studies on the use of simulation in nursing education broken down by author, article title, journal, and country (2008-2012)

| Code | Author | Title | Journal | Study Site |
|------|------------------------------------|---|--|----------------|
| 35X | Noorwood BR. | The Integration of a Program of Structured Simulation Experiences in a SCDNT Based Curriculum. | Self-Care, Dependent-Care & Nursing | USA |
| 36R | Patterson N, Hulton LJ. | Enhancing nursing students' understanding of poverty through simulation. | Public Health Nursing | USA |
| 37P | Reid-Searl K, <i>et al.</i> | The educator inside the patient: students' insights into the use of high fidelity silicone patient simulation. | Journal of Clinical Nursing | Australia |
| 38C | Reising DL, <i>et al.</i> | Comparison of communication outcomes in traditional versus simulation strategies in nursing and medical students. | Nursing Education Perspectives | USA |
| 39P | Rosenzweig M, <i>et al.</i> | Patient communication simulation laboratory for students in na acute care nurse practitioner program. | American Journal of Critical Care | USA |
| 40P | Ryan CA, <i>et al.</i> | Using standardized patients to assess communication skills in medical and nursing students. | BMC medical education | Ireland |
| 41M | Sarver PA, <i>et al.</i> | Development of simulation scenarios for an adolescent patient with diabetic ketoacidosis. | The Journal of nursing education | USA |
| 42M | Sears K, <i>et al.</i> | The relationship between simulation in nursing education and medication safety. | The Journal of nursing education | Canada |
| 43M | Sharpnack PA, Madigan EA. | Using Low-Fidelity Simulation with Sophomore Nursing Students in A Baccalaureate Nursing Program. | Nursing Education Perspectives | USA |
| 44C | Shepherd CK, <i>et al.</i> | Investigating the use of simulation as a teaching strategy. | Nursing standard (Royal College of Nursing (Great Britain) | United Kingdom |
| 45M | Shinnick MA, <i>et al.</i> | Predictors of Knowledge Gains Using Simulation in the Education of Prelicensure Nursing Students. | Journal of Professional Nursing | USA |
| 46P | Simones | Collaborative simulation Project to teach scope of Practice | Journal of Nursing Education | USA |
| 47M | Sleeper JA, Thompson C. | The use of hi fidelity simulation to enhance nursing students' therapeutic communication skills. | International journal of nursing education scholarship | USA |
| 48M | Smith KV, <i>et al.</i> | High-fidelity simulation and legal/ethical concepts A transformational learning experience. | Nursing Ethics | USA |
| 49X | Starkweather AR, Kardong-Edgren S. | Diffusion of innovation: Embedding simulation into nursing curricula. | International Journal of Nursing Education Scholarship | USA |
| 50M | Stephens J, <i>et al.</i> | Appearing the team: from practice to simulation. | International Journal of Therapy and Rehabilitation | United Kingdom |
| 51P | Storr GB. | Learning How to Effectively Connect with Patients Thorough Low-Tech Simulation Scenarios | International Journal for Human Caring | Canada |
| 52O | Stutts LA, <i>et al.</i> | Investigating patient characteristics on pain assessment using virtual human technology. | European Journal of Pain | USA |
| 53M | Teixeira CRS, <i>et al.</i> | The Use of Simulation in Teaching of Clinical Nursing Assessment | Texto Contexto Enferm | Brazil |
| 54X | Whelan JJ, <i>et al.</i> | A 'RIPPER' project: advancing rural inter-professional health education at the University of Tasmania. | Rural and Remote Health | Australia |

Source: the author.

The 54 reviewed articles had been published in 31 professional journals, such as: International Journal of Nursing Education Scholarship (6), Nursing Education Perspectives (7), Journal of Nursing Education (6), Rev. Latin Am. Nursing (3) Journal of Advanced Nursing (3), which accounted for 76% of the selected publications. With regard to the year of publication, most had been published in 2010 (Figure 2).

As for the country in which the studies were conducted, the US lead with 34 studies (63%), followed by Brazil with six (11%), Canada with five (9%), Australia with three (5%), the UK with two (4%), and Finland, Norway, Ireland, and Singapore with one each, individually accounting for 2% of the publications.

Three categories emerged with regard to the qualitative analysis of the articles, which are discussed below.



Figura 2 - Studies on the use of simulation in nursing education, based on year – 2008-2012.

Source: the author.

SIMULATION IN NURSING EDUCATION USES DIFFERENT TYPES OF SIMULATORS

By analyzing the type of simulator used in the studies, it was found that 29 used mannequins (patient simulator), six referred to the use of people in the role of the patient (simulated patients), eight dealt with virtual learning objects (educational software), four compared separately applied methods, six used more than one form of simulation (mixed methods), and one used role-play (Table 2).

Table 2 - Types of simulators used in nursing education – 2008-2012

| Type of simulator | Article code |
|---|---|
| High fidelity patient simulator (mannequin) | 3M, 4M, 5M, 7M, 8M, 12M, 13M, 15M, 16M, 17M, 20M, 21M, 23M, 26M, 27M, 28M, 29M, 30M, 31M, 33M, 34M, 41M, 42M, 45M, 47M, 48M, 50M, 53M |
| Low fidelity patient simulator (mannequin) | 43M |
| Virtual learning objects | 1O, 2O, 6O, 9O, 10O, 11O, 19O, 52O |
| Simulated patient | 22P, 37P, 39P, 40P, 46P, 51P |
| Mixed methods | 18X, 25X, 32X, 35X, 49X, 54X |
| Comparison | 14C, 24C, 38C, 44C |
| Role-play | 36R |

Source: the author.

Study (32X), conducted with nursing, pharmacy, and medical students, used the simulated patient associated with a patient simulator to practice difficult conversations involving violence against women and suicidal thoughts in an interdisciplinary context. Only one study (36R) used role-play to raise the awareness of students about poverty. Assuming the roles of real-life families that survive on a low income in a simulated community, nursing students were able to reflect on many factors related to poverty, including the social stigma attached to it. This simulation took place during a community healthcare simulation stage and represented a positive boost to civic engagement (Table 2).

The use of Virtual Learning Objects was also found in the studies, especially the use of games, such as Second Life Hos-

pital®, a virtual 3-D environment that reproduces life in various environments. Voice simulators also appeared (10O, 11O), which were used in teaching psychosocial care, simulating common auditory hallucinations in patients with schizophrenia (Table 2).

The Virtual Patient (19O) was used for teaching mental health, based on virtual narratives of common situations that arise in psychiatric care, in which students are led to make clinical decisions by choosing proper medical solutions. Other computer programs (2O, 6O, 9O) were used to develop skills in pain assessment, oxygen therapy, and intensive care treatment; the video feature (52O) was also used to investigate whether characteristics such as the patient’s sex, race, age, and facial expressions influenced the students’ ability to assess pain.

SIMULATION IS USED TO DEVELOP DIFFERENT COMPETENCIES

Simulation was used to develop different competencies – knowledge, skill, and attitude – while covering a range of topics (Table 3).

Most of the studies used mannequins as simulators in the teaching process, particularly for developing technical skills. However, the search associated with attitudinal competence, such as communication, humanization, and leadership, can also be observed (Table 3)

While reviewing the studies, it could be observed that despite the varied repertoire of clinical contents through simulation, most of the experiences add to the development of attitudes (behavioral and emotional) that are associated with the development of technical procedures. According to the studies, the use of mannequins resulted in an increase in healthcare behavior, self-efficacy, confidence, communication, clinical judgment, interprofessional collaborative care, civic engagement, as well as an improvement in technical performance, error reduction, and patient safety.

CLINICAL SIMULATION IS MORE THAN SIMPLY USING A SIMULATOR

Simulation is capable of helping students recognize that care-giving is not innate, that it can be learned and prepare them for many different situations, including natural disasters, for which they are not always ready to face (33M, 22P).

Clinical simulation has its differential in a reflective moment that takes place after a simulation experience, called debriefing. This space for reflection is essential for integrating and building confidence in both technical and interpersonal competencies for an effective clinical outcome, as could be observed in the 50M study.

Table 3 - Studies on the use of simulation in nursing education broken down by type of competence and topics – 2008-2012

| Competency | Studies | Topics |
|------------|--|--|
| Knowledge | 1O; 6O; 9O; 13M; 16M; 25X; 27M; 28M; 29M; 30M; 31M; 32X; 33M; 34M; 35X; 36R; 37P; 38C; 39P; 40P; 41M; 42M; 43M; 44C; 45M; 46P; 47M; 48M; 49X; 50M; 51P; 52O; 53M; 54X | Patient safety, intensive care, oxygen therapy; mastectomy, positive end-expiratory pressure (PEEP); sickle cell disease; legal concepts in nursing; clinical care; evidence-based practice; clinical communication; diabetic ketoacidosis; medication errors; pharmacology; pathophysiology; clinical psychiatry; physical evaluation; law; ethics. |
| Skill | 1O; 2O; 4M; 5M; 7M; 8M; 12M; 14X; 17M; 18X; 19O; 20M; 21M; 22P; 23M; 24X; 26M; 28M; 29M; 30M; 31M; 32X; 33M; 34M; 35X; 36R; 37P; 38C; 39P; 40P; 41M; 42M; 43M; 44C; 45M; 46P; 47M; 48M; 49X; 50M; 51P; 52O; 53M; 54X | Communication; delegation; conflict management; decision-making; pain evaluation; heart failure treatment; newborn care; recognizing standard deviations; prioritizing data; venous catheterization; semiotics; critical thinking; disaster-relief; infection control; prioritizing actions according to physiological results; teamwork; aseptic technique; suture removal; central venous catheter dressings; vital signs; drawing blood; urine test; intramuscular administration of intravenous medications; affective domain; critical thinking; observation. |
| Attitude | 3M; 4M; 7M; 10O; A11O; 28M; 29M; 30M; 31M; 32X; 33M; 34M; 35X; 36R; 37P; 38C; 39P; 40P; 41M; 42M; 43M; 44C; 45M; 46P; 47M; 48M; 49X; 50M; 51P; 52O; 53M; 54X | Interprofessional collaboration; humanization; self-confidence; raising awareness; empathy; responsibility; initiative; self-evaluation; collaboration; prudence; ethics; interaction; autonomy; interdisciplinarity. |

Source: the author.

One of the studies (33M), which compared the use of simulation with the presence of a tutor and a self-guided simulation, in which the student followed a prepared script, demonstrated that having a tutor present was more effective, which indicates that the tutor provides moments for reflection, which in turn lead to more critical, reflective learning. Moreover, the use of Virtual Learning Objects was able to more boldly promote the pursuit of knowledge, enabling students to dynamically construct their own learning (2O, 9O). The same was found in studies using simulated patients.

Simulation is not restricted to developing technical skills. Attitude development appears in the 48M study, which worked with juridical, ethical, and legal concepts to understand that students attributed more importance to practical subjects. The outcome was a transformative learning experience.

DISCUSSION

The use of simulation in nursing education is by no means new. Mannequins representing the patient for skills training have been used since the nineteenth century. In developed countries, low-fidelity models used in simple training procedures were gradually replaced by medium and high fidelity models. However, Brazil, which adopted the American model of education with mannequins in 1920, continues to use the very same models in most nursing schools.¹⁰ This situation is reflected in the greater production of literature on the theme in the United States as compared to a more limited production in Brazil, as shown in this review. However, the topic has been gaining ground in recent years, especially in Brazil, in response to demands for changes in the education process.

Furthermore, when combined with ethical and patient safety issues, technological advancement has contributed to the expanding use of different types of simulators in nursing education.

Simulators are tools that can be used in different ways to wholly or partially reproduce reality¹¹ and can be classified as low, medium, and high fidelity.¹² Low-fidelity mannequins remain still, with no interaction or responses, have an exterior anatomy similar to a human's, may have a complete or partial body, and allow for basic movements in the major joints. They are relatively inexpensive and require little maintenance. They are recommended for technical procedure training (venipuncture, nasogastric catheters, urinary catheters, and others).¹⁶

Medium fidelity models are equipped with respiratory and heart sounds (without chest expansion); they allow EKG monitoring and may present pre-recorded sounds, such as coughing, vomiting, and moaning. They cost more than low-fidelity mannequins, and their maintenance requires specialized technical knowledge. They are recommended for skills training, such as the identification of cardiac arrest and early resuscitation maneuvers.⁶

Originally developed for training in anesthesia, high-fidelity mannequins are now an intrinsic part of the education of many healthcare professionals. These life-size mannequins present computer-controlled physiological responses, including spontaneous breathing, chest expansion, heart and lung sounds, speech, cyanosis, diaphoresis, among others.¹⁶

Another type of device used in simulation is the part task trainers, anatomical parts for skills training, such as arms for venipuncture, a pelvis for vesical catheterization, a torso, among others. These simulators can be used alone or with other simulators.¹² When associated with a simulated patient, it is called a hybrid simulation. This strategy is ideal for training psychomotor, cognitive, and affective skills in a safe environment.

Although the use of high fidelity simulators appears in many publications (because their use is more recent, as they are associated with technological advancement), what we see is that many of them are still being used for simple demonstration purposes; for instance, in a laboratory presentation

or in a video with an instructor showing a step by step procedure and its context.¹³

Another type of clinical simulation – simulated patients – which first made its appearance in North America, is gaining proponents worldwide and gradually being implemented in Brazil.¹⁴ This strategy, carried out with professional or amateur actors or real patients who have been trained what to do and say, has proven to be quite effective in specific situations involving dialog, communication, ethical issues, or difficult management events in clinical practice.

Role-play, or role reversal, is another type of simulation consisting of a method-based learning experience in which people assume the role of others (dramatization) to understand a problem from another person's standpoint.¹⁵ This feature, used in training different healthcare professionals, helps raise students' awareness of a particular theme or situation.¹⁶

The use of digital simulations – also known as Virtual Learning Objects – likewise appeared in the reviewed studies. These are reusable digital resources that help students learn a particular concept while simultaneously encouraging the development of personal skills, such as imagination and creativity.^{17,21} One that has been used in nursing education is Second Life Hospital², in which participants create a character and simultaneously interact with other participants in a clinical context.¹⁸

There is a tremendous potential in using different types of simulators in nursing education. However, teacher preparation and the pedagogical framework that guides their use are just as important as their fidelity. The tools alone do not ensure a meaningful learning experience; teachers must play a vital role as facilitators and need to know how to use this methodology properly. In this respect, a clinical simulation environment, when it promotes active student participation and provides them with a chance to see their mistakes and correct them, constitutes an excellent setting for putting active methodologies into practice.¹² When the simulation is used as an active methodology, it allows students to recognize themselves in the teaching-learning process and improve their own practical-theoretic performance.

Clinical Simulation encompasses strategies, techniques, processes, and tools. To implement these simulators requires more than mere effective simulators; its use must be adapted to the simulation's methodology, given that it "uses technology, and offers tools, such as simulators, but these alone do not cover the entire meaning of the simulation, only part of it".¹

Using simulation as a way for students to develop different competencies (not only technical skills) was also mentioned by the studies in this review, i.e., simulation is not confined to teaching practical content, which demonstrates its potential as a teaching resource, as students need to reflect on all aspects involved in patient care.

Teaching patient care in acute situations, for example, requires that students be prepared for swift, precise intervention. As much as they may be theoretically prepared to face an emergency situation, it in no way ensures that their practical performance will be effective. In this situation, it takes much more than theoretical knowledge; it takes skill, dexterity, safety, good communication, and rapport with the entire medical staff. This can be acquired through the kind of practical experience afforded by on-the-job training, but at a steep price: patient safety. With that in mind, simulation offers an opportunity to learn in a safe environment, one that also contributes to attitude development. This harkens back to what effective adult learning is all about, one that includes the cognitive, affective, and psychomotor areas.¹⁹

Finally, simulation is much more than the use of simulators. It encompasses a comprehensive context involving teachers, students, professional practice, and professionals from other fields of knowledge that support the use of various types of simulators. Regardless of the content or coverage area, it does spark an interest in new possibilities of teaching and learning, in which elements of the real context can be addressed, thereby minimizing constraints, enhancing the use of students in the practical settings, providing a safe haven to develop activities in an practically real scenario, as well as expanding critical-reflexive, creative, and decision-making skills. These prerogatives contribute to nursing education that recovers the individualized learning process, centered on the students' experiences, taking their time, development, and maturation into account.

CONCLUSION

Simulation is an active teaching methodology that is widely used in healthcare and nursing courses. The types of simulators used in undergraduate nursing include Patient Simulators (mannequins), Simulated Patients (people in the role of the patient, role-play), Virtual Learning Objects (educational software games, videos, audio, and web technology), and mixed methods (use of more than one type of simulator). Simulation contents include healthcare in acute situations, psychosocial care, maternal and child healthcare, outpatient care, medical-surgical care, semiotics, ethics, leadership, communication, and professional behavior. The use of simulation for interdisciplinary work is also reported and represents a breakthrough for healthcare education.

Clinical Simulation is distinguished from the other teaching methodologies by the possibility of student-centered experiential learning in a safe environment, supported by reflection and guided by a teacher. In addition to the simulator, an appropriate environment, trained staff, and clear learning objectives are essential for this strategy to be effective.

A significant limitation concerns the preparation of teachers from a pedagogical point of view, given that clinical simulation involves organizing the learning scenario, which goes beyond the mere existence of a simulator. Another major limitation is related to time, people, space, and the financial resources needed for its implementation.

This study, therefore, demonstrated the simulation context in nursing as portrayed in publications and may contribute to expanding the debate, providing improvement in active simulation dynamics as well as stimulating new studies that could further improve the teaching and learning processes in nursing.

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