The simulated clinical experience in nursing education: a historical review*

A experiência clínica simulada no ensino de enfermagem: retrospectiva histórica

La experiencia clínica simulada en la enseñanza de enfermería: retrospectiva histórica

José Carlos Amado Martins[1], Alessandra Mazzo[2], Rui Carlos Negrão Baptista[3], Verónica Rita Dias Coutinho[4], Simone de Godoy[5], Isabel Amélia Costa Mendes[6], Maria Auxiliadora Trevizan[7]

ABSTRACT

Objectives: To specify the ritual of teaching basic nursing procedures, analyze the implications of their use and discuss their pertinence, in the face of the current contexts for teaching and for practice. **Methods:** A historical-social study of rituals incorporated in the teaching method of nursing theory-practice, in Portugal and Brazil. As primary sources, we used written documents (letters, brochures, manuals) and photographs, and as secondary sources: textbooks, master's theses, doctoral dissertations and journal articles. **Results:** The description, analysis, interpretation and synthesis exposed the reader to a journey through the history and rituals, and changes that have occurred in nursing and health education. The simulation was discussed in terms of its pertinence in the face of the ethical, safety and quality requirements in health care, technological advances, and changes in environments and contexts of clinical practice. **Conclusion:** The use of simulation meets the needs and the current context of education for theory-practice.

Descriptors: Nursing; Simulation; Education, nursing; History of nursing, Educacional technology

RESUMO

Objetivos: particularizar o ritual do ensino de procedimentos básicos de enfermagem, analisar as implicações de sua utilização e discutir sua pertinência, face aos contextos atuais para o ensino e para a prática. **Métodos:** estudo histórico-social de rituais incorporados ao método de ensino teórico-prático de Enfermagem em Portugal e no Brasil. Como fontes primárias, foram utilizados documentos escritos (ofícios, apostilas, manuais) e fotográficos; e como fontes secundárias: livros-texto, dissertação de mestrado, tese de doutoramento e artigos de periódicos. **Resultados:** descrição, análise, interpretação e síntese que expõe ao leitor uma viagem na história quanto aos rituais e mudanças ocorridas na formação de recursos humanos de enfermagem e saúde. A simulação foi discutida em termos da pertinência face às exigências éticas, segurança e qualidade em saúde, avanço tecnológico e mudanças nos ambientes e contextos da prática clínica. **Conclusão:** o uso da simulação atende às necessidades e ao contexto atual de ensino teórico-prático.

Descritores: Enfermagem; Simulação; Educação em enfermagem; História da enfermagem; Tecnologia educacional

RESUMEN

Objetivos: particularizar el ritual de la enseñanza de procedimientos básicos de enfermería, analizar las implicancias de su utilización, discutir su pertinencia, face a los contextos actuales para la enseñanza y para la práctica. **Métodos:** estudio histórico-social de rituales incorporados al método de enseñanza teórico-práctica de Enfermería en Portugal y en Brasil. Como fuentes primarias, fueron utilizados documentos escritos (oficios, apostilas, manuales) y fotográficos; y como fuentes secundarias: libros de texto, tesis de maestría, tesis de doctorado y artículos de periódicos. **Resultados:** descripción, análisis, interpretación y síntesis que expone al lector un viaje en la historia en cuanto a los rituales y cambios ocurridos en la formación de recursos humanos de enfermería y salud. La simulación fue discutida en términos de la pertinencia face a las exigencias éticas, seguridad y calidad en salud, avance tecnológico y cambios en los ambientes y contextos de la práctica clínica. **Conclusión:** el uso de la simulación atiende a las necesidades y al contexto actual de la enseñanza teórico-práctica.

Descriptores: Enfermería; Simulación; Educación en enfermería, Historia de la enfermería; Tecnología educacional

* Study developed at the University of São Paulo at Ribeirão Preto College of Nursing, Brazil and the Nursing School of Coimbra, Portugal.

[1] Ph.D. in Nursing Sciences. Adjunct Professor, Scientific-Pedagogical Unit of Medical-Surgical Nursing, Nursing School of Coimbra – ESENFC – Coimbra – Portugal.

[2] Ph.D. in Fundamental Nursing. Professor, General and Specialized Nursing Department, University of São Paulo at Ribeirão Preto College of Nursing – USP – Ribeirão Preto (SP), Brazil.

[3] M.Sc. in Nursing. Adjunct Professor, Scientific-Pedagogical Unit of Medical-Surgical Nursing, Nursing School of Coimbra – ESENFC – Coimbra – Portugal.

[4] M.Sc. in Nursing. Equivalent to Assistant, Scientific-Pedagogical Unit of Medical-Surgical Nursing, Nursing School of Coimbra – ESENFC – Coimbra – Portugal.

[5] Ph.D. in Sciences. Laboratory Specialist, General and Specialized Nursing Department, University of São Paulo at Ribeirão Preto College of Nursing – USP – Ribeirão Preto (SP), Brazil.

[6] Ph.D. in Nursing. Full Professor, General and Specialized Nursing Department, University of São Paulo at Ribeirão Preto College of Nursing – USP – Ribeirão Preto (SP), Brazil.

[7] Ph.D. in Nursing. Full Professor affiliated with the Graduate Program in Fundamental Nursing, University of São Paulo at Ribeirão Preto College of Nursing – USP – Ribeirão Preto (SP), Brazil.

Corresponding Author: **Isabel Amélia Costa Mendes**
Av. Bandeirantes, 3900
14040-902 – Campus Universitário, Ribeirão Preto, SP, Brasil
E-mail: iamendes@eerp.usp.br

INTRODUCTION

The construction of Nursing knowledge has grown over the years, permitting the gradual formation of a scientific *corpus* that sustains the passage from nursing-art to nursing-science. The way knowledge is transmitted accompanied this evolution. Nursing schools were obliged to evolve in their way of being and offering teaching, absorbing and using didactical and pedagogical knowledge. Practical teaching in the school context is an example of this evolution. Based on logistic, pedagogical, scientific, technical and ethical foundations, the school evolved over time to prepare students for practice, grounded in the clinical teaching context and *a posteriori* in the job world.

This historical-social study looks at rituals incorporated into the theoretical-practical teaching method in Portugal and Brazil, aimed at: particularizing the teaching ritual of basic procedures in Nursing, analyzing implications of using these rituals and discussing their pertinence, in view of the current contexts of teaching and practice.

Recent technological development led to the availability of high-fidelity patient simulators, which present realistic, human and physiological responses to acute conditions, trauma and interventions, permitting high levels of realism in simulations, which enhances students' immersion and its consequent advantages [1-4]. But this has not always been the case and, even today, many schools invest little in simulated practice with a view to competency development.

The intention in this paper is to present the readers with a historical voyage and use it to analyze the ritual that ruled for more than a century in human resource teaching and training in Nursing and Health, until evidence proved the need to adopt changes in response to the needs and current context of theoretical-practical teaching.

METHODS

The study fit into a historical-social paradigm[5], used written (letters, course-packs, manuals) and photographic documents as primary sources, and the following secondary sources: textbooks, master's theses, doctoral dissertations and journal articles focusing on teaching about the theme[3,6-13]. To respond to the goal and compose the material, a work plan was elaborated, including the identification and location of the sources. Next, the materials and facts were described, analyzed, interpreted and summarized.

From injection into pillows to simulated clinical experience – the winds of change

A long road was trod until Nursing gained the notability and importance it enjoys today. Almost everyone agrees that everything started with Florence Nightingale, during the Crimean War, underlining the importance of education for professional nursing practice, based on the argument that compassion is not enough for nurses, who should only work when in possession of solid knowledge. This started the age of scientific nursing and structured nursing teaching[6].

Across the next century, Nursing knowledge evolved amazingly, integrating knowledge from different disciplines and opening the route towards autonomy. The technical dimension of Nursing knowledge, however, continued to grow through the same imitation process, in which apprentices always practiced and improved their performance on the patients, and sometimes on themselves or fellow students.

A significant part of nurses active in the job market in Portugal and Brazil, and who graduated between the 1970's and 1980's, did their first blood collection on a colleague or a patient. The first time they executed more invasive techniques, however, was on a real patient, and generally in the hospital context. Schools did not have facilities and equipment to simulate the care environment and which would allow students to train technical procedures inherent in the profession before starting to work in clinical practice. It is still common to train nursing procedures among the students, although this practice is not recommended due to the risks it can cause[14]. At most teaching institutions, with some exceptions, low-fidelity simulators have supported simulations, due to inefficient academic management and lack or insufficient use of the school's resources.

Some exceptions are acknowledged though, generally resulting from creativity and art, which have characterized nurses since the early phases, as well as some managers and teachers' leadership and entrepreneurism. The pillow used to train needle insertion and intramuscular medication administration (Figure 1) or the sheet or thin towel role and rubber tube (tourniquet) used to simulate a vein with a view to training venipuncture (Figure 2) were simulation strategies many of us used. Certainly rudimentary, but useful to improve the technique.

Due to the easy simulation on a colleague and the non-invasive nature, procedure training was common among the students, and still happens at many nursing schools around the world, such as bandages or patient positioning and mobilization in bed. In Portugal, bandaging was an area that strongly developed, with specific manual and countless classes exclusively dedicated at

Figure 1. "Pillow injection" training.

Figure 2. Tourniquet puncture training.

this practice. After all, it was the resource available at times when adhesives were not the main resource and when hemostasis techniques during surgery were hardly developed. In Figure 3, we show the front page of the *Manual do Enfermeiro João Valente*, which Portuguese nurses from different generations are familiar with, and the box where the masking tape used in class were stored, which are part of the historical archives at the Nursing School of Coimbra today[7].

The benefits of training nurses' technical competences in a simulated environment were perceived early, before executing them for the first time on a real person.

Figure 3. Bandage manual and box of bandages.

The industry itself helped through the creation of not always realistic anatomic models, but which systematically attended to the schools' needs in this area. The delivery mannequin (Figure 4), which Mme Coudray created as early as in the 18th century, is part of the collection at the Flaubert Museum of the History of Medicine (CHU – Hôpitaux de Rouen) and evidences professionals' need to have a model for training in this specific area.

Figure 4. Mme Coudray Delivery Mannequin.

Six factors led to the emergence of simulation as we know it today: the social requirement for safety and quality in health care, the need to renew health professionals' education, ethical considerations, technological advances, professional inexperience and constantly changing practice environments and contexts[2,9].

Safety and quality in health
Errors in health in general (and not just medical errors) are possible, frequent and have multiple causes. Health organizations' strategic and operational policies, the organization of work and services, available resources and materials may have a positive or negative impact on error events. Patient safety is increasingly valued, pertinent and current. It is estimated that between 10% and 20% of hospitalized patients are victims of adverse events and that a significant number of deaths occur due to health professionals' errors, almost half of which would be avoidable[15]. The quality of care delivery is another current element and health organizations make huge efforts in this respect, which demands knowledge and competences with a view to calm, timely, safe and high-quality interventions in a wide range of situations, contributing to minimize errors.

The education of health professionals
Today, knowledge and technologies proliferate exponentially, demanding new forms of knowledge transfers and a pro-active attitude from teachers and students. Health professionals' and specifically nurses' education is a factor closely connected with quality and patient safety[16]. It is through theoretical and practical training that nurses remain updated, mobilize knowledge for practical contexts and perform practices centered on each patient and based on scientific and current evidence. Some traditional teaching models, on the opposite, still incorporate practical learning on patients only, with many students, lack of uniformity and opportunities in the teaching-learning process, so that students get different experiences and their education displays gaps, resulting in nursing care that is more centered on organizations and processes and not always truly scientific.

The ethical-legal justification
It is mainly through emerging concerns with care humanization and the assertion of bioethical and legal thinking that some of the strategies used for decades in students' learning of technical procedures start to be reconsidered and questioned, mainly those procedures in which the other person (patient or fellow student) is the practical learning object[3].

Centered on the dignity and integrity of human beings and on the avoidance of equipment, it is assumed that, whenever the development and training of a technique are possible in a simulated context, it is illegitimate to perform an invasive procedure first on a person in the context of health teaching and learning. This idea is reinforced if we consider that the vulnerability of disease processes makes it difficult for ill people to practice their autonomy, which compromises their ability to refuse an intervention a student will perform. The need to inform patients that it is the first time the student is performing a technical procedure is another source of strong anxiety for both, which makes it necessary to adapt teaching strategies to ethical and legal precepts[3,4].

Technological advances
Current information and communication technologies permit high-quality distance education, provide interactive software and make available realistic materials and models, besides simulators that are not only anatomically similar to a human being, but are also able to give physiological reactions to interventions made that are very close to actual reactions. Also, they provide "human" responses, as an instructor can answer the student's questions and inquiries[17,18]. A school that intends to be updated, innovative and future-oriented uses the potential of current technologies to stimulate competency development in its students.

Professional inexperience

Nurses' excessive mobility and turnover, besides many teams' young age, are determining factors of immaturity and professional inexperience. In many job contexts, the Nursing team consists of a set of young workers, as a result of the large number of retirements in the last decade and successive changes in education programs. In many teams, there are no expert nurses to serve as leaderships in care management and in permanent education and improvement processes. Low wages, precarious job conditions and low professional acknowledgement in society have caused discouragement in nurses. This stimulates neither self-education nor the search for excellence.

Practice environments and contexts in constant change

Today's hospitals (and their respective clinical contexts) have gone through significant changes. At more complex units, there are patients who were considered incurable until some years ago, and patients are present at secondary and palliative care wards that were transferred to distinguished units until some years ago. Patients are discharged increasingly early. Outpatient and minimally invasive surgeries are preferred. In this context, students or nurses, whether in clinical practice or education, can develop several clinical practices, throughout their education process or professional life, without the opportunity to experience different situations over a long time period, increasing the probability of error when one of these takes place for the first time.

Other factors are the recent changes in the health units' management paradigm, which are strongly concerned with costs, productivity and resource rationalization.

Simulation and simulators

In health education contexts, various resources can be used for learning through simulation. With a view to the efficacy of this strategy, these resources need to be in accordance with the learning objectives, such as technical learning or something purely relational, which determines the use of a simulator or role-play (representation of an actual situation using actors) for example. In addition, the need to develop a specific competency or the ability to solve a scenario and inherent particularities determine the use of a low, medium or high-fidelity simulator.

The external anatomy of the *low-fidelity simulator* model is similar to human anatomy, with a complete or partial body, permitting rough movements in the main joints and without any type of response to interventions. Its advantages are low cost, solidity and simple maintenance. It is particularly recommended to learn specific competences like venipuncture and nasogastric intubation, among others[17]. One of the first simulators to teach the physical examination to nursing students emerged in the United Kingdom around 1950[19].

The *medium-fidelity simulator* goes beyond anatomical aspects. Some simulators with respiratory and cardiac sounds permit monitoring electrocardiogram curves and investigate some (usually central) pulses. They may also include some pre-recorded sounds (coughing, vomiting, groaning, among others), reproduced on the command of the teacher operating the simulator. These simulators are more expensive in comparison with low-fidelity equipment and their maintenance requires specialized technicians. They are particularly indicated to learn specific competences and compose simple clinical practice scenarios. In these, in a given situation, students are expected to simply assess the "patient/simulator" and perform specific interventions, like detecting a respiratory arrest and starting assisted ventilation[16].

The *high-fidelity simulator* is a full-body mannequin, anatomical and physiologically similar to a person. Initially, this equipment was developed for anesthesia training. It has been used today to train different health professionals. They display respiratory movements, blink their eyes, permit the assessment of different vital parameters, the auscultation of respiratory, cardiac and intestinal sounds, as well as the assessment of some skin data, like capillary perfusion time, cyanosis, diaphoresis and others. Their functioning is computer-managed, with software that permits extremely realistic physiological reactions to the interventions applied and with variations in function of age and previously defined health conditions[13,19].

The cost of high-fidelity simulators is high and specialized technicians are needed for their maintenance. These simulators reveal their complete usage potential in learning to solve complete and complex scenarios, facilitating technical competency development, teamwork, critical thinking, clinical judgment and decision making, among others.

When associating a high-fidelity simulator with a realistic space, with real material and equipment and sound and imaging technology that permits the recording of students' performance and its further use for discussion, this provides a high-fidelity simulation, i.e. we move from a "practical scenario" to a "simulated clinical experience".

Material and equipment are not enough of course. A well-designed scenario, with well-defined pedagogical objectives and a prepared and motivated work team are fundamental.

Figure 5. Simulated clinical experience: space, equipment and patient simulator.

Simulated clinical experience as a teaching and learning strategy

The main goal of a simulated clinical experience is to replicate the essential aspects of a clinical situation, so that students can find it easy and can fully understand it, permitting an adequate response when something similar comes to happen in a real context[13, 18].

Training specific skills is fundamental, but it is when solving complete and complex scenarios in a simulation environment that students consolidate their knowledge and develop critical reasoning and decision making skills and technical, relational and ethical competences[19].

Various studies refer that simulated clinical experiences are an important strategy in nursing teaching at undergraduate and graduate level, benefiting the students, mainly in terms of knowledge and competency development for critical reasoning and priority setting, decision making, accomplishment of correct actions, teamwork and correction of errors without the effects of these errors on the patients[4,18,20,21]. Significant improvements in expertise and students' practical competences are gained in comparison with traditional teaching methods, besides self-efficacy and self-confidence to assess vital signs and offer patient education, enhanced student satisfaction, skills development to solve problems, to think and act as nurses and to develop communication competences[21-27].

To conduct a simulated clinical experience, the trainer needs to present the student (or student group) with a real case, in which students should take full responsibility for the patient. The activity should take place in a realistic environment and the student-simulator interactions produces objective and subjective data that will lead to the accomplishment of a set of interventions (alone or as a team, depending on the case) that are adequate to the situation. The simulator reacts to these interventions physiologically, also interacting with students through verbal and non-verbal communication. The experience ends with a debriefing about the situation, learning and decisions made, consolidating group knowledge.

To fully explore the potential of a simulated clinical experience, students should have previously trained technical skills on low and medium-fidelity simulators, so that their attention is not only focused on the technical execution of a task, but on the interaction with patients, clinical reasoning, assessment of the simulator's responses to their interventions, on teamwork, among others.

FINAL CONSIDERATIONS

Schools that are concerned with teaching quality, student satisfaction and who aim for their students' technical, scientific and humane performance need to invest in simulated practical teaching, in a high-quality laboratory context, based on scientific and ethical foundations and legal support. This teaching should precede the students' participation in clinical practice, guaranteeing the development of the competences needed to minimize errors in the real context.

Nursing students training a range of skills deficiently or, even worse, involving real persons, often vulnerable due to the disease, cannot be justified (except when this is impossible in a simulated environment). It is the duty of schools to serve as an example of best practices, starting with complete respect for human beings.

Low and medium-fidelity spaces and simulators are essential to develop specific competences and their cost/benefit relation is clearly positive. The availability of sound and imaging technology and high-fidelity patient simulators at a reasonable cost has permitted their most consistent use at various nursing schools around the world, making it easier to integrate actual simulated clinical experiences into Nursing curricula.

REFERENCES

1. Parker B, Myrick F. Transformative learning as a context for human patient simulation. J Nurse Educ. 2010;49(6):326-32.
2. Wilford A, Doyle TJ. Integrating simulation training into the nursing curriculum. Br J Nurs. 2006; 15(17): 926-30.
3. Schiavenato M. Reevaluating simulation in nursing education: beyond the human patient simulator. J Nurs Educ. 2009; 48(7): 388-94.
4. Kardong-Edgren SE, Starkweather AR, Ward LD. The integration of simulation into a Clinical Foundation of Nursing Course: student and faculty perspectives. Int J Nurs Educ Scholarsh. [Internet]. 2008 [cited 2009 Jul 1]; 5(1): Article 26. DOI: 10.2202/1548-923X.1603.
5. Padilha MI, Borenstein MS. [The methodology of historic research in the nursing]. Texto & Contexto Enferm. 2005; 14(4):575-84. Portuguese.
6. Nightingale F. Notes on nursing: what it is, and what it is not. London: Duckworth. 1970.
7. Valente J. Apontamentos sobre ligaduras. Lisboa: Edição do autor. 1985.
8. Souza EF. Administração de medicamentos e preparo de soluções. Rio de Janeiro: Escola de Enfermeiras Ana Néri da Universidade do Brasil; 1955.
9. Souza EF. Novo manual de técnica de enfermagem. Rio de Janeiro: Bruno Buccini. 1966.
10. Souza EF. Novo manual de enfermagem. Rio de Janeiro: Bruno Buccini. 1972.
11. Souza EF. Administração de medicamentos e preparo de soluções. Rio de Janeiro: Cultura Médica. 1994.
12. Hayashida M, Mendes IA, Trevizan MA, Nogueira MS. Laboratório de enfermagem: incidentes críticos relacionados à sua utilização. Enfermagem. 2001; 22: 21-8.
13. Nehering W. History of simulation in nursing. In: Nehering W, Lashley F, organizers. High-fidelity patient simulation in nursing education. Quebec: Jones and Bartlett Publishers. 2010.
14. Conselho Regional de Enfermagem do Estado de São Paulo. Parecer COREN-SP CAT no. 012/2009. Treinamento de técnicas injetáveis em alunos na formação profissional [Internet]. 2009 [citado 2012 May 5]. Disponível em: http://inter.coren-sp.gov.br/sites/default/files/12.pdf
15. Council of the European Union. The Council adopted recommendation on patient safety, including the prevention and control of healthcare-associated infections [Internet]. In: 2947th Council Meeting Employment, Social Policy, Health and Consumer Affairs; 2009 Jun 8-9; Luxembourg [cited 2009 Dec 1]. Available from: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/en/lsa/108380.pdf
16. Trevizan MA, Mendes IAC, Mazzo A, Ventura CAA. Investment in nursing human assets: education and minds of the future. Rev. Latino-Am. Enfermagem. [Internet] 2010 [citado 2011 Apr]; 18(3): [cerca de 5 p.] Disponível em http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-11692010000300024&lng=en.
17. Rangel EM, Mendes IAC, Carnio EC, Alves LMM, Crispim JA, Mazzo A, et al. Evaluation by nursing students in virtual learning environments for teaching endocrine physiology. Acta Paul Enferm. 2011; 24 (3):327-33.
18. Jeffries P, organizer. Simulation in nursing education: from conceptualization to evaluation. New York (NY): National League for Nursing; 2007.
19. Martins J. Atuação do enfermeiro no setor de urgências: gestão para o desenvolvimento de competências. In: Malagutti W, Caetano C, organizadores. Gestão do serviço de enfermagem no mundo globalizado. Rio de Janeiro (RJ): Rubio. 2009. Capítulo 14.
20. Campbell S, Daley K. Simulation scenarios for nurse educators: making it real. New York (NY): Springer Publishing. 2009.
21. Starkweather AR, Kardong-Edgren SE. Diffusion of innovation: embedding simulation into nursing curricula. Int J Nurs Educ Scholarsh. [Internet] 2008 [cited 2010 Jun 17]; 5(1): Article 13. DOI: 10.2202/1548-923X.1567.
22. Tuttle RP, Cohen MH, Augustine AJ, Novotny DF, Delgado E, Dongilli TA, et al. Utilizing simulation technology for competency skills assessment and a comparison of traditional methods of training to simulation-based training. Respir Care. 2007; 52(3): 263-70.
23. Bambini D, Washburn J, Perkins R. Outcomes of clinical simulation for novice nursing students: communication, confidence, clinical judgment. Nurs Educ Perspect 2009; 30(2):79-82.
24. Sinclair B, Fergunson K. Integrating simulated teaching/learning strategies in undergraduate nursing education. Int J Nurs Educ Scholarsh [Internet]. 2009 [cited 2010 Fev 12]; 6(1): Article 7. DOI: 10.2202/1548-923X.1676.
25. Smith SJ, Roehrs CJ. High-fidelity simulation: factors correlated with nursing student satisfaction and self-confidence. Nurs Educ Perspect. 2009; 30(2):74-8.
26. Sleeper JA, Thompson C. The use of hi fidelity simulation to enhance nursing students' therapeutic communication skills. Int J Nurs Educ Scholarsh [Internet]. 2008 [cited 2009 Jun 12]; 5(1): Article 42. DOI: 10.2202/1548-923X.1555.
27. Waldow VR, Borges RF. Caring and humanization: relationships and meanings. Acta Paul Enferm. 2011; 24(3):414-8.