RECOM
Revista de Enfermagem
do Centro-Oeste Mineiro

Exploring the use of clinical simulation in emergency Nursing education: an integrative review

Explorando a utilização da simulação clínica no ensino de Enfermagem em emergência: uma revisão integrativa

Explorando el uso de la simulación clínica en la educación de Enfermería en emergencias: una revisión integradora

ABSTRACT
Objective: To identify the scientific literature on the use of clinical simulation in nursing education in emergency situations. **Method:** Integrative literature review, following the PRISMA guideline recommendations. The search for primary studies took place in the MEDLINE/PubMed, LILACS, CINAHL, BDENF, Scopus, and Periodical Portal of the Coordination for the Improvement of Higher Education Personnel Periodicals Portal databases, considering the publication period from 2017 to 2022. **Results:** A total of 190 publications were identified, of which 12 comprised the sample of this review. Data were grouped into pre-established categories: simulation and target audience characterization, prebriefing, scenario development, debriefing and feedback, assessment, and outcome. **Final remarks:** This study provides practical insights by highlighting the contemporaneity of clinical simulation in nursing education for emergencies, emphasizing research gaps, method diversity, and the importance of interprofessional collaboration.
Descriptors: Simulation Training; High Fidelity Simulation Training; Patient Simulation; Emergency Nursing; Education Nursing.

RESUMO
Objetivo: Identificar a literatura científica sobre o uso da simulação clínica no ensino de Enfermagem em situações de emergência. **Método:** Revisão integrativa da literatura, a partir das recomendações da diretriz PRISMA. A busca de estudos primários ocorreu nas bases de dados MEDLINE/PubMed, LILACS, CINAHL, BDENF, Scopus e Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, considerando-se o período de publicação entre 2017 e 2022. **Resultados:** Foram identificadas 190 publicações, sendo que 12 compuseram a amostra desta revisão. Realizou-se o agrupamento dos dados em categorias preestabelecidas: caracterização das simulações e do público-alvo, prebriefing, desenvolvimento dos cenários, debriefing e feedback, avaliação e desfecho. **Considerações finais:** Este estudo oferece contribuições práticas ao destacar a contemporaneidade da simulação clínica no ensino de Enfermagem em emergências, ressaltando lacunas de pesquisa, diversidade de métodos e a importância da interprofissionalidade.
Descritores: Treinamento por Simulação; Treinamento com Simulação de Alta Fidelidade; Simulação de Paciente; Enfermagem em Emergência; Educação em Enfermagem.

RESUMEN
Objetivo: Identificar la literatura científica sobre el uso de la simulación clínica en la educación de enfermería en situaciones de emergencia. **Método:** Revisión integrativa de la literatura, siguiendo las recomendaciones de la directriz PRISMA. La búsqueda de estudios primarios se realizó en las bases de datos MEDLINE/PubMed, LILACS, CINAHL, BDENF, Scopus y Portal Periódico de la Coordinación para el Perfeccionamiento del Personal de Educación Superior, considerando el período de publicación entre 2017 y 2022. **Resultados:** Se identificaron 190 publicaciones, de las cuales 12 conformaron la muestra de esta revisión. Los datos se agruparon en categorías preestablecidas: caracterización de las simulaciones y del público objetivo, prebriefing, desarrollo de los escenarios, debriefing y retroalimentación, evaluación y resultado. **Consideraciones finales:** Este estudio brinda aportes prácticos al resaltar la contemporaneidad de la simulación clínica en la educación de enfermería en emergencias, enfatizando las lagunas de investigación, la diversidad de métodos y la importancia de la interprofesionalidad.
Descriptores: Entrenamiento Simulado; Enseñanza Mediante Simulación de Alta Fidelidad; Simulación de Paciente; Enfermería de Urgencia; Educación en Enfermería.

William Campo Meschial[1]
0000-0002-0678-6126

Andressa de Paula[1]
0000-0002-6263-1671

Alice Milani Nespollo[2]
0000-0003-1307-0350

Muriel Fernanda de Lima[3]
0000-0001-9812-659X

Sandra Mara Marin[1]
0000-0002-3447-9473

Vivian Carla de Castro[4]
0000-0002-6615-0859

[1]State University of Santa Catarina - Chapecó, Santa Catarina, Brazil

[2]Federal University of Mato Grosso - Sinop, Mato Grosso, Brazil

[3]Federal University of Mato Grosso do Sul - Coxim, Mato Grosso do Sul, Brazil

[4]UniCesumar - Cesumar University - Maringá, Paraná, Brazil

Corresponding author's e-mail::
William Campo Meschial
williameschial@yahoo.com.br

INTRODUCTION

Clinical simulation has become increasingly prevalent in healthcare education, providing an innovative approach to training professionals in various areas. In the context of the training of nursing professionals, clinical simulation plays an important role, since the proper training of these professionals is crucial to guaranteeing the provision of quality care in emergencies. Clinical simulation serves as an effective tool, allowing both technical and non-technical skills to be addressed, while providing a safe and controlled environment for practice[1].

A number of studies have shed light on the benefits of clinical simulation in the teaching of emergencies to healthcare professionals. A study conducted in Australia showed that simulation increased nurses' confidence and competence when dealing with emergency situations, improving the quality of patient care[2]. Similar results were observed in a study involving nursing students in China, which showed that simulation contributed to improving clinical decision-making and problem-solving skills, strengthening students' self-confidence to deal with emergencies in clinical practice[3].

Moreover, studies with resident doctors carried out in different countries, such as Australia[4], Canada[5] and Brazil[6], have presented interesting findings. These studies consistently found that there are no statistically significant differences in the levels of acute stress, including parameters such as heart rate[4-6], blood pressure[6] and endocrine responses[6], when comparing emergency situations, whether real or simulated. This agreement in results demonstrates that well-designed simulation scenarios can create an environment of high psychological fidelity and can trigger physiological stress responses comparable to real clinical experiences. These findings have significant implications, suggesting the crucial role of simulations in effective emergency teaching, providing a safe environment to practice managing challenging emergency scenarios.

The effectiveness of clinical simulation in emergency nursing education relies on several key factors. Carefully designed scenarios that emphasize realism and complexity, combined with guidance from experienced instructors and support teams, enhance student learning and skill refinement[7]. In addition, the active participation of students in different roles during the simulations, including team leadership, contributes to the development of leadership and decision-making skills.

Despite positive outcomes, research on clinical simulation in urgent and emergency nursing education remains limited[3]. Aspects worthy of investigation include evaluating the effectiveness of simulation in different contexts, identifying the most relevant skills for student development, inte-

grating multiple simulation modalities and comparing clinical simulation with other teaching methodologies.

This study aims to review the literature on clinical simulation in emergency nursing education, in order to highlight key evidence and areas in need of investigation. The results of this review are expected to make a substantial contribution to improving training in emergency nursing, resulting in improvements in the quality of care provided to patients.

METHOD

This is an integrative literature review (ILR), which is an essential approach to improving knowledge in nursing, offering solid bases from scientific literature that allow nurses to practice with excellence. Furthermore, ILR helps to overcome barriers that often hinder the use of scientific knowledge by making research results more accessible. Through ILR, readers can access a multiple studies brought synthesized into a single comprehensive review, speeding up the dissemination of knowledge[8]. This accelerates knowledge dissemination[8] and promotes evidence-based nursing practice. This process involves five stages, according to the framework adopted: formulating the problem, researching the literature, evaluating the data, analyzing the information and presenting the results[8].

In the first stage of the study, the research question was established based on the PCC strategy[9], consider-

ing the target population of nursing students (P), the concept of clinical simulation (C) and the context of urgency and emergency (C). This led to the research question: How has clinical simulation been used in nursing education in the area of urgency and emergency?

The literature search took place during the month of June 2022. In order to identify the relevant literature, search strategies were employed in renowned databases such as MedLine/PubMed (Science Direct and US National Library of Medicine), Latin American and Caribbean Health Sciences Literature (LILACS), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Nursing Database (BDENF) and SCOPUS. In addition, we searched for articles in the Portal of Journals of the Coordination for the Improvement of Higher Education Personnel (Capes Portal).

To carry out the search process, we used Health Sciences Descriptors (HSCD) and their respective Medical Subject Headings (MeSH), as shown in Table 1. It is important to emphasize that the use of this search strategy in the aforementioned databases allowed for a more comprehensive and concise analysis of the available scientific literature, thus allowing for the collection of more precise data and the preparation of a high-quality review in the field of Nursing.

Table 1 - Decs and MeSH used for the database search according to the PCC mnemonic. Chapecó, Santa Catarina, Brasil, 2022

|	
Population (P)	"Estudantes de Enfermagem"**,** "Students, Nursing"**,** "Estudiantes de Enfermería"**,** "Educação em Enferma-gem"**,** "Education, Nursing"**,** "Educación en Enfermería".
Concept (C)	"Simulação"**,** "Simulation"**,** "Simulación", "Simulação de Paciente", "Patient Simulation"**,** "Simulación de Pa-ciente", "Treinamento com Simulação de Alta Fidelidade", "High Fidelity Simulation Training", "Enseñanza Mediante Simulación de Alta Fidelidad", "Treinamento por Simulação", "Simulation Training", "Entrenamien-to Simulado".
Context (C)	"Emergências", "Emergencies", "Urgencias Médicas", "Enfermagem em Emergência", "Emergency Nursing", "Enfermería de Urgencia".

Source: Prepared by the authors based on survey data.

In order to improve the search process, the Boolean operators AND and OR were used, which gave greater precision and conversion to the results obtained. Moreover, the search strategy was customized for each database, taking into account its particularities and singularities. Regarding the selection of studies, the following inclusion criteria were listed: complete primary studies, freely available online and in full, in Portuguese, English or Spanish, published between 2017 and 2022. Conversely, exclusion criteria were stipulated, such as: editorials, case reports, letters, opinion articles, commentaries, essays, duplicate publications, theses, books and reflection articles, as well as research that did not include undergraduate nursing students in its sample.

The search and selection process was carried out by two researchers, both familiar with the study's objectives and inclusion criteria, and in the event of disagreement or doubt, a third researcher was consulted. To guide and ensure the quality of this process, the PRISMA (Preffered Reporting Items for Systematic Reviews and Meta-Analysis)[10] guideline was adopted (Figure 1), which is internationally recognized for its effectiveness and methodological rigor. From the careful selection of primary studies, relevant information was extracted to characterize the publications and analyze their content. This rigorous and comprehensive process allowed for a complete and reliable analysis of the scientific literature in the research area.

Figure 1 - Flowchart for identifying, screening and including studies, according to the PRISMA guideline. Chapecó, Santa Catarina, Brasil, 2022
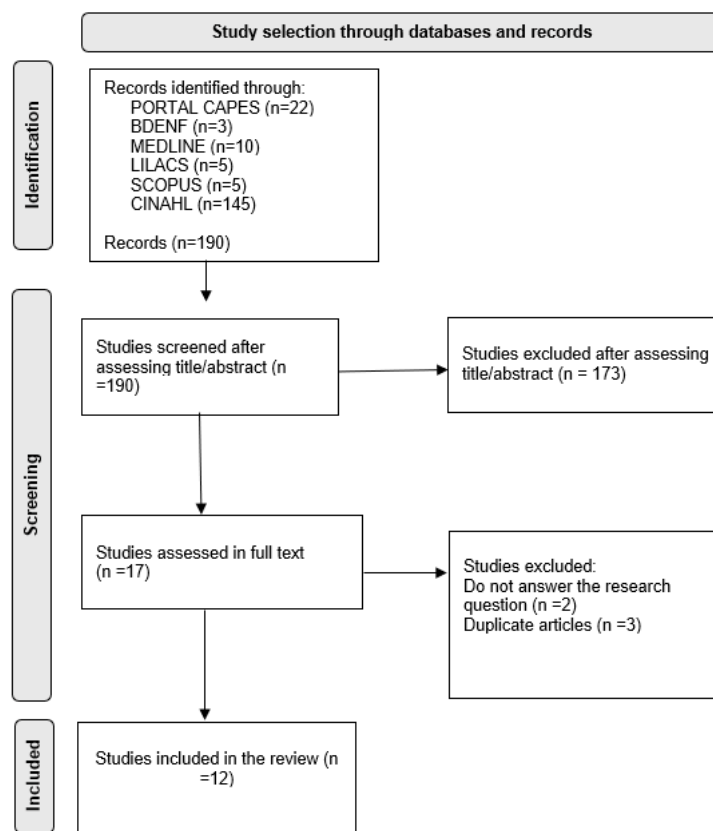
Source: Prepared by the authors based on survey data.

It took two months to collect and organize the data. Drawing up the search protocol was a crucial stage, carried out by the researchers responsible for conducting the study, following the PRISMA guideline.

Once the sample had been defined, a Microsoft Excel® spreadsheet designed for this study was used to extract information such as title, authors, country where the study was carried out, year of publication, target population, simulation locations, groups, topics considered, preparation for the simulation, type of simulation, facilitators, briefing, scenario, debriefing, evaluation instruments, results evaluated and main results. With this structured approach, it was possible to analyze the selected sample, identifying important concepts and assessing the quality of the studies.

To assess the strength of the evidence of the included studies, we used the classification proposed by Fineout-Overholt[11], made up of seven levels: level I - systematic review or meta-analysis; level II - randomized controlled study; level III - controlled study without randomization; level IV - case-control or cohort study; level V - systematic review of qualitative or descriptive studies; level VI - qualitative or descriptive study; level VII - opinion or consensus. Based on this categorization, levels one and two are categorized as strong evidence, while levels three and four are moderate evidence, and levels five to seven are weak evidence.

In presenting the integrative review,

the results were presented in summary tables and in a descriptive manner, interpreted in categories and discussed on the basis of the literature related to the subject of the study. As this is a study whose source of data are articles already published and available in databases, it was not necessary to have them examined by a research ethics committee; however, the copyright of the works included in the analysis was preserved.

RESULTS

As shown in Table 2, the sample of studies that made up this integrative review included 12 primary studies, which were published in nine different journals. The journal Nurse Education in Practice stands out, with four articles published. With regard to the period of publication, it was noted that nine studies were published between 2019 and 2021 and, in relation to the country, the sample covered seven different countries, with Brazil and Australia standing out. The predominant languages were English and Portuguese.

In terms of design, five were quasi-experimental studies, five were descriptive studies and two were randomized clinical trials. Regarding the level of evidence, seven studies had moderate to strong evidence and were classified as level II and III.

Table 2 – Characterization of the articles included in the review sample. Chapecó, Santa Catarina, Brasil, 2022

No.	Title	Authors/Year/Country	Journal	Objective	Design	Level of Evidence
1	A randomized controlled trial of student nurse performance of cardiopulmonary resuscitation in a simulated family-witnessed resuscitation scenario	Kenny G, Bray I, Pontin D, Jefferies R, Albarran J, 2017[12] United Kingdom	Nurse Education in Practice	Exploring the impact of the presence of family members on the performance of nursing students in basic life support.	Randomized clinical trial	II
2	Mass casualty education for undergraduate nursing students in Australia	Curriea J, Kourouchea S, Gordona C, Jormb C, Westa S, 2018[13] Australia	Nurse Education in Practice	Determining student experience and satisfaction with First Line Interventions and interprofessional mass casualty simulation.	Descriptive, quantitative	VI
3	Communicating out loud: Midwifery students' experiences of a simulation exercise for neonatal resuscitation	Carolan-Olah M, Kruger G, Brown V, Lawton F, Mazzarino M, Vasilevski V, 2018[14] Australia	Nurse Education in Practice	Developing and evaluating two simulation scenarios to better prepare third-year obstetrics students to participate in neonatal resuscitation.	Descriptive, qualitative	VI

4	Effectiveness of simulation on nursing students' self-confidence in out-of-hospital cardiopulmonary resuscitation: a quasi-experimental study	Barbosa GS, Bias CGS, Agostinho LS, Oberg LMCQ, Lopes ROP, Sousa RMC, 2019[15] Brazil	Scientia Medica	Verifying the effectiveness of simulation on nursing students' self-confidence in out-of-hospital cardiopulmonary resuscitation.	Almost experimental	III
5	Simulating an incident with multiple victims: training professionals and teaching university students	Lima DS, Vasconcelos IF, Queiroz EF, Cunha TA, Santos VS, Arruda FAEL, Freitas JG, 2019[16] Brazil	Revista do Colégio Brasileiro de Cirurgiões	To describe a teaching strategy based on the simulation of a Multiple Victim Incident (MVI), discussing and evaluating the performance of students involved in the initial care of trauma victims.	Descriptive, quantitative	VI
6	Implementing simulation in oncology emergencies education: A quasi-experimental design	Sharour LA, 2019[17] Jordan	Technology & Health Care	To evaluate the effectiveness of the use of high-fidelity simulation on the satisfaction, self-confidence, self-efficacy and knowledge of undergraduate students in cancer care.	Almost experimental	III
7	Simulation in emergency teaching for nursing students	Costa CRB, Melo ES, Rei RK, 2020[18] Brazil	Revista Cuidarte	To assess the knowledge of newly enrolled undergraduate nursing students before and after training in Basic Life Support (BLS) using simulation.	Almost experimental	III
8	Self-confidence and satisfaction of nursing students in emergency simulation	Bortolato-Major C, Mantovani MF, Felix JVC, Boostel R, Mattei AT, Arthur JP, Souza RM, 2020[19] Brazil	Revista Mineira de Enfermagem	To compare self-confidence for nursing assessment and intervention in simulated emergency clinical scenarios and to verify the satisfaction of nursing students in participating in the method.	Almost experimental	III

#	Title	Authors	Journal	Objective	Method	Level
9	Training interval in cardiopulmonary resuscitation	Oermann MH, Krusmark MA, Kardong-Edgren S, Jastrzembski TS, Gluck KA, 2020[20] United States of America	PLoS ONE	To compare the CPR skills (compressions and ventilations) of nursing students with four different spaced training intervals: daily, weekly, monthly and quarterly, each for four consecutive times.	Randomized clinical trial	II
10	The impact of simulation-based triage education on nursing students' self-reported clinical reasoning ability: A quasi-experimental study	Hu F, Yang J, Yang BX, Zhang FJ, Yu SH, Liu Q, Wang AL, Luo D, Zhu XP, Chen J, 2021[21] China	Nurse Education in Practice	To evaluate the impact of a simulation-based screening exercise on the self-reported clinical reasoning skills of nursing students.	Almost experimental	III
11	Are You Prepared to Save a Life? Nursing Students' Experience in Advanced Life Support Practice	Gutiérrez-Puertas L, Márquez-Hernández VV, Gutiérrez-Puertas V, Rodríguez-García MC, García-Viola A, Aguilera-Manrique G, 2021[22] Spain	International Journal of Environmental Research and Public Health	To explore the experiences and perceptions of nursing students after applying advanced life support techniques to a hospitalized patient in cardiac arrest in a simulated environment.	Descriptive, qualitative	VI
12	Emergency scenarios in maternity: An exploratory study of a midwifery and medical student simulation-based learning collaboration	Burnsa ES, Duffa M, Leggettb J, Schmieda V, 2021[23] Australia	Women and Birth	To evaluate students' experience with simulation-based interprofessional learning workshops focused on emergency scenarios with Medicine and Obstetrics students.	Descriptive, quantitative	VI

Source: Prepared by the authors based on survey data.

In order to present the results, five previously defined categories were established, which were shaped based on crucial elements for the construction of scenarios for clinical simulations: "characterization of the simulations and the target population", "prebriefing", "scenario development", "debriefing and feedback" and "evaluation and outcome".

Characterization of the simulations and the target population

The articles selected presented 18 scenarios (Table 3), although some studies used more than one. Among the scenarios that dealt with cardiac arrest and cardiopulmonary resuscitation in adults, five involved advanced life support measures[17,19,22-23] and four dealt with basic life support[12,15,18,20], one of them in an out-of-hospital environment[15]. The second most frequently discussed topic is incidents involving multiple victims[13,16,21].

The total number of participants in the studies ranged from 36 to 396. Of the 12 studies, four used interprofessional simulation[13,16,21,23], which involves two or more healthcare professions in the same scenario, as well as learning or assessing collaborative skills. These studies involved medical and nursing students[13,16,21,23].

As for the types of simulation used, the studies that opted for clinical simulation with the use of simulators stood out[14,17,19,22], while the studies that only involved skills training were less frequent[18,20].

The use of simulators was present in nine studies[12,14-15,17-22], with the use of high-fidelity simulators standing out. Five studies[13,16,19,21,23] did not report the models or the degree of fidelity of the simulators.

Table 3 - Characterization of the simulations and the target population. Chapecó, Santa Catarina, Brasil, 2022

Simulation themes	Cardiorespiratory arrest in adults[12,15,18-20,22] - eight scenarios
	Cardiorespiratory arrest in neonates[14] - a scenario
	Incident with multiple victims[13,16,21] - three scenarios
	Congestive heart failure[19] - a scenario
	Stroke[19] - a scenario
	Septic shock[19] - a scenario
	Chemotherapy infusion reaction[17] - a scenario
	Cord prolapse[23] - a scenario
	Postpartum hemorrhage[23] - a scenario
Simulation participants	Nursing students only[12,14-15,17-20,22]
	Nursing students and medical students[13,16,21,23]
Simulation modalities	Clinical simulation using patient simulators (manikins)[14,17,19,22]
	Clinical simulation with simulated patient (human)[13,16,23]
	Hybrid simulation[12,15,21]
	Clinical simulation for skills training[18,20]
Degree of fidelity and simulator models	High-fidelity simulators[12,14,17,18,20] (Gaumard Advanced Patient simulators, METIman®)
	Medium-fidelity simulators[18,20] (Resusci Anne® Skillreporter, Resusci Anne® QCPR®)
	Low-fidelity simulators[15,20] (Mini Anne®Plus)
	Did not inform the simulator's fidelity[22]

Source: Prepared by the authors based on survey data.

Most of the simulations were carried out in university simulation laboratories[12,15-20,22], two took place in simulation centers outside of universities[21,23] and two studies did not report the location[13-14].

The use of actors to simulate patients was present in eight studies, either in isolation or in hybrid simulation scenarios[12,13,15-16,18,20-21,23]. The actors played the role of family members or patients. Of the studies that used simulated patients, only one[21] involved professional actors; the others involved undergraduate students. The moulage technique was used to prepare the actors.

Prebriefing

The prebriefing involves preparation for the simulation and the briefing, which consists of orientation and activities carried out with the students prior to the simulated scenario. With regard to the theoretical content of the simulations, this was made available to students mainly in the form of courses and classes, while other less common forms were lectures, symposia and the sending of material for prior study.

The actions carried out during the briefing were superficially covered in the studies, five of which[12,15-18] did not report on the activities carried out during this stage of the simulation. The elements developed in the briefing include a review of the protocol for dealing with the scenarios[20-22,23], providing the students with information on the learning objectives[14,19,22], a description of the simulated environment[19,23] and how the simulators work[19-20].

Other important elements that were also developed at this stage include the psychological preparation of the stu-

dents for the simulation, the promotion of a welcoming and trusting environment, the expectations of the participants, a description of the roles in which the students would be simulating and providing a time to clarify doubts. Two studies reported that the briefing stage was carried out using a previously recorded video[20,23].

Scenario development

Five studies highlighted the incorporation of good practice guidelines in simulation to guide the design of the proposed scenarios[14-16,19,21-22]. However, only three emphasized the adoption of a theoretical framework for learning[13,17,22], opting for Kolb's Experiential Learning Theory. With regard to the guidelines for the subjects of the simulations, ten studies[12,14-19,21-23] referenced internationally recognized guidelines for the preparation of scenarios. On the other hand, only three[4,6,8] mentioned the prior validation of simulation scenarios and/or checklists by experts.

Little information was provided in the articles about the role of the instructor in the simulation scenarios, with the emphasis being on the instructors' experience or certification in clinical simulation or in the theme of the scenario. Some authors have pointed out that the scenarios were based on real situations[12,16-19]. Scenario times ranged from 10 minutes to an hour, the longest being those dealing with incidents with multiple victims[13,16,21].

In terms of the students' involvement in the scenario (actively or as observers), it was noted that in the skills scenarios all the students actively participated in the activity. In some cases, student observers were given the task of documenting the actions carried out by the students working directly in the scenario[12,13,16-17,21-23]. Only

three studies[12,16,21] provided information on the progression of the scenario during the simulation, such as situations in which patients deteriorated.

Debriefing e Feedback

Seven studies used the debriefing technique[13-15,17,19,21-23] and one used feedback[16]. Three studies did not specify the technique used[12,18,20].

Regarding the way the debriefing was conducted, the authors reported separating the participants into small groups, in which they had the opportunity to reflect and evaluate their performance, skills, positive and negative aspects and what improvements could be made. The use of guiding questions focused on the theme of the simulation was also reported. Only two studies reported the debriefing method used, namely debriefing model of clinical reasoning[21] and debriefing with good judgment[19]. The debriefing time ranged from 15 minutes to an hour.

Evaluation and outcome

Knowledge was the outcome variable most evaluated in the studies[12-14,16-18]. Also worth mentioning are the variables self-confidence[14-15,17,19], skills[12,16,20] and satisfaction with the simulation[13,17,19], which were evaluated in three studies. Other variables analyzed were experience with simulation[22-23], self-efficacy[17], clinical reasoning[21] and collaborative skills[23]. It was also found that all the studies showed positive results in relation to the items assessed. The measuring instruments used ranged from validated scales to questionnaires drawn up by the authors. Only three used qualitative analyses[14,22-23] and the others used statistical tests.

DISCUSSION

Simulation as a teaching strategy has been widely explored globally, with relatively recent studies. In this review, considering the area of Emergency Nursing, Brazil and Australia have stood out in terms of publications. These findings reflect growing academic interest, in line with the current trend to re-evaluate traditional teaching methods, given the restrictions on available clinical experience and concerns about patient safety[24]. In the context of emergency nursing, it is possible to identify gaps, since scientific production focuses mainly on cardiopulmonary arrest (CPR) scenarios in adult patients, neglecting other relevant areas.

CA consists of the sudden interruption of systemic circulation and ventilatory activity, requiring immediate attention due to the risk of irreversible brain damage or death. The first few minutes are considered crucial, and it is important for professionals to know and develop their skills in order to minimize harm to patients[25]. In this sense, universities are looking for innovative learning methods, such as simulations, which allow students to apply theory and develop cognitive, affective and psychomotor skills when faced with emergencies.

Simulation offers a wide range of content and encourages students to improve their knowledge during their training. Considered a form of teaching that seeks to anticipate or amplify real experiences, simulation creates interactive situations that resemble the daily lives of professionals. Therefore, the fundamental concept for simulation is fidelity, which measures how accurately a simulation represents reality in terms of possible

cues, stimuli and interactions[26].

With regard to the fidelity of the simulated activities, individual actions and teamwork to solve complex problems in clinical health practice stand out. High-fidelity manikins are the most suitable for use, as they have physiological responses that help students to understand the realism of the scenario and allow them to train attention to pathologies in patients in a stable, unstable, critical clinical situation or in an anesthetic situation, as well as the management of a team that has to solve a concrete situation, in which decision-making and teamwork are crucial[26].

However, not all universities have access to these resources due to financial constraints. In these cases, strategies such as simulation with simulated patients, who can be actors, students or other professionals playing the roles of patients or companions, are viable alternatives, since they associate enthusiasm with the activity and do not require the use of large technologies[27]. Hybrid simulation is also an option, combining anatomical parts with simulated patients, creating hybrid patients to simulate procedures and make practices more realistic. From the same perspective, the moulage technique, which involves makeup and molds on the limbs to simulate injuries, diseases, aging, secretions and odors, is also an approach to bring realism[27].

In the context of interprofessional simulation, an approach that has been addressed in a limited way in this review deserves to be highlighted due to its intrinsic relevance. Interprofessional simulation, a method that brings together two or more healthcare professions in the same scenario, aims to improve collaborative skills and foster a more holistic understanding of healthcare[28]. Reinforcing this approach, a systematic review with meta-analysis revealed that educational programs anchored in interprofessional simulation promoted significant improvements in teamwork and communication. These results corroborate the fact that interprofessional simulation not only strengthens these skills, but also raises the competencies of healthcare students[29]. Early integration of this approach into educational curricula, supported by administrative, institutional and financial efforts, can enhance the training of future healthcare professionals, giving them the ability to provide safer and more integrated care.

In the context of creating simulation scenarios, the development stage is of crucial importance for establishing an immersive learning experience. In this context, the development of effective scenarios requires meticulous planning, involving teachers and players, with the aim of allowing students to experience practical clinical situations that promote the development of critical and reflective skills[30]. It is essential that the simulated scenarios represent realistic and instructive clinical situations, interacting with the participants to foster critical thinking, decision-making and problem-solving, ensuring that they are credible, relevant and engaging.

The adoption of good practice guidelines in simulation, such as those recommended by the International Nursing Association of Clinical and Simulation Learning (INACSL)[31], is crucial in the construction of robust scenarios. These normative guidelines act as beacons for sol-

id methodological planning, ensuring the validity and effectiveness of the simulations. It is worth noting that five articles in this review anchored their scenarios in good practice guidelines. At the same time, validation of the scenario emerges as an essential step in achieving the objectives, with content validation by experts in the field and clinical simulation. This increases the reliability and relevance of the proposed clinical case, enriching it with suggestions backed up by evidence[32]. It can be seen that in this review, only three studies reported the execution of scenario validation, indicating an area to be further explored in future research.

As far as the simulation process is concerned, pre-briefing, conducted in a structured way before the scenario begins, plays a key role in preparing students. This preparation stage can adopt theoretical approaches or strategies such as the inverted classroom and the briefing, which takes place moments before the simulation. During the prebriefing, the aim is to clarify the general context of the simulation, while the briefing provides specific information about the problem to be addressed, outlining the clinical scenario to be experienced[33]. At this point, the facilitator identifies the participants' expectations and offers guidance on the environment, equipment and simulators. Particular details of the scenario are shared, covering the presentation of the problem and the steps for carrying out the task. In addition, it is important to establish rules and limits through a fictional contract, guiding the role of facilitators and evaluators in the simulation.

Debriefing, on the other hand, takes place immediately after the simulation and represents the last phase in which both the student and the teacher reflect on the activity carried out. During this stage, possible improvements are discussed and strengths and weaknesses are assessed. The feedback offered aims to encourage students to actively consider their actions. The effectiveness of this feedback is related to the emphasis placed on individual and team performance, the context in which it is provided, and the expected results of the simulation[34].

The immediate analysis of post-simulation knowledge was a recurring facet in many of the studies investigated, revealing a notable increase in understanding after the simulation[12-14,16-18]. However, these studies not only corroborated this increase in knowledge, but also highlighted significant advances in skills and self-confidence during the simulated activities. In light of the above, it is clear that simulated practice provides a suitable arena for assessing multiple vital components in building competencies, encompassing technical skills and clinical judgment, as well as intrinsic confidence in students. The promotion of simulations in a safe and believable environment is of unparalleled magnitude, since it is aligned with fostering the student's self-confidence and sense of security, thus improving performance substantially.

The limitations of this article include the lack of detail on the specific design of the simulation scenarios, the absence of comprehensive information on the role of facilitators, and the insufficient exploration of prebriefing and debriefing. However, the review shows significant prog-

ress in understanding the use of clinical simulation in teaching emergency nursing. It highlights gaps in the diversification of the themes explored in the simulations, signaling valuable directions for future research that could cover a variety of emergency scenarios. The review also contributed by identifying different simulation modalities and signaling the importance of interprofessional simulation as a powerful tool for training healthcare professionals to work effectively in multidisciplinary teams. This review has provided information that can guide innovative teaching-learning strategies, considering the complex challenges of contemporary clinical practice.

However, it is imperative to explore innovative approaches to evaluating these studies and simulation-based training methods, in order to effectively integrate them as educational tools in the curricula of undergraduate courses aimed at healthcare professionals. In this way, this research can make a significant contribution to the debate on curriculum planning in the training of nurses, with the aim of introducing new educational strategies that enrich the teaching-learning experience of nursing students from the initial stages of their degree.

CONCLUSIONS

This review revealed a notable concentration of recent studies with strong and moderate evidence. There were gaps in the diversification of the themes explored in the emergency simulation scenarios. Although cardiopulmonary resuscitation in adult patients is a highly relevant topic in nursing training, other crucial areas of nursing practice in critical situations, such as respiratory and trauma emergencies, were not covered. These gaps indicate directions for future research, including expanding the topics investigated, developing and validating scenarios and evaluating the effectiveness of these approaches in developing competencies and skills.

The identification of the different simulation modalities used, with emphasis on simulation using high-fidelity simulators, simulation with actors and hybrid approaches, reveals a remarkable wealth of methods available to foster practical and immersive learning. Only a few studies carried out interprofessional clinical simulations, a powerful modality for preparing healthcare professionals to work effectively in multidisciplinary teams in a collaborative manner. Considering the gaps in the description of the simulations, it is recommended that future studies present central elements of the simulation in a more comprehensive manner, such as the careful development of the scenarios, the role of the facilitators and the in-depth conduct of the pre-briefing and debriefing. In addition, the expansion of simulation studies focusing on interprofessionality offers a valuable opportunity to enrich discussions and the critical thinking of healthcare professionals, contributing directly to improving the quality of health outcomes.

As clinical simulation continues to evolve as a cornerstone in the training of healthcare professionals, this review offers a valuable contribution to the scientific landscape, providing essential information that can guide innovative teaching-learning strategies and shape future research. In the dynamic and complex context of modern healthcare, clinical si-

mulation has emerged as an essential tool for training competent nurses who are prepared to face the pressing challenges of clinical practice.

REFERENCES

1. Salifu DA, Heymans Y, Christmals CD. A Simulation-Based Clinical Nursing Education Framework for a Low-Resource Setting: a multimethod study. Healthcare (Basel) [internet]. 2022;10(9):1639. DOI: https://doi.org/10.3390/healthcare10091639.

2. Judd BK, Currie J, Dodds KL, Fethney J, Gordon CJ. Registered nurses psychophysiological stress and confidence during high-fidelity emergency simulation: effects on performance. Nurse Educ Today [internet]. 2019;78:44-9. DOI: https://doi.org/10.1016/j.nedt.2019.04.005.

3. Chow KM, Ahmat R, Leung AW, Chan CW. Is high-fidelity simulation-based training in emergency nursing effective in enhancing clinical decision-making skills?: a mixed methods study. Nurse Educ Pract [internet]. 2023;69:103610. DOI: https://doi.org/10.1016/j.nepr.2023.103610.

4. Ji J, Langley B, Zordan R, Dijk JV, Thies HH, Brahmbhatt A, et al. Heart rate responses in critical care trainees during airway intubation: a comparison between the simulated and clinical environments. BMC Emerg Med [internet]. 2023;23(1):66. DOI: https://doi.org/10.1186/s12873-023-00832-8.

5. Peabody J, Ziesmann MT, Gillman LM. Comparing the stress response using heart rate variability during real and simulated crises: a pilot study. Adv Health Sci Educ Theory Pract [internet]. 2023. DOI: https://doi.org/10.1007/s10459-023-10246-7.

6. Dias, RD, Scalabrini A Neto. Stress levels during emergency care: a comparison between reality and simulated scenarios. J Crit Care [internet]. 2016;33:8-13. DOI: https://doi.org/10.1016/j.jcrc.2016.02.010.

7. Bias CG, Agostinho LS, Coutinho RP, Barbosa GS. Simulation in emergency nursing education: an integrative review. J Nurs Educ Pract [internet]. 2016;6(12):12-17. DOI: https://doi.org/10.5430/jnep.v6n12p12.

8. Whittemore R, Knafl K. The integrative review: update methodology. J Adv Nurs [internet]. 2005;52(5):546-53. DOI: https://doi.org/10.1111/j.1365-2648.2005.03621.x.

9. Peters M, Marnie C, Tricco A, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evid Synth [internet]. 2020;18(10):2119-26. DOI: https://doi.org/10.11124/JBIES-20-00167.

10. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ [internet]. 2021;372(71). DOI: https://doi.org/10.1136/bmj.n71.

11. Fineout-Overholt E, Stillwell SB. Asking compelling, clinical questions. In: Melnyk B M, Fineout-Overholt E, organizators. Evidence-based practice in nursing and healthcare: a guide to best practice [internet]. Philadelphia: Wolters Kluwer; 2019. p. 33-54. Available from: https://books.google.com.br/books?id=hHn7ESF1DJoC&printsec=frontcover&hl=pt-BR&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

12. Kenny G, Bray I, Pontin D, Jefferies R, Albarran J. A randomised controlled trial of student nurse performance of cardiopulmonary resuscitation

in a simulated family-witnessed resuscitation scenario. Nurse Educ Pract [internet]. 2017;24:21-26. DOI: https://doi.org/10.1016/j.nepr.2017.03.004.

13. Currie J, Kourouche S, Gordon C, Jorm C, West S. Mass casualty education for undergraduate nursing students in Australia. Nurse Educ Pract [internet]. 2018;28:156-162. DOI: https://doi.org/10.1016/j.nepr.2017.10.006.

14. Carolan-Olah M, Kruger G, Brown V, Lawton F, Mazzarino M, Vasilevski V. Communicating out loud: Midwifery students' experiences of a simulation exercise for neonatal resuscitation. Nurse Education in Practice [internet]. 2018;29:8-14. DOI: https://doi.org/10.1016/j.nepr.2017.10.027.

15. Barbosa GS, Bias CG, Agostinho LS, Oberg LM, Lopes RO, Sousa RM. Eficácia da simulação na autoconfiança de estudantes de Enfermagem para ressuscitação cardiopulmonar extra-hospitalar: um estudo quase experimental. Sci. Med [internet]. (2019;29(1):e32694. DOI: https://doi.org/10.15448/1980-6108.2019.1.32694.

16. Lima DS, Vasconcelos IF, Queiroz EF, Cunha TA, Santos VS, Arruda FA, et al. Simulação de incidente com múltiplas vítimas: treinando profissionais e ensinando universitários. Rev. Col. Bras. Cir. [internet]. 2019;46(3). DOI: https://doi.org/10.1590/0100-6991e-20192163.

17. Sharour LA. Implementing simulation in oncology emergencies education: a quasi-experimental design. Technol Health Care[internet]. 2019;27(2):223-232. DOI: https://doi.org/10.3233/THC-181543.

18. Costa CR, Melo ES; Reis RK. Simulação no ensino de emergência para estudantes de Enfermagem. Rev. Cuid [internet]. 2020;11(2). DOI: http://dx.doi.org/10.15649/cuidarte.853.

19. Bortolato-Major C, et al. Autoconfiança e satisfação dos estudantes de Enfermagem em simulação de emergência. REME rev. min. Enferm [internet]. 2020;24:e-1336. DOI: http://doi.org/10.5935/1415.2762.20200073.

20. Oermann MH, Krusmark MA, Kardong-Edgren S, Jastrzembski TS, Gluck KA. Training interval in cardiopulmonary resuscitation. PloS one [internet]. 2020;15(1):e0226786. DOI: https://doi.org/10.1371/journal.pone.0226786.

21. Hu F, Yang J, Yang BX, Zhang FJ, Yu S-H, Liu Q, et al. The impact of simulation-based triage education on nursing students' self-reported clinical reasoning ability: a quasi-experimental study. Nurse Educ Pract [internet]. 2021;50:102949. DOI: https://doi.org/10.1016/j.nepr.2020.102949.

22. Gutiérrez-Puertas L, Márquez-Hernández VV, Gutiérrez-Puertas V, Rodríguez-García MC, García-Viola A, Aguilera-Manrique G. Are you prepared to save a life?: Nursing students' experience in advanced life support practice. Int J Environ Health Res [internet]. 2021;18(3):1273. DOI: https://doi.org/10.3390/ijerph1803127.

23. Burns ES, Duff M, Leggett J, Schmied V. Emergency scenarios in maternity: an exploratory study of a midwifery and medical student simulation-based learning collaboration. Women Birth [internet]. 2021;34(6):563-569. DOI: https://doi.org/10.1016/j.wombi.2020.10.005.

24. Meschial WC, Ciccheto JR, Lima MF, Menegaz JC, Echevarría-Guanilo ME, Oliveira ML. Active teaching strategies improve nursing knowledge and skills to assist burn victims. Rev. bras. Enferm [internet]. 2021;74(5):e202002354. DOI:

https://doi.org/10.1590/0034-7167-2020-0235.

25. Matos JH, Gomes EB, Lima GS, Albuquerque GA, Maia ER. Competências de Enfermagem na simulação da parada cardiorrespiratória: scoping review. Revista Recien – Revista Científica de Enfermagem [internet]. 2021;11(33):149-156. DOI: https://doi.org/10.24276/rrecien2021.11.33.149-156.

26. Lima SF, D'Eça A Júnior, Silva RA, Pereira GA Júnior. Conhecimentos básicos para estruturação do treinamento de habilidades e da elaboração das estações simuladas [internet]. In: Pereira GA Júnior, GUEDES HT, organizators. Simulação em saúde para ensino e avaliação: conceitos e práticas. São Carlos: Cubo Multimídia; 2021 [cited 2023 Jun 15]. p. 53-81. Available from: https://website.abem-educmed.org.br/wp-content/uploads/2022/03/LIVRO-Simulacao-em-saude-para-ensino-e-avaliacao.pdf.

27. Santos EC, Almeida RG, Meska MH, Mazzo A. Paciente simulado versus simulador de alta fidelidade: satisfação, autoconfiança e conhecimento entre estudantes de Enfermagem no Brasil. Cogitare Enferm [internet]. 2021;26:e76730. DOI: https://doi.org/10.5380/ce.v26i0.76730.

28. Oliveira SN, Massaroli A, Martini JG, Rodrigues J. From theory to practice, operating the clinical simulation in Nursing teaching. Rev. bras. Enferm [internet]. 2018;71(Suppl 4):1791-8. DOI: http://dx.doi.org/10.1590/0034-7167-2017-0180.

29. Sezgin MG, Bektas H. Effectiveness of interprofessional simulation based education programs to improve teamwork and communication for students in the healthcare profession: a systematic review and meta-analysis of randomized controlled trials. Nurse Educ Today [internet]. 2023;120:105619. DOI: https://doi.org/10.1016/j.nedt.2022.105619.

30. Cazañas EF, Prado RL, Nascimento TF, Tonhom SF, Marin MJ. Simulation in nursing baccalaureate courses of Brazilian educational institutions. Rev. bras. Enferm [internet]. 2021;74:e20190730. DOI: https://doi.org/10.1590/0034-7167-2019-0730.

31. INACSL Standards Committee, Watts PI, McDermott DS, Alinier G, Charnetski M, Nawathe PA. Healthcare Simulation Standards of Best PracticeTM Simulation Design. Clin Simul Nurs [internet]. 2021;58:14-21. DOI: https://doi.org/10.1016/j.ecns.2021.08.009.

32. Negri EC, Pereira GA Júnior, Cotta CK Filho, Franzon JC, Mazzo A. Construction and validation of simulated scenario for nursing care to colostomy patients. Texto & contexto enferm [internet]. 2019;28:e20180199. DOI: https://doi.org/10.1590/1980-265X-TCE-2018-0199.

33. INACSL Standards Committee, McDermott DS, Ludlow J, Horsley E, Meakim C. Healthcare Simulation Standards of Best PracticeTM Prebriefing: Preparation and Briefing. Clin Simul Nurs [internet]. 2021;58:9-13. DOI: https://doi.org/10.1016/j.ecns.2021.08.008.

34. INACSL Standards Committee, Decker S, Alinier G, Crawford SB, Gordon RM, Wilson C. Healthcare Simulation Standards of Best PracticeTM The Debriefing Process. Clin Simul Nurs [internet]. 2021;58:27-32. DOI: https://doi.org/10.1016/j.ecns.2021.08.011.

How to cite this article:
Meschial WC, Paula A, Nespollo AM, et al. Explorando a utilização da simulação clínica no ensino de Enfermagem em emergência: uma revisão integrativa. Revista de Enfermagem do Centro-Oeste Mineiro. 2024;14:e5148. [Access_____]; Available at:_____. DOI: http:/doi.org/10.19175/recom.v14i0.5148.