Literature Review

TEXTO & CONTEXTO ENFERMAGEM
TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

SIMULATION IN NURSING: PRODUCTION OF THE KNOWLEDGE OF THE GRADUATE COURSES IN BRAZIL FROM 2011 TO 2020

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ABSTRACT

Objective: to synthesize the production of knowledge on simulation in Nursing generated by the Nursing graduate programs in Brazil between January 2011 and February 2020.
Method: a documentary research study, which adopted as primary source the official documents of the Coordination for the Improvement of Higher Level personnel, conducted by means of an integrative literature review from October 2019 to February 2020, with quantitative analysis of the data.
Results: initially, 68 studies were identified, 40 of them comprising the final sample. The following categories stood out: purpose of the studies; types of simulation; Health Care level; variables analyzed regarding the effectiveness of the simulation; themes addressed; comparison of the effectiveness of simulation with that of other teaching strategies, and weaknesses and potentialities of simulation. The scientific research of the Brazilian graduate courses prioritized the analysis of the effectiveness of simulation in the development of knowledge, satisfaction and confidence, in an off-site or virtual teaching environment, aimed both at hospital care and at primary care, mainly in Neonatology and Pediatrics, with the participants' anxiety as main weakness; and satisfaction, knowledge, critical thinking, safety, confidence and the ability to articulate theory and practice as potentialities.
Conclusion: this study contributes to research, teaching and care in Nursing, for enabling the identification of the scientific production setting on simulation, which supports new research studies, with a focus on objectives and settings not yet explored. Simulation is indicated as an effective strategy for the development of cognitive, psychomotor and attitudinal skills in Nursing.

DESCRIPTORS: Simulation. Nursing. Teaching. Learning. Research study.

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SIMULAÇÃO EM ENFERMAGEM: PRODUÇÃO DO CONHECIMENTO DA PÓS-GRADUAÇÃO NO BRASIL DE 2011 A 2020

RESUMO

Objetivo: sintetizar a produção do conhecimento sobre simulação em enfermagem gerada pelos programas de pós-graduação da **área** de enfermagem no Brasil entre janeiro de 2011 a fevereiro de 2020.
Método: pesquisa documental, que adotou como fonte primária os documentos oficiais da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, realizada por revisão integrativa da literatura, de outubro de 2019 a fevereiro de 2020, com análise qualitativa dos dados.
Resultados: identificaram-se inicialmente 68 estudos, e 40 compuseram a amostra final. Destacaram-se as categorias: intencionalidades dos estudos; tipos de simulação; nível de Atenção à Saúde; variáveis analisadas quanto à eficácia da simulação; temáticas abordadas; comparação da efetividade da simulação *versus* outras estratégias de ensino e fragilidades e potencialidades da simulação. A pesquisa científica da pós-graduação brasileira priorizou a análise da eficácia da simulação no desenvolvimento de conhecimento, satisfação e confiança, em um ambiente *off-site* ou virtual de ensino, voltado tanto à atenção hospitalar como primária de cuidado, principalmente em neonatologia e pediatria, tendo a ansiedade dos participantes como principal fragilidade, e a satisfação, o conhecimento, o pensamento crítico, a segurança, a confiança e a capacidade de articular teoria e prática como potencialidades.
Conclusão: este estudo contribui para a pesquisa, o ensino e a assistência em enfermagem, por possibilitar a identificação do cenário da produção científica sobre simulação, que sustenta novas investigações, com enfoque em objetivos e cenários ainda não explorados. Indica-se a simulação como estratégia eficaz para o desenvolvimento de habilidades cognitivas, psicomotoras e atitudinais em enfermagem.

DESCRITORES: Simulação. Enfermagem. Ensino. Aprendizagem. Pesquisa.

SIMULACIÓN EN ENFERMERÍA: PRODUCCIÓN DE CONOCIMIENTO EN LOS PROGRAMAS DE POSTGRADO EN BRASIL ENTRE 2011 Y 2020

RESUMEN

Objetivo: sintetizar la producción de conocimiento sobre simulación en Enfermería generada por los programas de postgrado del **área** de Enfermería en Brasil, entre enero de 2011 y febrero de 2020.
Método: investigación documental, que adoptó como fuente primaria los documentos oficiales de la Coordinación de Perfeccionamiento de Personal de Nivel Superior, realizada por medio de una revisión integradora de la literatura, de octubre de 2019 a febrero de 2020, con análisis cualitativo de los datos.
Resultados: inicialmente se identificaron 68 estudios, de los cuales 40 compusieron la muestra final. Se destacaron las siguientes categorías: propósito de los estudios; tipos de simulación; nivel de Atención de la Salud; variables analizadas en relación a la eficacia de la simulación; temáticas abordadas; comparación entre la efectividad de la simulación y la de otras estrategias de enseñanza, y puntos débiles y potencialidades de la simulación. La investigación científica de los programas de postgrado de Brasil priorizó el análisis de la eficacia de la simulación en el desarrollo de conocimiento, satisfacción y confianza, en un ambiente de enseñanza externo o virtual, dirigido tanto a la atención hospitalaria como primaria, principalmente en Neonatología y Pediatría, donde la ansiedad de los participantes se indicó como el principal punto débil; y la satisfacción, el conocimiento, el pensamiento crítico, la seguridad, la confianza y la capacidad para articular teoría y práctica se indicaron como potencialidades.
Conclusión: este estudio contribuye a la investigación, la enseñanza y la asistencia en Enfermería, ya que permite identificar el ámbito de la producción científica sobre simulación, que sustenta nuevas investigaciones, enfocadas en objetivos y ámbitos todavía no explorados. La simulación se indica como una estrategia eficaz para desarrollar habilidades cognitivas, psicomotoras y actitudinales en Enfermería.

DESCRIPTORES: Simulación. Enfermería. Enseñanza. Aprendizaje. Investigación.

INTRODUCTION

The present time is permeated by new pedagogical trends related to teaching in Nursing, which point to the possibility of adopting strategies capable of improving the educational processes in this area, when considering the demands of the labor market and the concern with patient safety.[1]

Despite the traditional approaches and educational methods such as dialoged exposition of the contents facilitating the understanding of certain themes and being useful and effective for the teaching-learning process in Nursing,[2–3] it becomes important to incorporate new pedagogical strategies in the curricula and, in this perspective, simulation stands out.[4]

Defined as a teaching and learning strategy that accurately replicates an event, a situation, an environment or a clinical setting,[5–6] simulation allows developing knowledge, skills and attitudes pertinent to the nurse's practice in a controlled and safe setting, in addition to configuring the current theme, which is relevant and inspires scientific deepening in its various contexts.[7]

In this perspective, it is important to understand how the Brazilian Nursing graduate-level studies on simulation are conducted, what their main outcomes are in relation to the teaching and learning process with the intention of identifying this educational background, its characteristics, trends, weaknesses and potentialities, as well as supporting new pedagogical paths, based on reliable scientific evidence.[8]

There is still no clarity as to the definition of a setting on the use of simulation, in terms of a teaching strategy aimed at Nursing in Brazil, on the methodological nature of the scientific research studies developed in graduate programs in this scope, the most adopted types of simulation, and the themes related to Nursing care prioritized, among other variables, which can support research, teaching and assistance.[8–9]

In addition, the National Curricular Guidelines emphasize the adoption of innovating and significant teaching and learning methods, which align with the use of simulation and with the purpose of deepening the Brazilian scientific research studies on this topic, so as to define the best Nursing practices.[10] The following question emerges in this context: what is the scientific evidence available generated by the Nursing graduate programs in Brazil on simulation for students and professionals between January 2011 and February 2020?

The objective of this study was to synthesize the production of knowledge on simulation in Nursing generated by the Nursing graduate programs in Brazil between January 2011 and February 2020.

METHOD

This is a documentary research study,[11–12] which adopted as primary source the official documents of the Coordination for the Improvement of Higher Level Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*, CAPES)[13] and had its methodological path guided by an integrative literature review, according to Ganong's perspective.[14]

Six methodological phases were carried out to proceed to the integrative literature review: identification of the research question; search and selection of the studies in the literature; categorization of the studies; evaluation of the studies included in the review; interpretation of the results; and synthesis of the studies analyzed/presentation of the integrative review.[14]

The Patient, Intervention, Comparison, Outcomes (PICO) strategy was used to elaborate the research guiding question, with "P" (population) being students and nurses; "I" (intervention) being the identification of the national scientific production on simulation generated by the Nursing

graduate programs; and "O" (outcome) being the teaching and learning process.[15] The following research question was defined: what is the scientific evidence available generated by the Nursing graduate programs in Brazil on simulation for students and professionals between January 2011 and February 2020?

The documentary search was conducted from October 2019 to February 2020 and the Thesis and Dissertation Catalog published in the CAPES website was adopted as database.[13] The descriptors used for the search were "*enfermagem*" ("nursing"), "*simulação*" ("simulation"), "*ensino*" ("teaching") and "*aprendizagem*" ("learning"), present in the Health Sciences Descriptors (*Descritores em Ciências da Saúde*, DeCS). The following search strategy was used: "*enfermagem*" *AND* "*simulação*" *AND* "*ensino*" *AND* "*aprendizagem*".

The criteria to include the studies were as follows: national theses and dissertations, between January 2011 and February 2020 (time cut justified by the emphasis on the adoption of simulation in Nursing as an active and innovating pedagogical strategy in this period and the scientific production on this subject matter),[2–7] which pointed to the use of simulation for Nursing undergraduate students and nurses, aimed at the teaching and learning process. The documents excluded were those that did not address simulation as the main object to enable the educational process in Nursing, that only described the elaboration and validation of instruments for simulation, without detailing their application, and studies with populations that addressed the medium level in Nursing or other professions in the health area.

Three phases were carried out for the selection of the studies. The first addressed the initial screening of 68 publications, assessing titles and abstracts, and conducted by two researchers, who were nurses and experts on the theme proposed. In order to avoid undue exclusions, the studies with titles and abstracts that raised doubts regarding relevance were initially included to proceed with an in-depth reading. The five manuscripts that revealed divergence between the researchers were handed in to a third person, a nurse and teacher, with experience in the use of simulation as a pedagogical strategy, responsible for making the decision to include or exclude papers, according to the established criteria. In the last phase, full reading of 41 theses and dissertations was performed so as to define the final sample. The selection of the studies was shown by means of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) recommendations,[16] as indicated in Figure 1.

To extract the diverse information from the selected studies, a data collection instrument[17], previously validated with the following items was adopted: identification number of the study; title of the study: teaching institution where the research was produced; graduate level (MS, PhD or Post-PhD); type of study, Level of Evidence, and year of publication.

After data collection and analysis, the findings were organized in categories, according to the assumptions of Thematic Analysis[18] in order to conduct three stages: pre-analysis, configured by the floating reading of the findings and annotation of the convergent information (Registration Units); exploration of the material, defined by a detailed grouping of the Registration Units; and treatment of the data, so as to determine the categories.[18] Subsequently, the studies included in this review were evaluated, the results were interpreted and discussed, and this documentary research was presented.

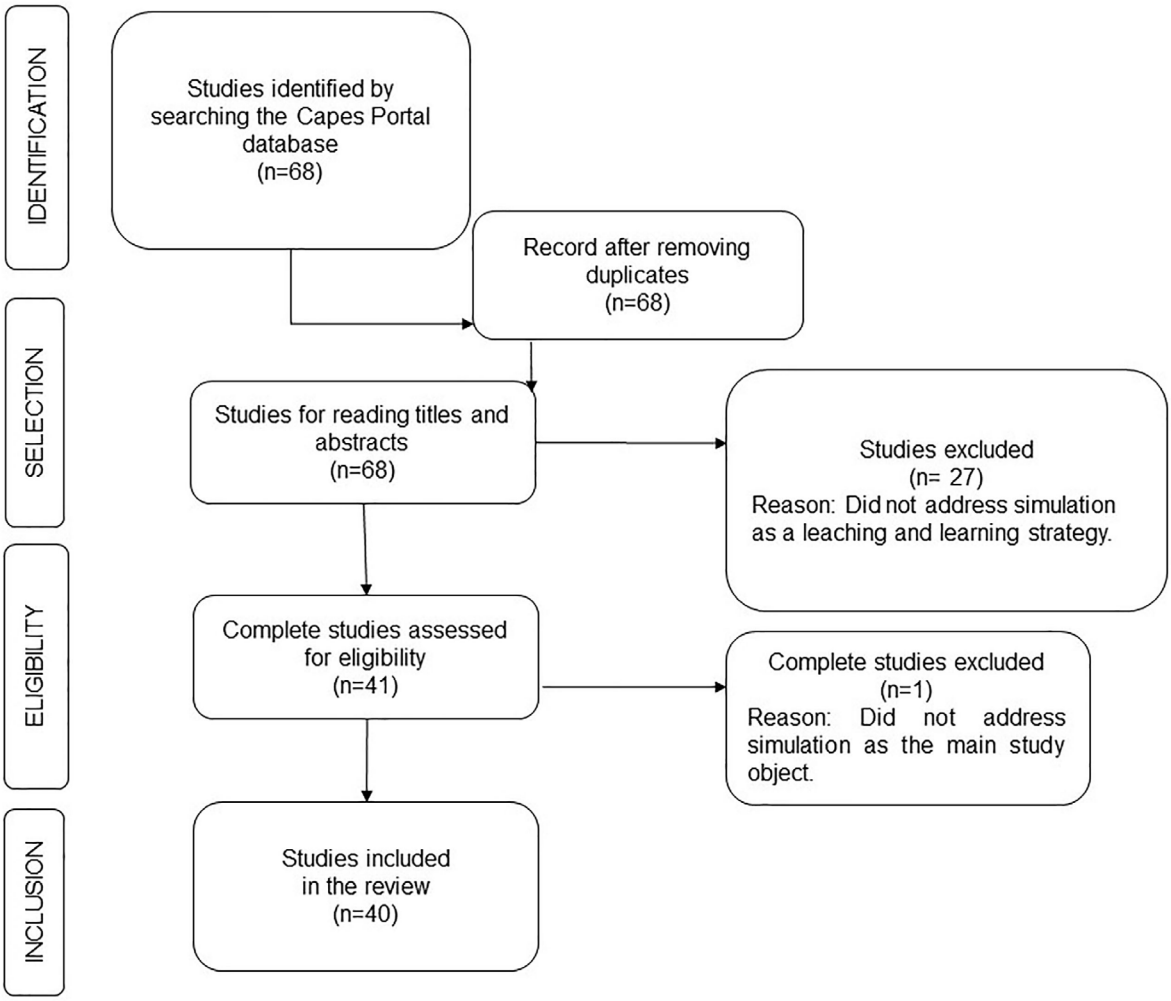

Figure 1 – Flow diagram of the process of identification, selection and inclusion of the Brazilian theses and dissertations on simulation. Ribeirão Preto, SP, Brazil, 2020.

RESULTS

The diverse available evidence on the scientific production generated by the Nursing graduate programs in Brazil regarding the teaching and learning process by means of simulation, between January 2011 and February 2020, comprised the final sample of 40 manuscripts. Chart 1 characterizes the dissertations and theses addressed in this context.

Chart 1 – Characterization of the dissertations and theses on the teaching and learning process of simulation in Nursing. Ribeirão Preto, SP, Brazil, 2020.

Objective	Type of study; Level of Evidence
To reveal how the student considered learning Nursing by means of the realistic simulation.[19]	Descriptive-exploratory study; Level 6
To develop, implement, and assess a training course for instructors of clinical simulation in Nursing with the use of a VLE, together with the faculty of the UNICAMP Nursing School.[20]	Methodological study followed by an intervention; Level 6
To analyze the methodology of the realistic simulation as a facilitating instrument for the teaching and learning process in Nursing.[21]	Descriptive study of the action-research type; Level 6

Chart 1 – Cont.

Objective	Type of study; Level of Evidence
To analyze the effectiveness of the students' learning, immediately, 14 and 30 days after the expository-dialog class and the class simulated in the Nursing laboratory.[22]	Longitudinal and experimental study; Level 2
To assess the effectiveness of the realistic simulation in the teaching-learning process of Nursing diagnostic reasoning.[23]	Experimental study, randomized; Level 2
To understand the contributions of the clinical simulation with the participation of actors to the experiential learning of the Nursing consultation.[24]	Descriptive study; Level 6
To assess the contribution of teaching based on high-fidelity simulation for the development of clinical competences by the Nursing student.[25]	Intervention study; Level 6
To assess the realistic simulation as a teaching-learning strategy in the acquisition of knowledge in the transfusion process for Nursing professionals.[26]	Quasi-experimental study; Level 3
To compare the clinical performance of students who attended learning settings with and without debriefing and to verify their opinion regarding the use of settings with debriefing.[27]	Longitudinal intervention study, randomized; Level 2
To assess the teaching-learning process in view of the clinical simulation strategy, aiming at the development of the professional competence of evaluation of the risk for pressure injury and its respective knowledge, skills and attitudes.[28]	Descriptive study; Level 6
To assess the teaching and learning process in the pre-hospital care to the victims of CPA, by using the CPR maneuvers and the AED, in the theoretical (knowledge) and practical (skill) aspects, according to the recommendations of the 2010 ILCOR[29] guideline.	Quasi-experimental study; Level 3
To assess the effectiveness and efficacy of using high-fidelity simulation in the teaching and learning process in relation to traditional teaching.[30]	Experimental study, randomized clinical trial; Level 2
To analyze the use of the realistic simulation as a facilitating strategy of the teaching and learning process, with the undergraduate Nursing students in the settings of Primary Health Care.[31]	Descriptive-exploratory study; Level 6
To assess the teaching-learning process for electrocardiograms before and after the training, by means of the traditional method and in the Center of Realistic Simulation.[32]	Quasi-experimental study of the before-and-after type; Level 3
To investigate the knowledge, satisfaction and self-confidence of graduate Nursing students on the learning of the *delirium* in older adults content, by means of the teaching method of realistic simulation, as well as to assess the simulation design.[33]	Intervention study; Level 6
To assess the impact of the *e-Baby* serious game: skin integrity in cognitive learning of Nursing students, considering the learning styles.[34]	Methodological study with an experimental and randomized design; Level 2
To construct and assess the robotic simulation setting with the specialists; to describe the development process of the Clinical Evaluation of Oxygenation and Blood Flow of the Preterm Baby semi-in-person diffusion course; and to assess the performance of cognitive learning of the students attending the semi-in-person course on the clinical evaluation of oxygenation and blood flow of the preterm baby.[35]	Quasi-experimental study of the before-and-after type; Level 3
To analyze the use of the realistic simulation as a teaching strategy for the students attending the Nursing undergraduate course in the Ceilândia College.[36]	Intervention study with a cross-sectional design; Level 6

Chart 1 – Cont.

Objective	Type of study; Level of Evidence
To assess the perception of the teachers and students regarding the use of the realistic simulation as a teaching-learning strategy for the Nursing undergraduate course of the Pernambuco Health School.[37]	Descriptive-exploratory study; Level 6
To assess the satisfaction and self-confidence of the Nursing students in learning experiences by means of advanced simulation.[38]	Descriptive and cross-sectional study; Level 6
To analyze the efficacy of teaching and learning strategies in the acquisition of knowledge and the satisfaction of Nursing undergraduate students in the teaching of immunization in the PHC context.[39]	Experimental study of the randomized clinical trial type; Level 2
To develop and assess the educational game called *e-Baby*: clinical evaluation of thermo-regulation in the preterm newborn.[40]	Methodological and quasi-experimental research; Level 3
To assess and compare the theoretical and practical performance of Nursing students exposed to teaching-learning strategies, expository-dialog classes, and practical activities in skills laboratory or simulated classroom, in emergency airway management by using an LM.[41]	Experimental study, randomized; Level 2
To develop and assess the BLS online course: essential aspects for the care of adults in cardiopulmonary arrest.[42]	Applied research study of technological production followed by a quasi-experiment; Level 3
To identify the perception of teachers and students on the efficacy of the realistic simulation in Nursing education.[43]	Descriptive-exploratory study; Level 6
To identify the opinions of the faculty regarding the introduction of realistic simulation in the curriculum; how the faculty experiments the use of settings followed by debriefing in their classrooms; and to determine what the difficulties, challenges and conquests are in the use of simulation as a teaching tool in undergraduate health courses.[44]	Descriptive-exploratory study; Level 6
To identify the effect of the realistic simulation in the learning of Nursing students.[45]	Experimental study; Level 2
To validate a setting for clinical simulation on breastfeeding, with a focus on communication in health, applied to the training of nurses for performance in the SUS.[46]	Methodological study with intervention; Level 6
To assess the knowledge (theoretical) and the skills (practical) of laypeople before and after their participation in the BLS course for laypeople exposed to teaching-learning strategies, expository-dialog classes, and practical activities in skills laboratory or simulated classroom in the care for CPA/CPR with BLS for laypeople.[47]	Quasi-experimental study; Level 3
To analyze the professional and pedagogical path of the nurse-professors for the development of clinical simulation in Nursing teaching, considering their social and cultural interactions throughout life and the repercussions in undergraduate Nursing teaching.[48]	Descriptive and exploratory study; Level 6
To assess the perception of Nursing undergraduates on the teaching and learning process in the practice settings of the Semiology and Semiotechnics subject.[49]	Case study research; Level 6
To assess the self-efficacy and clinical judgement response of nurses for the management of sepsis based on high-fidelity clinical simulation.[50]	Methodological study followed by a quasi-experimental design; Level 3
To elaborate and apply an inventory of knowledge, skills and attitudes, in face of the use of multi-parametric monitors in an intensive care unit.[51]	Quasi-experimental study; Level 3
To develop an educational software program for the simulation of a hospitalization unit, in relation to staffing and decision-making, offering the possibility of experiencing situations close to reality, in a virtual environment.[52]	Applied research, Level 6

Chart 1 – Cont.

Objective	Type of study; Level of Evidence
To report the first experience of the Continuing Education service of a child-youth hospital in the state of Paraná with the use of realistic simulation as a teaching and learning methodology for the Nursing teams.[53]	Descriptive study; Level 6
To identify the levels of satisfaction and self-confidence of students in the roles of doers and observers in realistic simulation.[54]	Quasi-experimental study; Level 3
To understand the experiential learning process in clinical simulation in the Nursing undergraduate course.[55]	Case study research; Level 6
To develop and validate educational material, consisting in an educational video, a virtual learning environment, and a clinical simulation setting, on the management of pediatric CPA caused by respiratory failure.[56]	Methodological study followed by an intervention; Level 6
To analyze the competences developed by the student in the assessment of the critically-ill patient, based on clinical simulation. Method: a qualitative, analytical and deductive study, following Vygotsky's historical-cultural strand.[57]	Deductive analytical study; Level 6
To assess the influence of the simulation strategy in knowledge acquisition for the development related to the competence in the dyspnea setting among Nursing students.[58]	Quasi-experimental study; Level 3.

*VLE: Virtual Learning Environment; †UNICAMP: *Universidade Estadual de Campinas*; ‡CPA: Cardiopulmonary Arrest; §CPR: Cardiopulmonary Resuscitation; ‖AED: Automatic External Defibrillator; ¶ILCOR: *Aliança Internacional dos Comitês de Ressuscitação*; **PHC: Primary Health Care; ††BLS: Basic Life Support; ‡‡LM: Laryngeal Mask); ***SUS: *Sistema* **Único** *de Saúde*.

Chart 2 shows the categories identified in the selected sample, referring to the teaching and learning process by means of simulation.

Chart 2 – Categories referring to the teaching and learning process by means of simulation, identified in the sample of studies selected. Ribeirão Preto, SP, Brazil, 2020.

Category	Studies
Category 1: Main purposes of the studies regarding simulation	
To understand the meaning of the teaching and learning process, by means of the simulation for Nursing students and professionals.	19,22,37,43–44,48–49,55,57
To develop, validate and apply virtual teaching and learning environments and tools by means of simulation.	20,34–35,42,52–53,56
To analyze the efficacy of using the simulation as a teaching and learning strategy for Nursing.	21,25–26,28–29,31,33,34,38,40,46,47,50–51,54,58
To compare the effectiveness of simulation with other teaching and learning strategies.	22–23,27,30,32,34,41,45
Category 2: Types of simulation	
Simulation with high-fidelity mannequin.	21,25,30.41
Scenic simulation.	24,46
Off-site simulation.	22,29,32,41,47,49–50,51–53,57–58
Virtual simulation.	34–35,40,42,52
Category 3: Level of health care referring to the simulation setting	
Primary Level (Primary Care).	21,24,27,29,31,39,46
Tertiary Level (Hospital).	26,41,50–53,55,57–58

Chart 2 – Cont.

Category	Studies
Category 4: Main variables analyzed in the teaching and learning process	
Self-confidence.	25,30,32–33,36,38–39,54,58
Satisfaction.	25–26,30–33,36,38–39,53–54,58
Effectiveness to develop competence: knowledge-skill and attitudes.	25,28,51
Effectiveness to develop only knowledge and skill.	25–26,29,31,47
Effectiveness to develop only knowledge.	22,32–33,35,39–40,58
Category 5: Themes addressed to conduct the simulation setting	
Diagnostic reasoning.	23
Nursing consultation.	24,31
Cardiovascular emergency.	25,29,42,47,56
Respiratory emergency.	25,41,58
Neurological emergency.	22,25
Transfusion process.	26
Immunization.	27,39
Pressure injury.	28
Medication administration.	30
Electrocardiogram.	32
Delirium in older adult.	33
Care in Neonatology and Pediatrics.	34–36,40,46,57
Women's health.	36
Sepsis.	50
Use of equipment.	51
Staffing.	52
Nursing in surgical clinic and surgical center.	53,55
Patient safety.	54
Intensive care and critical care unit.	57
Category 6: Comparison of the effectiveness of simulation *versus* other teaching and learning strategies	
Simulation *versus* traditional teaching strategy: simulation is more effective for the teaching and learning process than the traditional strategy: expository-dialog class and skills training.	22–23,30,39,45
Simulation *versus* traditional teaching strategy: similar effectiveness regarding the teaching-learning process.	32,34,41
Category 7: Weaknesses perceived by students and nurses regarding the simulation	
Insufficient time and duration of the settings.	23,31
Exacerbated anxiety/Nervousness/Distress.	31,37,57
Students/Professor ratio.	31,44
Correlation between the objectives of the settings and the curricular competences.	31,47
Category 8: Potentialities perceived by students and nurses regarding the simulation	
Significant experience.	19,24,31.37
Development of knowledge, critical thinking, doing and learning.	19,25–26,28,33–34,38,40,50,53,58
Promotion of self-evaluation.	19,24,28.37
Promotion of patients' and participants' safety.	19,31,37,38,43,49,53
Satisfaction/Motivation/Gratitude.	21,22,25–26,28,30–31,33–34,35,36
Development of competence-knowledge, skills, attitudes.	28,30–31,51

Chart 2 – Cont.

Category	Studies
Self-confidence.	20,25,33,38,54.58
They consider the debriefing as a fundamental phase.	25,27,37.44
Articulates theory and practice.	31.35–37,49,53,55

DISCUSSION

The findings relevant to the teaching and learning process were analyzed by means of the simulation in Nursing of 40 graduate-level studies developed in Brazil between January 2011 and February 2020, with a sample considered as incipient, due to the extension of the inclusion period of the manuscripts, and possibly justified by the current nature of the theme.[59]

Aware of this new educational trend, the Nursing schools foresee the implementation of simulation programs that support teaching and, in this perspective, the Ribeirão Preto Nursing School stood out in relation to the scientific production on simulation in the selected period.[60]

More MS dissertations on simulations than PhD theses were developed in this period, with descriptive, quantitative and Level of Evidence 6 studies standing out. The predominance of this Level of Evidence points to the scarce elaboration of research studies such as systematic reviews and meta-analyses (Level of Evidence 1), followed by experimental studies (Level of Evidence 2), fundamental to support the nurse in a safer manner to incorporate such evidence to the clinical practice.[61]

The purpose of the manuscripts included was considered as one of the categories in the present research, with emphasis on the analysis of the efficacy of simulation for Nursing teaching. A meta-analysis study conducted in 2016 selected 40 scientific articles and showed that the adoption of simulation in Nursing is effective for the development of various domains pertinent to the Nursing practice, mainly cognitive knowledge and psychomotor domain.[7] Simulation-based learning exerts a positive effect on the results of the actions performed by the students, who benefit when exposed to this strategy.[59,62–63]

The off-site simulation, followed by virtual simulation, emerged as the main simulation modality adopted. Off-site simulation is the one performed in simulation centers or laboratories, outside the clinical practice setting.[64] The adoption of or preference to conduct the simulation in environments such as simulation laboratories can be justified by the existing operational obstacles regarding the conduction of an *in-situ* simulation.[64]

Among the most innovating types of simulation, virtual simulation with computers and serious games stands out, with the objective of creating realistic environments so that Nursing undergraduate students and/or nurses can practice and construct their own learning, in addition to stimulating the execution of certain care actions as many times as necessary, in a virtual environment.[65]

The health care level related to the conduction of a simulation setting was also one of the categories of this study. Both the tertiary health care level, represented by the hospital setting, and primary health care were largely considered by the scientific research studies that comprised the sample of this study. The simulation strategy is strongly associated with the prevention of adverse events in the patient, which requires training of the facilitators and the elaboration of settings that meet the specific educational objectives, be it in the hospital setting or in Primary Health Care.[2–3,64]

The main variables analyzed in the studies, regarding the efficacy of simulation, were the following: satisfaction, self-confidence, and cognitive knowledge. Such criteria have been considered for the teaching and learning process in the simulation, with an association with better performance and motivation of the students.[59]

The main theme addressed for Nursing teaching, by means of simulation, was Nursing care in Neonatology and Pediatrics. Maternal-child education in Nursing by means of virtual simulation has been gaining focus in the last decade, for offering an educational experience which imitates with fidelity the real challenges of this practice, preparing the students in a safe and error-free environment.[63,65]

In the comparison of the effectiveness of simulation against other teaching and learning strategies, it was considered that the former is more effective for Nursing education than the traditional strategies, such as expository classes and skills training in laboratories. However, the disproportion of descriptive studies and comparative studies in different training formats observed in the scientific literature on Nursing constitutes a reason for reflection on the need to invest in research studies with methodological designs that can test the effectiveness of the different instructional formats in simulation.[62]

The participants' anxiety was indicated as the main weakness in a simulation. The moment when Nursing students and professionals go through a simulated experience, due to realism and to being observed by possible evaluators, can imply fears, pallor, sweat, cold and wet skin, emotional imbalance, fainting and crying, minimized by the welcoming interaction between teachers and participants, previous skills training, forwarding of frameworks for study, adequate pre-briefing/briefing and non-accusing briefing.[62]

The main limitation of this study was the difficulty in identifying certain information for the characterization of the research studies that comprised the sample, mainly in relation to the number of participants, population and sample; definition of the type of study; methodological approach; and treatment of the data.

This study contributes to research, teaching and care in Nursing, for presenting a synthesis of the production on simulation in Brazilian graduate courses and for enabling the analysis of this context, based on scientific evidence that support and imply the conduction of new research studies, mainly aimed at the themes, objectives and settings little addressed (or still not addressed) in the area. Simulation is recommended as an effective pedagogical strategy for the development of cognitive, psychomotor and attitudinal skills in Nursing.

CONCLUSION

A total of 40 studies developed by graduate programs in Nursing were identified on the teaching and learning process by means of simulation, between January 2011 and February 2020, mostly represented by master's dissertations developed in 2017 at the Ribeirão Preto Nursing School, with a quantitative approach and Level of Evidence 6.

The synthesis of this knowledge revealed a production trend of research studies aimed at analyzing the efficacy of simulation in relation to the development of knowledge, satisfaction and self-confidence in Nursing students and professionals, in an off-site or virtual teaching environment, mainly regarding Neonatal and Pediatrics care. The participants' anxiety was signaled as the main weakness; while satisfaction, knowledge, critical thinking, safety, confidence and ability to articulate theory and practice were the potentialities recognized as derived from the simulation.

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NOTES

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