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Clinical simulation in teaching nursing students: Scoping review

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ABSTRACT

Introduction: Clinical simulation is an innovative teaching methodology that is widely recognised in nursing training for its ability to promote technical, relational and critical skills in a safe environment. It allows students to apply theoretical knowledge, develop clinical reasoning and acquire self-confidence before entering real care contexts.
Objectives: To map the available scientific evidence on the use of clinical simulation in teaching nursing students, identifying perceived benefits and barriers to its implementation.
Methodology: Follows Joanna Briggs Institute methodology and PRISMA-ScR guidelines. The March 2025 search used "Students, Nursing", "Simulation Training" and "Education, Nursing" in MEDLINE® Complete (via PubMed); CINAHL® Complete, MedicLatina® and Cochrane Central Register of Controlled Trials® (via EBSCOhost®). Included free full-text studies in any language, selected by two independent reviewers, with a third reviewer in the event of disagreement.
Results: Main benefits: increased self-efficacy and confidence; development of technical skills; reflection and critical thinking; satisfaction and efficiency in learning. Obstacles to implementation: emotional and psychological challenges; training and support for teachers/supervisors; limitations of physical, human and financial resources; logistical problems and poor curriculum integration; lack of realism and limitations of simulated scenarios; insufficient preparation of students; initial resistance; ethical and emotional demands.
Conclusion: Clinical simulation is a valuable educational tool in nursing, improving readiness for complex clinical situations. Effective implementation requires institutional support, educator training, and emotional support. This review underscores the need for structured curriculum integration and further research into the long-term impact and effectiveness of simulation in real-world clinical practice.

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RESUMO

Introdução: A simulação clínica é uma metodologia de ensino inovadora, reconhecida na formação em enfermagem pela sua capacidade de promover competências técnicas, relacionais e críticas num ambiente seguro. Permite aplicação de conhecimentos teóricos, desenvolver raciocínio clínico e adquirir autoconfiança.
Objetivos: Mapear a evidência científica disponível sobre a utilização da simulação clínica no ensino de estudantes de enfermagem, identificando os benefícios percepcionados e os entraves à sua implementação.
Metodologia: Segue a metodologia do *Joanna Briggs Institute* e PRISMA-ScR. Pesquisa realizada em março de 2025, com "*Students, Nursing*", "*Simulation Training*" e "*Education, Nursing*" na MEDLINE® *Complete* (via PubMed), CINAHL® *Complete*, MedicLatina® e *Cochrane Central Register of Controlled Trials*® (via EBSCOhost®). Incluídos estudos em *free full text*, sem restrição de idioma, selecionados por dois revisores independentes, com um terceiro revisor em caso de desacordo.
Resultados: Principais benefícios: aumento da autoeficácia e confiança; desenvolvimento de competências técnicas; reflexão e pensamento crítico; satisfação e eficiência na aprendizagem. Entraves à implementação: desafios emocionais e psicológicos; formação e apoio aos docentes/supervisores; limitações de recursos físicos, humanos e financeiros; problemas logísticos e fraca integração curricular; falta de realismo e limitações dos cenários simulados; preparação insuficiente dos estudantes e resistência inicial; exigência ética e emocional.
Conclusões: A simulação clínica é uma ferramenta pedagógica valiosa no ensino de enfermagem, promovendo a preparação para situações clínicas complexas. A sua implementação eficaz exige apoio institucional, formação de docentes e estratégias de suporte emocional. Esta revisão reforça a necessidade de uma integração curricular e mais investigação sobre a simulação na prática clínica real.

Introduction

Clinical simulation (CS) is a relevant pedagogical strategy when training health professionals, particularly nurses, and has an impact on personal satisfaction, the perception of safety and the achievement of health care objectives. It is an educational process that covers the cognitive and behavioural dimensions, as it promotes self-esteem and self-confidence, facilitating the acquisition of knowledge and learning.[1]

It can be seen as a technique, not just a technology, which replaces real experiences in the learning context, seeking to interactively reproduce essential aspects of the real world. It consists of a set of activities carefully planned to reflect the reality of the clinical environment, with the aim of demonstrating procedures, stimulating decision-making and fostering critical thinking. It often uses methods such as role play and the use of devices such as mannequins with different levels of fidelity (low, medium or high).[2]

It is recognised as an innovative teaching method and a pedagogical strategy of high value in nursing education, in line with the principles of active education. It aims to promote effective learning of technical and non-technical skills in a safe environment, contributing to the development of confidence and autonomy in professional practice. It also favours enhanced decision-making and teamwork.[1,3]

The student takes an active role in the teaching-learning process, becoming the protagonist in their training. It is a constantly evolving methodology that integrates teaching, research and practice. In addition, it promotes autonomy, stimulates problem-solving skills and encourages the development of critical thinking.[1]

The main objective of CS is to reduce errors by recreating scenarios based on real situations in practice, in a safe environment where it is possible to make mistakes without harming patients. This methodology facilitates the consolidation of theoretical concepts acquired in traditional teaching, allowing skills to be honed through training. It also helps to increase students' self-confidence and

perception of safety, preparing them more effectively for practice before they come into contact with patients.[1]

The study of CS is fundamental in health training, particularly in nursing, as it enables theory to be applied in a safe environment that is representative of clinical reality. As well as facilitating the learning process, it plays a central role in the development of professional skills, namely psychomotor skills, clinical and critical thinking, prioritisation of tasks, teamwork, communication, autonomy, confidence, decision-making under pressure and leadership.[1]

Recent systematic reviews have confirmed the benefits of clinical simulation in enhancing students' knowledge, skills, self-confidence and clinical reasoning. For instance, Lei et al. demonstrated significant gains in communication, clinical judgment and technical performance through high-fidelity simulation[4]; Alrashidi et al. highlighted the positive impact of simulation on self-confidence and team communication[5]; and Alharbi et al. reinforced the role of simulation in improving immediate knowledge and psychomotor skills, although they noted a lack of evidence on long-term retention.[6]

Despite these contributions, current literature remains methodologically heterogeneous and thematically fragmented. Several reviews are limited to isolated outcomes or specific competencies, lacking integration across the various dimensions of learning in nursing simulation. Moreover, inconsistencies in study designs and outcome measures reduce the generalisability of findings.

The initial search on the PROSPERO and Open Science Framework (OSF) platforms did not reveal systematic reviews that thoroughly explore the benefits and challenges of clinical simulation in nursing education. Existing reviews typically focus on narrow aspects, such as specific techniques, clinical areas, or isolated outcomes, lacking a comprehensive perspective. These limitations, already noted by recent robust studies,[4-6] underscore the need for a broader mapping of current knowledge.

In this context, a scoping review is justified, as it allows for the systematic identification, classification and synthesis of a wide range of evidence. This approach is particularly useful when the literature is diverse in terms of methodology, outcomes and populations, as is the case with simulation-based nursing education.

This scoping review aims to fill an underdeveloped area in the scientific literature by mapping the available scientific evidence on CS when teaching nursing students, identifying the benefits felt by students, as well as the obstacles associated with the implementation of this methodology. Understanding this evidence is essential to support future research, improve teaching practice and contribute to higher quality training for future nursing professionals, in a context where active and competency-based learning is becoming increasingly important.

In order to respond to the defined objective, a scoping review was chosen and the following research question was therefore formulated: What scientific evidence is available on CS when teaching nursing students?

Methodology

This review was conducted based on the Joanna Briggs Institute (JBI) methodological framework for scoping reviews,[7] which outlines the following operational steps: title; development of the title and question; introduction; inclusion criteria; search strategy; selection of information sources; data extraction; analysis of the evidence and presentation of the results, written in accordance with the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).[8] The protocol that guided this scoping review is registered on the OSF platform and can be consulted via the following link: https://doi.org/10.17605/OSF.IO/HP52V.

This type of review was chosen because, according to JBI recommendations, a scoping review is the most appropriate methodological approach when the objective is to map the breadth and nature of the existing evidence, particularly in areas where knowledge is emerging, scattered, or inconsistently reported. Previous reviews on clinical simulation in nursing education have tended to focus on narrow outcomes or specific interventions, without integrating the full range of benefits, strategies and implementation challenges.[4-6] Therefore, this scoping review is justified by the need to provide a broad synthesis of the available literature, identifying knowledge gaps and supporting future research and curriculum development.

Eligibility criteria

The eligibility criteria for this scoping review were established based on the acronym PCC (Population, Concept and Context), which is used for this type of review.[7] The population under analysis consists of nursing students; the central concept focuses on clinical simulation; and the context refers to nursing education. These criteria guide the selection of included studies, ensuring their relevance and alignment with the objectives of the review. Studies written in any language, available in free full text and with no time frame were included. Studies were included regardless of their methodological nature, including quantitative, qualitative, mixed, exploratory, analytical, review and grey literature. All studies that did not respond to the PCC acronym and the study objective were excluded.

Research strategy

The search and identification of studies in the databases took place in March 2025 and was carried out in three stages, consisting of: 1) In the initial stage, a preliminary search was carried out in the MEDLINE® Complete (via PubMed); CINAHL® Complete, MedicLatina® and Cochrane Central

Register of Controlled Trials® (via EBSCOhost®). The keywords of interest, identified in the titles, abstracts and indexing terms of the relevant studies, were used to develop a comprehensive search strategy. The Boolean operator "AND" will be used to combine the search terms and identify studies that address the topics of interest, as shown in Table 1. The following Boolean phrase was constructed: (("Students, Nursing"[Mesh]) AND "Simulation Training"[Mesh]) AND "Education, Nursing"[Mesh]. 2) In the second stage, the search strategy developed previously was adjusted for each source of information, taking into account the specificities of each one, as shown in table 1. In each database, the search strategy was adapted using appropriate controlled vocabularies. For example, MeSH terms were used in PubMed, and CINAHL Headings were used in the CINAHL® Complete database, ensuring the inclusion of indexed studies with terminological accuracy. In the third stage, a search was carried out in the list of references of the studies selected for data extraction, with the aim of identifying additional studies.

All languages were included to reduce the risk of excluding relevant studies. Articles in languages other than English, Portuguese or Spanish were translated by colleagues fluent in the language. Where these resources were not available, digital tools such as DeepL were used. No time restrictions were applied.

Several recent reviews have pointed to limitations in existing studies on clinical simulation in nursing education, such as heterogeneity in methods, lack of long-term follow-up, or inconsistency in outcome measures. By including a wide range of sources and study designs, this scoping review aims to reflect these limitations and identify areas where methodological improvement is needed.[4-6]

Table 1. Records of the searches conducted across all information sources.

Database	Strategy	Results
MEDLINE® Complete	(("Students, Nursing"[Mesh]) AND "Simulation Training"[Mesh]) AND "Education, Nursing"[Mesh]	134
CINAHL® Complete	(("Students, Nursing") AND ("Simulation")) AND ("Education, Nursing")	396
MedicLatina®	(("Students, Nursing") AND ("Simulation Training")) AND ("Education, Nursing")	1
Cochrane Central Register of Controlled Trials®	(("Students, Nursing") AND ("Simulation Training")) AND ("Education, Nursing")	2

Study selection

The articles identified in the databases were exported to the Intelligent Systematic Review platform (Rayyan®),[9] where the studies were selected. The process began with identifying and removing duplicates, followed by analysing the title and abstract. The remaining studies from the previous stage were then analysed by reading them in full. Studies that did not address CS in nursing education were excluded, including those that did not explore CS in basic or realistic mannequins, role-play or structured scenarios; did not analyse the relationship between nursing education and the effectiveness, benefits or difficulties of CS in teaching nursing students; focused on virtual reality as a teaching strategy; included nursing professionals in a continuing education context; did not address CS; centred on students from other professions; used CS only as an assessment tool and not as a teaching strategy; opinion articles, letters to the editor or editorials. The selection was conducted by two independent reviewers, with the intervention of a third reviewer in cases of disagreement. The results of the search and selection of studies are described and presented according to the recommendations of the PRISMA Extension for Scoping Reviews,[8] as shown in figure 1.

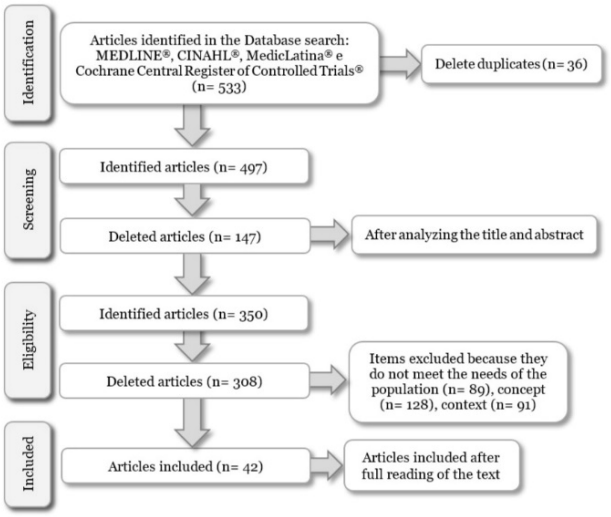

Figure 1. Flowchart of the process of identifying, selecting and including studies, based on the PRISMA-ScR recommendations, of the articles for the scoping review.

Data extraction

The data was analysed and extracted independently by two authors, following the methodological recommendations of the JBI.[7] The process involved a rigorous reading of the title, abstract and full text of the selected studies. The data was extracted using an instrument constructed by the authors with the aim of answering the guiding question of this scoping review and includes the following information: authors, year of publication, geographical location, study design, strategy used, curricular year of the student, subject implemented and main results (most effective approaches, benefits felt by students and supervisors and obstacles associated with implementing this methodology).

Results

The results are presented in summarised form, in line with the objectives and guiding question of this scoping review. A total of 533 studies were identified across the different databases, of which 36 were excluded for being duplicates. By analysing the title and abstract, 147 were removed. After reading them in full, they were disregarded due to the study population (n=89), concept (n=128) and context (n=91). Forty-two articles were included, the content of which will be presented descriptively and narratively, based on the evidence tables drawn up by the authors.

The forty-two studies included information on the most effective approaches, the benefits experienced by students and supervisors and the obstacles associated with implementing this methodology. Eight were carried out in Spain, six in Brazil, five in China, four in Korea, three in Norway, three in the United Kingdom, two in Iran, two in Portugal, two in Japan, one in South Korea, one in Turkey, one in Denmark, one in Italy, one in Australia, one in Saudi Arabia and one in Ireland. The year of publication varies between 2017 and 2024 and, from a methodological point of view, the predominance is experimental (33.3 per cent) and quasi-experimental (35.7 per cent) studies. Systematic reviews and meta-analyses were also identified (level 1.a), which reinforce the findings regarding the effectiveness of simulation in acquiring knowledge and practical skills.

The majority of studies used high-fidelity CS (n = 21), followed by those that used high-fidelity simulation with standardised patients (n = 12). Other less common formats included realistic scenario-based simulation (n = 2), video simulation (n = 2), computer simulation (n = 1), role-play (n = 2) and videoconference simulation (n = 1). One study did not provide a clear description of the type of simulation used.

As for the year of study of the participants, the simulation was implemented predominantly with 3rd year students (n = 18), followed by 4th year (n = 14), 2nd year (n = 9) and 1st year (n = 7). Only one study involved 5th year students and in three studies it was not possible to clearly identify the year of training, and one study did not specify this information. This distribution suggests a predominance of CS implementation in the middle years of the nursing course, when students already have basic theoretical knowledge and are beginning to integrate it into more complex clinical contexts.

The identification of thematic categories resulted from a detailed analysis of the results of each study, allowing the organisation of the main topics and central issues emerging from the research. It is important to note that the selection of these categories was based on the frequency with which the themes appeared in the studies analysed and their relevance to understanding CS in the teaching of nursing students.

The benefits most frequently identified in the studies included in this review show the positive impact of CS on the academic and professional development of nursing students. One of the most emphasised dimensions refers to increased self-efficacy and confidence.[10-24] The data points to a significant improvement in self-confidence in performing clinical and communicative skills, as well as a reduction in negative emotional states such as anxiety, fear and anger, especially during simulated clinical decision-making situations.

At the same time, the development of technical competences,[10-13,18-23,25-40] reflected in improvements in the acquisition of theoretical and practical knowledge, technical performance and clinical judgement. There was also improvement in psychomotor, cognitive and communication skills, especially in contexts that require interprofessional collaboration and care aimed at specific populations, such as the elderly or those with mental disorders. These results show that students are better prepared for real clinical practice, reinforcing their awareness of the responsibilities and decisions inherent in professional practice.

In the area of reflection and critical thinking,[10,14,15,18,20,31,32,34,37,38,41-45] CS proved to promote students' ability to analyse their own feelings, thoughts and actions, fostering clinical reasoning and informed decision-making. Debriefing, conducted by both peers and instructors, emerged as an essential tool for reinforcing self-reflection and improving the skills developed during the simulated scenarios.

Finally, several studies refer to satisfaction and efficiency in learning,[10-15,17,20-32,34-38,45,46] associating CS with a motivating, engaging educational experience that has a positive impact on performance. A positive correlation was also observed between the interest shown by students and satisfaction levels, especially in shorter, more intensive simulation sessions.

Despite the recognised benefits, the implementation of CS in nursing education faces several obstacles. One of the most frequently mentioned obstacles concerns the emotional and psychological challenges faced by students, such as anxiety, fear of making mistakes, insecurity and discomfort in the face of complex scenarios, especially in contexts that involve a significant emotional burden, which compromises involvement and performance during simulations.[12,13,15,17,18,21,22,25,26,31,38,39,41,42,46-48] Another relevant obstacle concerns the training and support for teachers/supervisors, where we highlight the insufficient pedagogical and emotional training of teachers and supervisors, the lack of structured feedback and the lack of experienced supervisors, which are essential for ensuring the effectiveness of the training process.[10,11,19,21,32,34,35,38,41,43] In addition, physical, human and financial resource limitations stand out, such as the scarcity of suitable spaces, the lack of technological equipment and the high costs of purchasing and maintaining simulators, associated with the lack of institutional support.[18,27,38,43,49] Logistical problems and poor curriculum integration are also barriers, with difficulties in planning, lack of time, heterogeneity of methods and lack of standardisation making it difficult to consolidate

learning.[11,14,20,27,29,30,34,35,43] Obstacles related to the lack of realism and limitations of the simulated scenarios were identified, where the artificiality of the models, poor interactivity and the mismatch between the level of fidelity and the students' expectations are factors that limit immersion and realism.[28,33,37,45,50] Insufficient student preparation and initial resistance to active participation are also obstacles, making it difficult to adapt to the simulated environment and transfer learning to practice.[23,24,32,36,44,46,51] Finally, the ethical and emotional demands of certain scenarios, such as those involving end-of-life care, mental health or gender-based violence, reveal the need for psychological support and specific preparation strategies.[19,21,22,25,39] This data highlights the complexity of implementing CS, requiring a multidimensional approach to ensure its effectiveness in the context of nursing supervision.

Discussion

The discussion of the results obtained from the 42 included studies centres on specific thematic categories that emerge recurrently, reflecting the consistent benefits associated with the use of CS in nursing education, as well as the main obstacles to its implementation. The analysis grouped by classes of themes allows for a more in depth understanding of the intersections and particularities of each study. The emerging thematic categories relating to the benefits of CS include: increased self-efficacy and confidence; development of technical skills; reflection and critical thinking; satisfaction and efficiency in learning and development of interpersonal and communication skills. In contrast, the main obstacles to its implementation are organised around seven categories: emotional and psychological challenges; training and support for teachers and supervisors; limitations of physical, human and financial resources; logistical problems and poor curriculum integration; lack of realism and limitations of simulated scenarios; insufficient preparation of students and initial resistance and ethical and emotional demands.

Among the most recurrent benefits identified in the included studies, the increase in students' self-efficacy and confidence after taking part in simulated scenarios stands out. In the study by Linn, de Souza & Caregnato[17] 76,6% of the students gave the maximum score to their self-confidence after carrying out a cardiac arrest simulation. This result is supported by Parlak et al.[52], who showed that CS, carried out prior to the start of clinical practice, significantly reduced anxiety levels and increased students' self-confidence levels.

Similarly, Chow et al.[18] showed statistically significant gains in self-confidence and decision-making ability in emergency situations, which is corroborated by Van de Weyer et al.,[53] who validated the NASC-CDM scale for high-fidelity simulation contexts and concluded that these environments effectively promote self-perception of clinical decision-making competence. Escribano et al.[34] reported a significant increase in communicational self-efficacy following participation in simulations with standardised patients. This finding is consistent with the results of Wojcieszek et al.,[54] who associate the application of diversified teaching strategies with improved self- confidence and satisfaction with learning, especially when supported by active and engaging processes.

Eade and Winter[23] revealed that all the students felt more confident interacting with young people with mental disorders, even six months after the training, supporting the durability of the simulation's effect. This result is in line with the conclusions of Moraes et al.,[55] who show that active participation in simulations has a long-lasting impact on the retention of technical skills and the development of self-efficacy, when compared to learning by observation. McConville and Lane[24] followed this trend by identifying substantial improvements in communication self-efficacy after viewing video simulations. Li et al.[56] explain this phenomenon through the learning mechanisms activated by immersive technologies, such as desktop virtual reality, which make it possible to personalise the educational experience, boost student engagement and promote greater internalisation of the skills trained.

Finally, Reed et al.[57] complement this analysis by distinguishing between facilitating and debilitating anxiety in simulation, arguing that moderate levels of anxiety can act as a stimulus for performance. This perspective is relevant to interpreting the positive effects recorded in the included studies, emphasising the importance of designing scenarios that promote self-confidence without generating emotional overload.

The development of technical skills is another of the main benefits of using CS in nursing education. He et al.[10] reported significant improvements in students' performance in cardiac arrest situations after training with high-fidelity mannequins. This is supported by Moraes et al.,[55] who showed that after practical training with simulation, students significantly increased their scores in basic life support protocols, showing concrete gains in the execution of technical procedures in a hospital environment.

Similarly, Nazari et al.[27] pointed out that the deliberate repetition of technical tasks in a controlled environment allowed skills to be consolidated and errors to be corrected in real time. This finding is in line with the results of Stenseth et al.[58], which indicate that students value the possibility of learning from mistakes during simulation and emphasise the positive impact on confidence and technical performance in highly complex situations.

Nunes et al.[41] reported greater confidence in clinical decision-making after simulations of acute scenarios. Li et al.[56] corroborate this result by showing that simulation

significantly improves the ability to recognise signs of patient deterioration, promoting rapid and informed decision-making in critical contexts. Escribano et al.[19] emphasised the development of technical skills associated with therapeutic communication, especially in difficult contacts. These data are consistent with the study by Yılmaz et al.[59] who showed that simulation with standardised patients contributed to an increase in communication proficiency and technical skills in vaccination campaigns, with particular emphasis on management of doubt in vaccination.

Kunst et al.,[46] for their part, emphasise the impact of simulation on the acquisition of structured clinical reasoning through exposure to multiple simulated scenarios. This aspect is reinforced by Parlak et al.,[52] which showed that simulation applied to obstetric emergencies facilitates the development of rapid clinical thinking and effective problem-solving, especially when students have the opportunity to reflect on the action with adequate supervision.

CS has proven to be an effective pedagogical strategy for promoting reflection and critical thinking among nursing students. Through exposure to complex clinical scenarios and structured debriefing sessions, students are systematically encouraged to critically analyse their decisions, question their reasoning and articulate theoretical knowledge with clinical practice. Several studies show significant improvements in clinical judgement, diagnostic reasoning, critical evaluation skills and the development of metacognitive competences.[10,14,15,18,20,31,32,34,37,38,41,43-45] The use of Tanner's clinical judgement model[14] as a structure to facilitate critical thinking and the application of specific instruments, such as the Lasater Clinical Judgement Rubric,[44] made it possible to measure the students' cognitive gains after the simulation. These findings converge with the results presented by Reed et al.,[57] who demonstrate how structured debriefing contributes to the construction of clinical reasoning and informed decision-making, particularly through reformulation and guided reflection. Stenseth et al.[58] reinforce this effect by documenting that students, after participating in simulations with reflective feedback, developed greater situational awareness and the ability to justify their clinical interventions. Wojcieszek et al.[54] also show that the quality of debriefing correlates positively with increased student confidence and satisfaction, emphasising the central role of post-simulation reflection. Similarly, Yılmaz et al.[59] show that simulation with standardised patients, accompanied by moments of observation and feedback, significantly improves students' conceptual knowledge and critical capacity when faced with complex topics such as doubt in vaccination. Finally, Mapulanga et al.[60] identify debriefing as a safe and formative space that reinforces theory practice integration and the development of structured clinical thinking. Taken together, these data reinforce the evidence that CS, combined with robust reflection and feedback strategies, is a promising tool for consolidating critical and ethical competences for professional nursing practice.

Learning satisfaction and efficiency emerge as dimensions widely valued by nursing students,[10-15,17,20-32,34-38,45,46] where there is widespread acceptance of CS as an effective teaching strategy. The participants emphasise the emotional involvement, the realism of the scenarios and the possibility of integrating theory and practice in a safe environment, which translates into a positive perception of the usefulness of learning. Del Pino et al.,[36] for example, emphasise the impact of simulation on the development of cultural competence, while Jiménez-Rodríguez et al.[22] demonstrate the formative involvement obtained in simulations on gender-based violence. Studies by Eade and Winter[23] and McConville and Lane[24] confirm that both face-to-face simulation and interactive audio-visual resources contribute to high levels of satisfaction and motivation.

These results are in line with data from Li et al.,[56] who identified that simulation provides students with a clearer and more meaningful experience than lectures, reinforcing their perception of the usefulness of the content covered. Moraes et al.[55] add that students report greater involvement and motivation during simulations, particularly when compared to traditional methods. Van de Weyer et al.[53] emphasise that satisfaction is associated with the possibility of critically reflecting on clinical practice, especially when the debriefing is well structured. Similarly, Wojcieszek et al.[54] emphasise that students value the realism, safe practice and confidence-building that simulation provides. Yılmaz et al.[59] confirm that simulations with standardised patients promote greater emotional involvement, the perception of meaningful learning and increased self-confidence, although they acknowledge challenges such as reduced practice time and initial stress. Taken together, this external evidence validates the findings of this review, confirming that CS, regardless of its format, represents pedagogical added value, capable of boosting satisfaction, involvement and the perception of effectiveness in nursing students' training.

In summary, the results of this review, complemented by the scientific evidence analysed, show that CS, whether in face-to-face, digital, high-fidelity, hybrid or with standardised patients, is an effective pedagogical strategy for developing essential competences in nursing education. Particularly noteworthy is the strengthening of students' self-efficacy and confidence, as well as the consolidation of fundamental technical competences, preparing them for autonomous clinical practice that is safe and adjusted to the complexity of contemporary care contexts.

With regard to the obstacles to implementing CS, emotional and psychological challenges stand out.[11-13,15,17,18,21,22,26,31,38,39,41,42,46-48] These include feelings of

anxiety, frustration, fear of making mistakes and insecurity during simulation activities, especially in emotionally charged scenarios such as episodes involving violence or suicide risk.[22,39] This emotional dimension is especially evident in simulations related to mental health, as shown in study by Quemada-González et al.,[39] where students showed high levels of anxiety when interacting with a simulated patient with borderline personality disorder. Lugo et al.[12] associates unfavourable initial emotional states with poorer practical performance. This trend is corroborated by Wojcieszek et al.,[54] who identify stress and anxiety as frequent side effects of hi-fi simulations, despite the benefits in terms of developing skills and self-confidence. Similarly, Yılmaz et al.[59] report that students experienced significant stress from being observed by peers and sharing the role of a nurse in the scenario, also pointing out limitations in the emotional realism of the simulation compared to real clinical contexts. Stenseth et al.[58] and Van de Weyer et al.[53] reinforce the presence of insecurity and fear of judgement, especially in students with less previous experience. Despite these obstacles, most studies emphasise that progressive exposure to simulation favours the acquisition of emotional self-regulation skills, promoting personal and professional growth. It is therefore recommended that simulation programmes integrate emotional preparation strategies, empathetic supervision and psychological support in order to mitigate the impact of these experiences and enhance the learning process.

Training and support for teachers/supervisors emerge as critical aspects for the success of CS in nursing education.[10,11,19,21,32,34,35,38,41,43] These studies highlight the importance of preparing instructors with specific pedagogical and technical competencies, particularly for the effective facilitation of simulated scenarios and, above all, debriefing moments. He et al.[10] emphasises that the structure of the debriefing, whether led by peers or teachers, requires adequate preparation to encourage critical reflection. This need is corroborated by Reed et al.,[57] who warn that teachers without adequate preparation avoid emotionally demanding moments, jeopardising the development of clinical reasoning and students' reflective reformulation.

Jin and Kang[11] highlights the positive impact of structured training for instructors in conducting hybrid simulations in complex paediatric contexts, revealing that pedagogical competence directly influences the effectiveness of the scenarios. Li et al.[56] state that the lack of specific training for facilitators limits the realism of simulated exercises and weakens the training process by compromising their ability to manage critical situations.

Martins et al.[32] emphasises the importance of teachers' familiarity with simulation models as an element that facilitates their effective application. This conclusion is echoed by Stenseth et al.,[58] who show that teachers with less mastery of pedagogical models face greater difficulties in conducting emotionally intense simulations, increasing student insecurity.

The meta-analysis presented by Vangone et al.[43] emphasises that the effectiveness of simulation depends significantly on the quality of the facilitation, reinforcing the need for continuous training for teachers. This perspective is reinforced by Wojcieszek et al.,[54] who show that students' perception of safety, involvement and learning is directly associated with the facilitator's technical and relational competence, especially during debriefing.

Other studies[19,21,34,35,38,41] reiterate the importance of preparing trainers to ensure the reliability, realism and consistency of simulated experiences. Similarly, Yılmaz et al.[59] report that students point out weaknesses in time management, the organisation of activities and the quality of feedback from some facilitators, which negatively affects the perception of usefulness and the reduction of stress associated with the simulation. To summarise, the link between the studies included and recent scientific literature confirms that the technical, pedagogical and emotional qualifications of teachers and supervisors are an essential pillar for the success of CS and should be the subject of ongoing institutional investment.

The limitations of physical, human and financial resources are significant obstacles to the sustained implementation of CS in nursing education. Studies by Vangone et al.[43], Chow et al.[18] and Presado et al.[38] point to structural difficulties, such as the lack of high-fidelity equipment and the inadequacy of the spaces available for complex scenarios. These limitations jeopardise both the frequency and quality of simulated sessions.

In addition, recent scientific evidence reinforces these concerns. Moraes et al.[55] describe the high costs of purchasing and maintaining simulators as one of the main obstacles to their systematic use. Parlak et al.[52] warn of the need for specific funding to guarantee the updating of equipment and the continuity of activities. Stenseth et al.[58] add that limited teaching hours and the lack of standardised infrastructure hinder the integration of simulation into the curriculum. Similarly, Wolf & Marks[61] report inconsistencies in the implementation of simulation due to a lack of material and human resources, with direct impacts on the clinical preparation of students. Finally, Yılmaz et al.[59] highlight the time and logistical pressure in simulated scenarios, as well as difficulties in continuous access to appropriate technologies.

These data, analysed together, point to the need for robust institutional planning, with strategic allocation of resources and continuous investment in technology, adequate spaces and specialised training, in order to guarantee the pedagogical effectiveness and sustainability of CS in nursing education.

Logistical problems and poor curriculum integration are recurring obstacles to the implementation of CS.[11,14,20,27,29,

[30,34,35,43] These include difficulties in aligning programme content with simulated activities, often due to rigid curricular structures and limited teaching time. Yang,[14] for example, identifies obstacles in coordinating timetables between different subjects, which limits the frequency of simulations. This reality is corroborated by Stenseth et al.,[58] who refer to the logistical complexity of scheduling and preparing clinical scenarios as a limitation to the continuity and sustainability of simulated practices.

Guerrero et al.[34] also emphasises the lack of cross-curricular integration of simulation in curricular units, contributing to it being perceived as a one-off and isolated activity with no clear link to the progression of the training pathway. In a similar vein, Mapulanga et al.[60] identify the lack of a coherent curricular strategy as a factor that jeopardises the effectiveness of CS, recommending greater articulation between theory and practice from the first years of the course.

In addition, the organisation of scenarios requires specialised material resources and detailed logistics, as mentioned in studies.[20,43] This need is emphasised by Wolf & Marks,[61] who highlight the difficulty in maintaining a standardised simulation model due to the variability in the availability of resources between institutions, which contributes to disparities in the students' training experience.

Finally, Cabañero-Martínez et al.[35] points out that even when there is the pedagogical will to integrate simulation in a structured way, the lack of time for teachers and the overload of curricular content makes it difficult to fully implement. This finding is also emphasised by Reed et al.,[57] who argue in favour of restructuring the curriculum to incorporate simulation as a central active methodology, rather than a supplementary one. In short, the literature analysed reinforces that for simulation to be truly transformative, it is essential to ensure its systematic integration into the curriculum, with adequate logistical, pedagogical and institutional support.

The lack of realism and the limitations of simulated scenarios are also noted as obstacles to clinical simulation, particularly when the perception of artificiality jeopardises immersion and student learning.[28,33,37,45,50] Issues such as the predictability of the situations, the lack of variability in the contexts presented, the technical limitations of the simulators and scenarios that are not representative of the real complexity of care are pointed out as factors that reduce the involvement and authenticity of the experience. In particular, Carrero-Planells et al.[45] emphasises that the low fidelity of the equipment compromised the students' perception of realism, affecting their motivation and focus. This data is corroborated by the study by Dias et al.,[62] who point out that the inadequacy of the physical infrastructure compromises the fidelity of the simulation and requires adaptations to maintain coherence between the pedagogical objectives and the scenario presented. These authors emphasise the importance of guaranteeing physical, conceptual and psychological fidelity, reinforcing the need for carefully planned simulated environments.

In addition, the poor representation of emotional aspects and realistic social interactions in the scenarios can hinder the development of relational and communication skills, as exemplified by Hammoud et al.,[50] where students felt that interactions with mannequins did not adequately mirror the demands of real clinical communication. For their part, Bortolato-Major et al.[63] address the progressive complexity of scenarios as a factor that influences students' stress levels, suggesting that the imbalance between the difficulty of the scenario and the level of preparation can affect the perception of realism and the quality of learning. In this sense, Abarca et al.[33] reveals that the lack of progressive challenges in simulated scenarios was perceived as limiting clinical development.

These data emphasise that unrealistic or inadequate scenarios can limit student involvement and compromise the transfer of skills to clinical practice.

Insufficient student preparation and initial resistance to CS appear to be significant obstacles to its effective implementation in nursing education.[23,24,32,36,44,46,51] These studies describe how students often struggle to adapt to simulated environments due to anxiety, insecurity or lack of prior knowledge of the methodologies involved. This resistance sometimes manifests itself in devaluing simulation, especially in the early stages of training. McConville & Lane,[24] for example, describes that students showed fear in dealing with emotionally demanding situations, while recognising the benefit of educational videos in reinforcing self-efficacy. Similarly, Eade & Winter[23] reveals that the lack of previous contact with mental health issues generated discomfort, which was later alleviated with structured simulation.

These findings are corroborated by Parlak et al.,[52] who identified feelings of hesitation and tension among students when interacting with simulated patients in sensitive contexts, such as vaccination counselling. Wojcieszek et al.[54] also point out that students, in initial contact with simulated patients representing complex scenarios, reported fear of making mistakes and fear of peer judgement. Yılmaz et al.[59] document that, despite the overall appreciation of the simulation experience, several participants expressed discomfort with the limited time and the fact that they had to share the role of nurse with a colleague, factors that negatively influenced their perception of practical preparation. Despite these initial difficulties, the data converges in pointing to a progressive adaptation on the part of the students, accompanied by an increase in confidence and technical mastery as they gain familiarity with the simulated scenarios. It is therefore essential that institutions ensure a careful pedagogical introduction to simulation, accompanied by ongoing emotional and technical support, in order to maximise its educational potential.

Ethical and emotional demands are a major obstacle to implementing CS, especially when the scenarios deal with sensitive topics such as palliative care, suicide risk or gender-based violence. These experiences often generate intense feelings of anxiety, insecurity and emotional overload in students, especially when they involve human suffering, moral dilemmas or the communication of bad news. Escribano et al.,[19] students reported emotional difficulties during end-of-life care simulations, while recognising their educational usefulness. This impact is also evidenced by Van de Weyer et al.,[53] who emphasise that simulation in palliative care triggers intense emotional reactions, requiring structured support, namely through debriefing. In the study by Tamaki et al.,[21] it is confirmed that end-of-life scenarios require a high level of emotional involvement, making prior preparation and subsequent monitoring essential. Wojcieszek et al.[54] identified that students experience significant emotional stress when exposed to highly emotionally charged simulations, such as situations of suffering or death, reinforcing the need for sensitive pedagogical management. Quemada-González et al.[39] revealed the psychological impact of simulations centred on the risk of suicide, with participants expressing feelings of helplessness and worry. Yılmaz et al.[59] also report that even in less extreme simulations, such as those related to doubts about vaccination, students face significant emotional challenges, especially when there is insufficient preparation, in turn, Jiménez-Rodríguez et al.[22] describe the ethical discomfort felt by students when dealing with simulated situations of gender-based violence in a video consultation context. Despite the difficulties, the students recognise the value of these experiences for developing empathy, emotional maturity and ethical preparation. These data highlight the importance of a rigorous pedagogical framework that ensures continuous emotional support for students throughout the simulation process.

In summary, the obstacles to implementing CS in nursing education are multifactorial and interdependent, encompassing emotional, pedagogical, structural and organisational challenges. The data analysed shows that anxiety, fear of making mistakes and the emotional demands associated with complex scenarios can compromise students' active participation and performance, requiring appropriate preparation and support strategies. At the same time, insufficient teacher training, limited physical, human and financial resources and poor curriculum integration jeopardise the effectiveness and sustainability of this methodology. The perceived artificiality of the scenarios and students' initial resistance to simulation also emerge as relevant obstacles that need specific pedagogical attention. Complementary scientific evidence confirms that the success of CS depends not only on the technical quality of the resources, but above all on their coherent integration into a structured educational project, supported by trained trainers and continuous monitoring strategies. Overcoming these obstacles is an essential condition for maximising the transformative potential of CS in the training of competent, critical and emotionally prepared nursing professionals.

Conclusion

This scoping review made it possible to map and analyse the available scientific evidence on the use of CS in teaching nursing students, highlighting its impact on the development of essential competences for professional practice, responding to the objective initially proposed. CS proved to be a powerful tool, providing a safe and controlled environment that favours the development of critical thinking, the acquisition of technical and non-technical skills, as well as promoting student confidence and autonomy.

The results indicate that the most effective approaches to implementing CS involve combining high-fidelity simulations with realistic scenarios and structured debriefings, which help students to reflect on their decisions and improve theoretical understanding in practice. Although the majority of students reported significant benefits, such as increased confidence and effectiveness in decision-making, several barriers to implementing simulation were identified, including resource limitations, lack of adequate space, resistance to change and logistical challenges.

The review suggests that CS not only prepares students for complex clinical scenarios, but also offers opportunities for the continuous improvement of teaching practice, and is fundamental for training nurses who are better prepared and safer in practice. However, there are still gaps in the literature, especially with regard to long-term effectiveness and comparisons between different simulation methodologies.

In view of this, it is imperative that more studies are carried out to further evaluate the effects of CS on nursing students' learning, while also exploring the cost-benefit ratio and the feasibility of its implementation in different educational contexts. This review serves as a basis for future research, with the aim of consolidating CS as an essential pedagogical strategy in the training of excellent nurses.

In summary, the benefits identified in the studies analysed corroborate the relevance of CS as a robust and effective teaching strategy, capable of promoting the development of essential competences and boosting the personal and professional growth of future nurses.

Limitations of the study

This scoping review has some limitations that should be considered when interpreting the results. Firstly, although a broad and inclusive search strategy was followed, the selection of studies was limited to the MEDLINE®, CINAHL®,

MedicLatina® and Cochrane® databases, which may have excluded relevant publications from other sources. Secondly, although studies written in any language were included, articles in less accessible languages were translated using digital tools, which may have introduced interpretative subtleties. In addition, the heterogeneity of the methodological designs of the studies included made it difficult to directly compare the results and limited the possibility of establishing robust causal relationships.

Implications for practice

The findings of this review reinforce the pedagogical potential of CS as a training strategy in nursing education, highlighting its contribution to the development of technical, communication and clinical reasoning skills. The implementation of simulated scenarios must, however, be accompanied by specific training for teachers and supervisors, ensuring that sessions and debriefing are conducted effectively. In addition, it is essential to ensure that simulation is systematically integrated into the curriculum, with adequate physical, human and financial resources allocated. The emotional management of students, particularly in highly affective contexts, should be included in teaching programmes, through psychological support strategies and prior preparation. In this regard, it is recommended that clinical supervision during simulation be reinforced as a key element in enhancing meaningful and safe learning.

Implications for research

The results obtained highlight the need for future studies to explore in greater depth the comparative effectiveness of different simulation formats (high vs. low fidelity, face-to-face vs. virtual) and their applicability at different levels of education. Longitudinal research could clarify the sustained impact of simulation on the real clinical practice of future nurses. In addition, it is recommended to evaluate the influence of mediating variables, such as the quality of debriefing, the profile of supervisors or the emotional preparation of students. Finally, there is an urgent need to develop validated instruments to measure the cognitive, technical and emotional gains resulting from simulation in a standardised way, promoting greater rigour and comparability in studies in this area.

Conflict of interest

No conflicts of interest were declared by the authors.

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