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Review Article

Interprofessional simulation for safe medication: a scope review*

Simulação interprofissional para medicação segura: revisão de escopo

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ABSTRACT

Objective: to map the characteristics of interprofessional simulations aimed at teaching safe medication use. **Methods:** scope review conducted in nine national and international databases and in the Virtual Health Library portal, with no time limit. **Results:** the 11 studies included in the review involved 1,932 participants in interprofessional simulations for safe medication. The most frequent students were from medicine, pharmacy, and nursing. The predominant scenarios were hospitals and primary care settings, with simulated standardized patients, and addressed the prescribing, dispensing, administration, and monitoring of medications. The simulations involved curricular and extracurricular activities, with emphasis on the theoretical framework of the Interprofessional Education Collaborative and interprofessional communication skills in the learning objectives. **Conclusion:** interprofessional simulation improves learning about medication safety, contributes to reducing errors, and strengthens patient safety. **Contributions to practice:** interprofessional simulation applied to medication safety develop collaborative skills, reduce errors in controlled environments, and improve communication and teamwork.

Descriptors: Interprofessional Education; Simulation Training; Patient Safety; Medication Errors; Students.

RESUMO

Objetivo: mapear as características de simulações interprofissionais voltadas ao ensino da medicação segura. **Métodos:** revisão de escopo conduzida em nove bases de dados nacionais e internacionais e no portal Biblioteca Virtual em Saúde, sem recorte temporal. **Resultados:** os 11 estudos incluídos englobam 1.932 participantes nas simulações interprofissionais para medicação segura. Os estudantes mais frequentes foram de medicina, farmácia e enfermagem. Os cenários predominantes foram hospitais e atenção primária, com paciente padronizado simulado, e abordagem da prescrição, dispensação, administração e monitoramento de medicamentos. As simulações envolveram atividades curriculares e extracurriculares com destaque para o referencial teórico do *Interprofessional Education Collaborative* e da competência da comunicação interprofissional nos objetivos de aprendizagem. **Conclusão:** a simulação interprofissional melhora o aprendizado sobre segurança na medicação, contribui para redução de erros e fortalece a segurança do paciente. **Contribuições para prática:** a simulação interprofissional aplicada à segurança na medicação desenvolve competências colaborativas, reduz erros em ambientes controlados e aprimora comunicação e trabalho em equipe.

Descritores: Educação Interprofissional; Treinamento por Simulação; Segurança do Paciente; Erros de Medicação; Estudantes.

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Introduction

The growing complexity of healthcare systems has reinforced the importance of interprofessional education as a structuring axis for training professionals capable of working collaboratively, articulating knowledge and practices for patient safety. This approach joint participation by students or professionals from two or more areas in educational or practical contexts, with the purpose of developing teamwork and collaboration skills. This approach prioritizes the enhancement of fundamental elements of care quality and patient safety, such as communication, teamwork, and understanding of professional roles[1-2].

With the intensification of challenges in health systems and the demand for integrated care responses, interprofessional education has become a central strategy for training professionals to work collaboratively and safely. It is also recognized for achieving the "Quintuple Aim" (from English) of health improvement, which involves: enhancing the patient experience, improving the health of populations, reducing per capita costs, valuing the experience of health professionals, and promoting health equity[3-4].

Interprofessional education, especially when based on active methodologies, contributes to improving attitudes, knowledge, and collaborative skills, as well as increasing student motivation for patient safety[1-2,5]. Among active methodologies, health simulation has stood out for providing realistic and safe learning environments in which students from different areas can practice and improve technical and non-technical skills[1,5-7].

Interprofessional simulations, especially those based on high-fidelity scenarios and real-life error situations, favor the development of communication, leadership, decision-making, and conflict-resolution skills, in addition to promoting understanding of the roles and responsibilities of each profession in the context of care[1,5-7]. Recent evidence indicates that such simulations increase students' confidence in communicating errors, strengthen teamwork, and contribute to positive changes in attitudes toward collaboration and patient safety[5-8].

Medication safety involves implementing safeguards to reduce the risk of preventable errors and harm during medication use. These errors can occur during the stages of prescribing, dispensing, preparing, administering, and monitoring[9].

In 2017, the World Health Organization (WHO) launched the third global patient safety challenge, titled "Medication without harm," with the goal of reducing serious preventable harm caused by medications by 50% in five years. This commitment was reinforced in the Global Action Plan for Patient Safety 2021–2030, which includes the safety of clinical processes among its seven strategic objectives[10-11].

Global estimates indicate that prescription errors account for 53% of preventable events, followed by 36% of monitoring failures. The combined prevalence of preventable medication-related harm is 5%, with 25% of cases classified as serious or potentially fatal. The most affected groups are 17% of geriatric patients and 9% of surgical or highly specialized patients[9,12].

The annual costs associated with medication errors amount to US$42 billion, representing almost 1% of global health spending. In low- and middle-income countries, such as Brazil, the frequency and impact of these errors tend to be even greater[9-10,12].

In the context of patient safety, medication errors remain one of the main global challenges, associated with adverse events, increased costs, and negative impacts on the quality of care[7-8]. Preventing these errors requires not only technical knowledge but also collaborative skills and effective communication among healthcare team members[5,8,13-14].

Interprofessional simulations focused on medication error management have demonstrated a positive impact on early risk identification, the promotion of safe attitudes, and the training of professionals in transparent communication with patients and teams[5-6,8,14].

Given the relevance of interprofessional simulation for promoting safety in the medication process and the need to map the available evidence on its application, this theme is directly aligned with Sustainable Development Goal 3 "Good Health and Well-being,"

as it contributes to improving the quality of care, reducing preventable medication-related harm, and strengthening safe, effective, and patient-centered health systems[11,15]. In this context, this scoping review aimed to map the characteristics of interprofessional simulations aimed at teaching safe medication use.

Methods

Study design

Scope review conducted according to JBI recommendations[16], starting with the alignment of objectives and research questions according to the PCC (Population, Concept, and Context) strategy. The report was structured according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR)[17]. The protocol was previously registered in the Open Science Framework (OSF), doi: https://doi.org/10.17605/OSF.IO/GZPS3.

Identification of the research question

The guiding question was: "What are the characteristics of interprofessional simulations offered to health students in safe medication scenarios?" To construct the question, the PCC strategy was used, defined as: Population (P) undergraduate health students; Concept (C) safety in the medication process; Context (C) interprofessional simulation scenarios.

The search was conducted in July 2025 and included studies published in English, Portuguese, and Spanish, without time restrictions, in the following databases: Education Resources Information Center (ERIC), Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, Web of Science, SCOPUS, Embase, Cochrane, OpenGrey, Latin American and Caribbean Health Sciences Literature (LILACS), Scientific Electronic Library Online (SciELO), and all other databases of the Virtual Health Library (VHL), preceded by a preliminary search in PubMed to calibrate the final strategy. Controlled descriptors in Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS), and free terms, were used, combined using the Boolean operators AND and OR, and organized according to the three dimensions of the PCC.

For Population, terms such as (student OR students) were used. For Concept, terms related to medication safety were combined, including (medication errors OR medication therapy management OR drug evaluation OR good manipulation practices OR drug dosage calculations OR pharmaceutical centers OR medication reconciliation OR remedy expiration OR drug contamination OR drug delivery systems OR drug-related side effects and adverse reactions OR drug stability). To Context, referring to interprofessional simulation, terms such as (interprofessional education OR IPE OR inter professional OR inter-professional OR multiprofessional OR multi-professional OR multidisciplinary OR multi-disciplinary) AND (simulation OR patient simulation OR simulation training OR malingering) were used.

The combinations were structured using the general format 1#(Population) AND 2#(Concept) AND 3#(Context), adjusted according to the specificities of each database.

Identification and selection of relevant studies

The inclusion criteria were defined according to JBI's PCC strategy[16], including primary quantitative, qualitative, or mixed-methods evidence sources involving health students in interprofessional simulations related to medication safety. Review studies, editorials, narrative reviews, and event summaries were excluded. Grey literature was not included due to the design of the review and the need to maintain a reproducible search strategy across bibliographic databases, given the limitations of traceability and standardization for a comprehensive international search of thesis and dissertation repositories, as recommended by the JBI for scoping reviews.

After extracting the articles, the results were exported to Rayyan[18], where duplicates were removed, and two independent reviewers screened the titles and abstracts. Disagreements were resolved by

consensus with the participation of a third researcher, the study advisor, who is a specialist in Interprofessional Education and has experience in scope reviews. It should be noted that this review is part of a doctoral project on Interprofessional Education, ensuring conceptual and methodological alignment throughout all stages of the process.

Data extraction and analysis

Data extraction was performed by two independent reviewers, with evaluators blinded to each other during data entry, using a Microsoft Excel® spreadsheet. The following variables were collected: author, year, country, objectives, population/sample, method, type of interprofessional education intervention, duration, type of simulation, medication approach, interaction strategies, theoretical and methodological framework, form of evaluation, results, and collaborative skills. The data were organized into a descriptive summary, presented in Figures 2, 3, 4, and 5.

According to the JBI guidelines[15], for scope reviews, no assessment of methodological quality or risk of bias of the included sources of evidence was performed, since this type of synthesis aims to map the extent and nature of the existing literature, rather than judge the quality of the primary studies.

In the discussion, the findings were interpreted in light of the literature and the theoretical framework of interprofessional education[19-20].

Ethical aspects

As this is a scoping review, this study is exempt from registration and evaluation by a Research Ethics Committee, in accordance with Resolution No. 510/2016 of the National Health Council.

Results

A total of 422 records were identified in the databases and, after removing duplicates, screening titles and abstracts, and reading the full texts according to the eligibility criteria, 11 studies were included in this review. Figure 1 shows the flowchart of the process of identifying, selecting, and including sources of evidence.

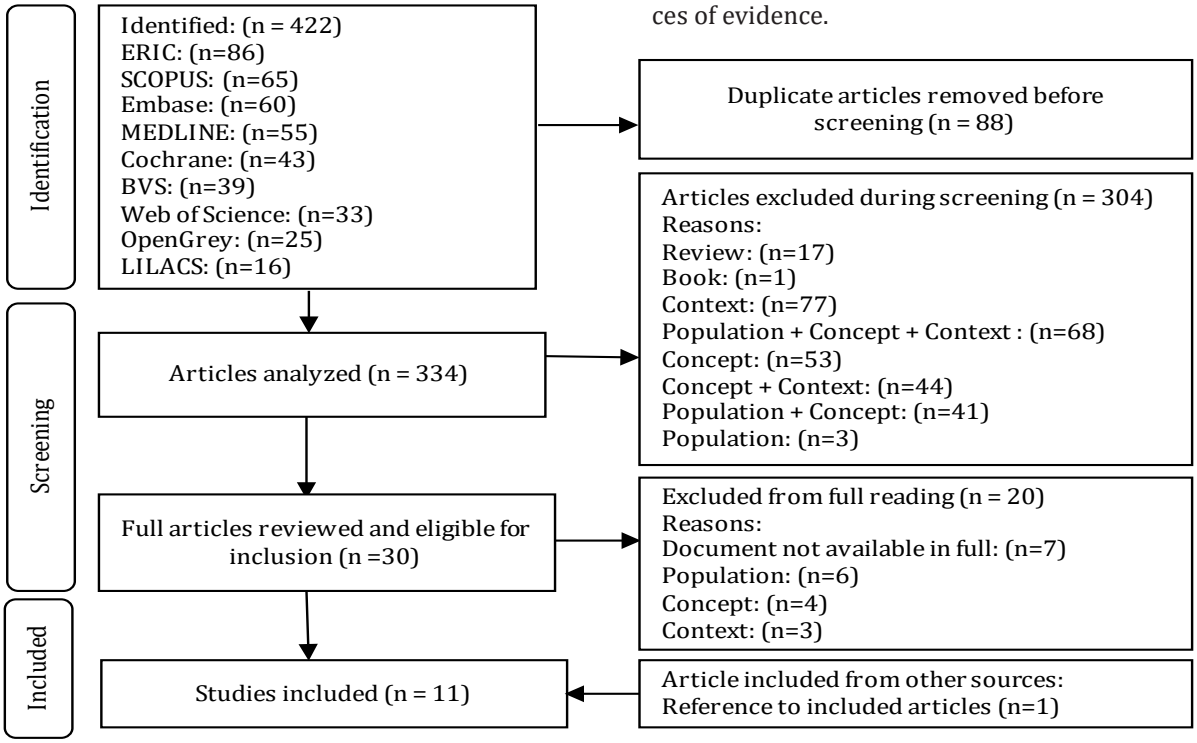

Figure 1 – Selection flowchart based on the PRISMA-ScR recommendation. São Carlos, SP, Brazil, 2025

Figure 2 shows the characteristics of the studies by country, year, design, intervention, and outcomes. The publications, all in English, date from 2015 to 2024. Six studies were conducted in the United States, three in the United Kingdom, one in Korea, and another in Germany.

ID	Country/ Year	Design/participant	Intervention	Outcome
A1[21]	United Kingdom (UK) 2015	Mixed study with 10 participants (two medical students, three pharmacy students, three nursing students, and two simulated patients).	Pilot masterclass with three simulated scenarios (sepsis, community, and polypharmacy), each lasting 45 minutes, including medical history, therapeutic decision-making, prescription, and structured debriefing.	Significant improvement in readiness for interprofessional learning, greater understanding of roles, effective collaboration, safer prescribing practices, and positive perception of educational usefulness.
A2[22]	USA 2016	Quasi-experimental quantitative study with 647 students (575 from Pharmacy, 36 from Medicine, 18 from Medical Assistance, and 18 from Nursing).	Simulation workshop on reporting medication errors, with rubric assessment and individual feedback.	Increased confidence in communicating errors ($p<0.001$), positive perception of interprofessional communication, high performance (92%), and high satisfaction (>94%).
A3[23]	United Kingdom (UK) 2017	Qualitative study with 19 students (nine from Medicine and 10 from Pharmacy) organized into four interprofessional and single profession focus groups.	Simulated consultations with standardized patients in small interprofessional and single-profession groups, with breaks for discussion and simulated dispensing.	Four central themes: expanded learning, patient-centered practice, understanding competencies and discovering roles; valuing collaboration and preparing for shared care.
A4[24]	USA 2018	Quasi-experimental quantitative study with 48 students (21 from Nursing, 15 from Pharmacy, and 12 from Medicine).	Team-STEPPS®* training followed by four medication error simulations and structured debriefings.	Significant improvement in the five domains of T-TAQ† ($p<0.05$), specific gains by profession, increased situational awareness, shared leadership, and appreciation of patient safety.
A5[25]	USA 2019	Qualitative study with 66 students (6 pharmacy and 60 medicine).	Medication adherence simulation exercise (Pillbox exercise) and reconciliation in a standardized patient, with interaction between medicine and pharmacy.	Greater awareness of barriers to adherence, empathy, appreciation of interprofessional communication, and increased confidence in medication reconciliation.
A6[26]	USA 2020	Quasi-experimental quantitative study with 78 students (40 nursing, 20 pharmacy, and 18 medicine).	Session with Team-STEPPS 2.0, 15-minute scenarios with debriefing and final discussion. PEARLS‡ (4hours total).	Significant improvements in 23/30 items on the T-TAQ; evidence of improved communication and team dynamics; greater understanding of roles and safety; frequent leadership by medical students.
A7[27]	USA 2020	Quasi-experimental quantitative pre/post study with 278 students (154 first-year pharmacy students and 124 third-year nursing students).	Asynchronous simulation on oral prescriptions via narrated slides, voice messages, and prescription transcriptions, followed by debriefing.	High satisfaction (>80%), high self-confidence (≥96%), adequate message performance (97%), and improved understanding of roles and confident verbal communication.
A8[28]	United Kingdom (UK) 2020	Mixed methods study with 352 second-year students (195 from Pharmacy and 157 from Medicine).	Sim-Man 3G in a sepsis scenario, with collective decision-making, use of protocols, and real-time effects.	High satisfaction (88%); better understanding of antimicrobial resistance and safe prescribing; greater confidence, collaboration, and perception of clinical authenticity.
A9[8]	USA 2023	Quasi-experimental quantitative study with 282 students (145 from Pharmacy and 137 from Medicine).	Three phases per teleconsultation: prior review, interaction for error disclosure§, and clarification sessions.	Increased confidence in disclosing errors and using teleconsultation ($p<0.001$); median performance 7/12; strong communication adequacy (>90%); weaknesses in disclosure planning.
A10[5]	Korea 2023	Quasi-experimental quantitative study with 102 students (55 nursing and 47 medical students) enrolled in an interprofessional education program on patient safety.	High-fidelity simulation with four medical error scenarios, Situation, Background, Assessment, and Recommendation, professional roles, teamwork, and interprofessional values.	Better readiness for interprofessional learning, high satisfaction, motivation for patient safety, and perception of educational realism.
A11[29]	Germany 2024	Randomized quantitative trial with pre/post-test Objective Structured Clinical Examination, including 50 students (33 from Pharmacy - 4th year - and 17 from Medicine - 5th year).	Theoretical training (1 hour) and eight adult and pediatric simulations (4 hours) focusing on the Medication Related Consultation Framework, comparing interprofessional versus single-profession training.	Both groups improved their consultation skills; the interprofessional group showed superior performance, especially in medication counseling; positive attitudes toward collaboration and improved self-confidence.

*Team-STEPPS®: Team Strategies and Tools to Enhance Performance and Patient Safety; †T-TAQ: Team-STEPPS Teamwork Attitudes Questionnaire; ‡PEARLS: Promoting Excellence and Reflective Learning in Simulation; §Disclosure: transparent communication/disclosure of medication errors to the patient and/or family

Figure 2 – Distribution of articles by country, year of publication, design, participants, intervention performed, and outcomes obtained. São Carlos, SP, Brazil, 2025

Figure 3 summarizes the operational characteristics of the identified interprofessional simulations. An analysis was conducted of the level of healthcare in which the scenarios were developed, the stages of the medication system addressed, the form of activity delivery, and the simulation modality employed. These elements allow us to understand how simulations have been structured across different educational contexts and how they adhere to the critical stages of the medication process.

Figure 4 shows the distribution of studies by the theoretical frameworks used to support Interprofessional Education and the interprofessional competencies explicitly addressed in the simulations. This summary facilitates the identification of trends regarding the conceptual models used and the competencies prioritized in teaching medication safety in interprofessional contexts.

Variables investigated		**Studies**
Level of health care	Hospital Care	A2, A4, A6, A10, A11
	Primary Health Care	A1, A3, A5, A7
	Urgent and Emergency Care	A8
	Transition from hospital care to primary health care	A9
Stages of the medication system	Prescription	A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11
	Dispensing	A3, A4, A5, A7, A9
	Preparation*	0
	Administration	A2, A4, A6, A10, A11
	Monitoring	A2, A6, A8, A11
Simulation delivery method	Curricular and extracurricular†	A2, A4, A5, A6, A11
	Curricular	A3, A7, A9, A10
	Extracurricular	A1, A8
Simulation mode	Simulated standardized patient (actor)	A1, A2, A3, A5, A9
	Human patient simulator	A8, A10, A11
	Hybrid	A4, A6
	Asynchronous‡	A7

*No article used the medication preparation stage in the simulations; †Curricular for some professions and extracurricular for others; ‡Without the use of an actor or human patient simulator

Figure 3 – Distribution of articles according to operational characteristics of interprofessional simulations, including level of health care, stages of the medication system, form of provision, and simulation modality. São Carlos, SP, Brazil, 2025

Variables investigated		**Studies**
Theoretical references for interprofessional competencies	Interprofessional Education Collaborative	A3, A4, A5, A6, A7, A10
	Centre for the Advancement of Interprofessional Education	A8
	Not specified	A1, A2, A9, A11
Interprofessional skills present in simulations	Communication	A2, A4, A5, A6, A7, A8, A9, A10, A11
	Teamwork	A4, A5, A6, A7, A8, A10, A11
	Roles and responsibilities	A3, A4, A5, A7, A10, A11
	Values and ethics	A4, A5, A7, A10
	Patient-centered care	A3
	Not specified	A1

Figure 4 – Distribution of articles according to the theoretical frameworks of Interprofessional Education adopted and the interprofessional competencies addressed in the simulations. São Carlos, SP, Brazil, 2025

In addition to the structural and pedagogical characteristics of the interventions, the specific simulation scenarios and strategies used to evaluate participants were analyzed. Figure 5 summarizes the context of the simulations performed and the evaluation instruments/approaches used in the included studies.

ID	Simulation context	Evaluation of interprofessional simulation
A1[21]	Community-acquired sepsis, medical history, diagnostic decision-making, management, prescription, polypharmacy, and medication reconciliation.	Evaluation by discourse analysis according to Clark's theory; pre/post-test using the Readiness for Interprofessional Learning Scale (RIPLS) and self-efficacy; and trust in the physician in simulated scenarios.
A2[22]	Gastrointestinal hemorrhage due to medication error, anticoagulant duplication, and disclosure.	Prior survey on confidence in disclosing errors; post-workshop satisfaction; team performance in disclosure assessed by validated rubric.
A3[23]	Prescription and dispensing of medications in Primary Health Care (PHC).	Evaluation through discourse analysis.
A4[24]	Drug classes and populations at higher risk of errors.	Pre/post-test with Team-STEPPS Teamwork Attitudes Questionnaire (T-TAQ) for teamwork attitudes; exposure to simulated scenarios and Team Strategies and Tools to Enhance Performance and Patient Safety (Team-STEPPS) as independent variables; analysis of four educational actions per scenario; review of debriefings.
A5[25]	Outpatient case of polypharmacy in the elderly and medication reconciliation.	Analysis of discourses regarding risk identification, adherence, preventive strategies, collaborative skills, and reflection on the professional role.
A6[26]	Prevention, detection, and mitigation of errors through collaborative strategies, with a focus on Huddle*.	Pre/post-test with Team-STEPPS and T-TAQ; recording of Huddle dynamics (duration, frequency, rigidity, and critical behaviors).
A7[27]	Secure verbal communication of oral prescriptions between nursing and pharmacy.	Satisfaction, trust, and feedback surveys; specific questionnaires for each course, addressing performance, professional role, and legal components of prescribing.
A8[28]	Small group interprofessional workshops on antimicrobial stewardship, infections, and patient safety.	Final form with three learning points, assessment of facilitators/barriers, and suggestions; interactive voting using a Likert scale; application of RIPLS.
A9[8]	Transition of care after discharge to community pharmacy; disclosure via teleconsultation.	Pre/post questionnaire (12 items, 5-point Likert scale) based on the Team-Oriented Medical Error Communication Assessment Tool on trust, teleconsultation, and professional roles; rubric (12 items) for error communication, based on ACPE†, CAPE‡, and EPAs§.
A10[5]	Team case analysis, root cause analysis, and solutions via roleplaying.	Pre/post online test with RIPLS, motivation for patient safety, program design, and satisfaction.
A11[29]	Medication consultation and interprofessional hospital collaboration (prescription and monitoring).	Pre/post assessment with Objective Structured Clinical Examination (OSCE) based on MRCF‖; self-assessment and survey of attitudes toward interprofessional learning.

*Huddle: brief, structured team meeting to review care plan, risks, and priorities; †ACPE: Accreditation Council for Pharmacy Education; ‡CAPE: Center for the Advancement of Pharmacy Education; §EPAs: Entrustable Professional Activities; ‖MRCF: Medication-Related Consultation Framework

Figure 5 – Distribution of articles according to the context of the simulation performed and the assessment instruments. São Carlos, SP, Brazil, 2025

Regarding the number of scenarios or moments of interprofessional simulation development to achieve learning objectives related to medication safety and/or interprofessional competencies, two publications presented a single scenario or moment of activity (A2, A7), four had four scenarios or moments (A3, A4, A6, A11), three used three scenarios or moments (A1, A8, A9), one publication used 16 scenarios (A11), and another included two scenarios or moments (A5).

Discussion

The effects of interprofessional simulation still lack strong evidence showing it's better than single-profession simulation. This limitation is largely ttributable to the predominance of descriptive, rather than comparative, study designs. Only one study included in this review[29] conducted a randomized clinical trial that directly compared the two simulation models.

Both groups showed increases in readiness for collaborative work, with statistically significant gains, though of small magnitude in the interprofessional group compared with the single-profession group. In addition, the authors highlighted that collaborative learning was more evident during the development of the team care plan, suggesting that interprofessional simulation fostered a richer qualitative experience of interaction and collaboration, even when the quantitative effects were modest. Thus, they reinforced

the need for more comparative studies and objective evaluations to consolidate the evidence on the real impact of interprofessional simulation versus single--profession simulation[30].

Medication errors are a significant concern for patient safety, contributing to morbidity, preventable mortality, and a substantial financial burden on healthcare systems[31-32]. These events can occur at any stage of the process, including prescribing, dispensing, preparation, administration, or monitoring, with approximately 90% of errors associated with the prescribing and administration stages[33]. There are significant variations in error rates, reaching 82.5% in some contexts, with prescribing being the most prevalent stage (7.1 to 90.5%), followed by administration (9.4 to 80%)[34]. A WHO review identified prescribing as the stage with the highest incidence of errors (53% of studies) and monitoring as the second most frequent (36%)[12]. In intensive care units, the prevalence ranges from 1.32% to 31.7%[35], while in PHC it ranges from 2% to 94%[36].

Identifying the causes of medication errors is crucial for implementing prevention strategies[31,37]. Interprofessional education promotes joint learning among different professions to improve collaboration and the quality of care, with direct positive impacts on medication safety[38-39].

When comparing these findings with the literature, it becomes clear that previous studies corroborate the importance of interprofessional communication in reducing errors. In a survey of 1,665 professionals, effective communication was associated with lower rates of prescription and dispensing errors, with a greater impact among less experienced professionals and in non-traditional settings[40]. Consolidated evidence shows that interprofessional education contributes to improving interprofessional attitudes, perceptions, skills, knowledge, and behaviors, resulting in positive effects on the quality and safety of care[2].

Specifically in the field of simulation applied to interprofessional education, a systematic review identified 43 interventions, of which 18 used simulation and debriefing to promote interprofessional collaboration and patient safety, highlighting simulation as a safe method for practice and reflection, capable of transferring learning to clinical practice[41]. This evidence is consistent with regulatory frameworks on competencies for interprofessional work and with guidelines for organizational structure in integrated primary health care (PHC) networks, reinforcing the findings in light of international recommendations.

The Pan American Health Organization (PAHO) emphasizes that interprofessional teams are strategic for strengthening health systems, reducing preventable errors and complications, morbidity, and mortality, and promoting worker satisfaction and retention. The report proposes six core competencies for interprofessional work: teamwork, roles and responsibilities, communication, learning/critical reflection, person/community focus, and ethical practice, which align directly with the objectives and outcomes of the simulations analyzed in this review. PAHO also recommends that teams organize themselves into integrated service networks based on PHC and territorial/community links, which reinforces the applicability of educational findings to collaborative care in practice[42].

Considering this framework and the magnitude/variability of medication errors, their prevention requires multifaceted approaches. Among the main strategies are: medication reconciliation with the active participation of the clinical pharmacist; the use of automated prescribing and dispensing systems; improved interprofessional communication; the implementation of quality programs; adequate workload management; the monitoring of safety indicators; and interprofessional simulation-based training, all directly related to the factors that contribute to the occurrence of these errors[31,37].

Interprofessional simulation offers students from different health fields the opportunity to participate in simulated scenarios in a controlled and safe environment, with the aim of achieving common or interconnected outcomes[43]. In addition, it provides a collaborative approach to the development and mastery of skills for interprofessional practice[19,44-46].

Among the studies mapped, the most effecti-

ve interventions combined high-fidelity simulations and deliberate practice with standardized assessment using OSCEs or behavioral checklists, resulting in consistent gains in communication, teamwork, and role clarity. Simulations focused on medication disclosure (including in teleconsultation format) improved ethical communication and the management of adverse events, while activities based on huddles and integrated clinical stations reinforced coordination and joint decision-making. Scenarios focused on prescribing, medication reconciliation, and the rational use of medications had a greater impact on technical knowledge and on understanding professional interfaces.

In terms of evaluation, the use of interprofessional attitude scales, clinical performance rubrics, and structured feedback in debriefing stood out, configuring replicable strategies for teachers interested in implementing simulations focused on medication safety. Measuring the development of interprofessional competencies, such as communication, teamwork, and leadership, among others, is crucial in interprofessional simulations aimed at promoting safe and collaborative clinical practice[41-47].

The findings of this review point to the importance of interprofessional simulation activities being planned and conducted in accordance with the best international practices, with valid and reproducible assessments. Their expansion in the Brazilian context is recommended, given that this review identified no national studies, underscoring the scarcity of publications on the topic in the country. It is necessary to invest in more robust research, including randomized clinical trials, capable of measuring objective outcomes related to patient safety and teamwork performance, including within the scope of the Unified Health System.

Study limitations

Only one of the 11 studies included was a randomized clinical trial, which reduces the robustness of the synthesis of findings and limits the possibility of firmer inferences about the effects of the mapped interventions; the exclusion of review studies and gray literature documents such as editorials, narrative reviews, event summaries, theses, and dissertations may represent limitations in the findings. In addition, the absence of studies conducted in Brazil calls for caution regarding the applicability of the findings to the Unified Health System, given regulatory, curricular, and simulation infrastructure differences between countries.

Contributions to practice

The findings of this scoping review indicate that interprofessional simulation applied to medication safety contributes to the development of essential collaborative skills, such as communication, teamwork, and role understanding, with the potential to reduce errors. In controlled environments, these strategies can reduce error rates and consistently improve integration between different professionals, focusing on their preparation for safe healthcare. The analysis of the mapped interventions provides support for teachers, nurses, and other healthcare professionals to lead curricular or extracurricular activities focused on patient safety. The use of realistic scenarios and consolidated theoretical references enhances safe learning, error identification, medication reconciliation, and disclosure, strengthening collaborative practice in nursing and other areas of healthcare. Despite the promising results, more robust, long-term studies that measure clinical outcomes are needed to confirm the applicability and sustained impact on healthcare practice.

Conclusion

The evidence indicates that interprofessional simulation favors the development of collaborative skills and yields consistent gains in learning about patient safety, particularly in risk minimization, medication reconciliation, error identification, damage mitigation, and disclosure. The mapping of studies also indicates that these results are associated with intentionally planned interventions, with explicit learning objectives and structured pedagogical strategies, rein-

forcing that the joint action of different professions, in isolation, is not sufficient to ensure effective collaborative practices.

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Authors' contributions

Conception and design or analysis and interpretation of data: **Lozano AW, Machado EF**. Drafting of the manuscript or critical revision of intellectual content: **Lozano AW, Simonato LE, Mioto JZAP, Saraiva-Mangolin SS, Mininel VA**. Agreement to be accountable for all aspects related to the accuracy or integrity of any part of the manuscript being appropriately investigated and resolved: **Lozano AW**. Final approval of the version to be published: **Silva JAM**.

Data availability

The authors declare that the data supporting the findings reported in this study are available in a public, open-access repository at: https://doi.org/10.17605/OSF.IO/GZPS3. The entire dataset is fully described and documented, ensuring transparency and reproducibility of the findings.

References

1. Jung C, Oh J, Chu SH. Research trends in interprofessional education programs related to medication for undergraduate nursing students: a scoping review. J Korean Biol Nurs Sci. 2024;26(2):83-98. doi: https://doi.org/10.7586/jkbns.24.007
2. Shuyi AT, Zikki LYT, Qi AM, Lin SKS. Effectiveness of interprofessional education for medical and nursing professionals and students: a systematic review. Nurse Educ Pract. 2024;74:103864. doi: https://doi.org/10.1016/j.nepr.2023.103864
3. Nundy S, Cooper LA, Mate KS. The quintuple aim for health care improvement: a new imperative to advance health equity. JAMA. 2022;327(6):521-2. doi: https://doi.org/10.1001/jama.2021.25181
4. Farrell TW, Greer AG, Bennie S, Hageman H, Pfeifle A. Academic health centers and the quintuple aim of health care. Acad Med. 2023;98(5):563-8. doi: https://doi.org/10.1097/ACM.0000000000005031
5. Hur HK, Kim KK, Lim YM, Kim J, Park KH, Park YC. Patient safety interprofessional education program using medical error scenarios for undergraduate nursing and medical students in Korea. J Interprof Care. 2023;37(6):944-53. doi: https://doi.org/10.1080/13561820.2023.2183184
6. Garwood CL, Salinitri F, Levine DL. Delivering interprofessional patient safety education using storytelling, a real-life medication error, and synchronous online platform. Med Teach. 2021; 44(6):643-9. doi: https://doi.org/10.1080/0142159X.2021.2017870
7. Rykhoff M, Pereira R, Wilkinson S. Building patient safety culture by using interprofessional simulation with nursing, paramedic and emergency telecommunication students. Nurse Educ Pract. 2024;81:104166. doi: https://doi.org/10.1016/j.nepr.2024.104166
8. Baalmann A, Crowl A, Coffey C, Jernigan S, Kalender-Rich J, Sabata D, et al. Interprofessional medication error disclosure training using a telehealth consultation simulation. Am J Pharm Educ. 2023; 87(1):ajpe8799. doi: https://dx.doi.org/10.5688/ajpe8799
9. World Health Organization. Medication without harm: policy brief [Internet]. 2024 [cited Nov 24, 2025]. Available from: https://www.who.int/publications/i/item/9789240062764
10. World Health Organization. WHO launches global effort to halve medication-related errors in 5 years [Internet]. 2017 [cited Nov 25, 2025]. Available from: https://www.who.int/news/item/29-03-2017-who-launches-global-effort-to-halve-medication-related-errors-in-5-years

11. World Health Organization. Global patient safety action plan 2021–2030 [Internet]. 2021 [cited Nov 25, 2025]. Available from: https://www.who.int/publications/i/item/9789240032705

12. World Health Organization. Global burden of preventable medication-related harm in health care: a systematic review [Internet]. 2023 [cited Nov 25, 2025]. Available from: https://iris.who.int/server/api/core/bitstreams/f208903d-b47d-4a8c-9fac-d8136c2bdbb6/content

13. Irajpour A, Farzi S, Saghaei M, Ravaghi H. Effect of interprofessional education of medication safety program on the medication error of physicians and nurses in the intensive care units. J Educ Health Promot. 2019;8:196. doi: https://dx.doi.org/10.4103/jehp.jehp_200_19

14. Grimes TC, Guinan EM. Interprofessional education focused on medication safety: a systematic review. J Interprof Care. 2022;36(5):621-34. doi: https://doi.org/10.1080/13561820.2021.2018217

15. United Nations. Sustainable development goals: Goal 3 – ensure healthy lives and promote well-being for all at all ages [Internet]. New York: United Nations; 2015 [cited Dec 10, 2025]. Available from: https://sdgs.un.org/goals/goal3

16. Aromataris E, Lockwood C, Porritt K, Pilla B, Jordan Z, editors. JBI Manual for Evidence Synthesis. JBI; 2024. doi: http://doi.org/10.46658/JBIMES-24-01

17. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169(7):467-73. doi: https://doi.org/10.7326/M18-0850

18. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan – a web and mobile app for systematic reviews. Syst Rev. 2016;5:210. doi: https://doi.org/10.1186/s13643-016-0384-4

19. Interprofessional Education Collaborative. Core competencies for interprofessional collaborative practice: Version 3 [Internet]. 2023 [cited Nov 4, 2025]. Available from: http://ipecollaborative.org/

20. Canadian Interprofessional Health Collaborative. CIHC competency framework for advancing collaboration 2024 [Internet]. 2024 [cited Nov 4, 2025]. Available from: https://www.cihc-cpis.com

21. Paterson R, Rolfe A, Coll A, Kinnear M. Inter-professional prescribing masterclass for medical students and non-medical prescribing students (nurses and pharmacists): a pilot study. Scott Med J. 2015;60(4):202-7. doi: https://dx.doi.org/10.1177/0036933015606583

22. Ragucci KR, Kern DH, Shrader SP. Evaluation of interprofessional team disclosure of a medical error to a simulated patient. Am J Pharm Educ. 2016;80(8):138. doi: https://dx.doi.org/10.5688/ajpe808138

23. Cooke C, Gormley GJ, Haughey S, Barry J. Tracing the prescription journey: a qualitative evaluation of an interprofessional simulation-based learning activity. Adv Simul (Lond). 2017;2:14. doi: https://doi.org/10.1186/s41077-017-0047-0

24. Motycka C, Egelund EF, Gannon J, Genuardi F, Gautam S, Stittsworth S, et al. Using interprofessional medication management simulations to impact student attitudes toward teamwork to prevent medication errors. Curr Pharm Teach Learn. 2018;10(7):982-9. doi: http://doi.org/10.1016/j.cptl.2018.04.010

25. Sehgal M, Nassetta KR, Bamdas JAM, Sourial M. First do no 'pharm': educating medical and pharmacy students on the essentials of medication management. Curr Pharm Teach Learn. 2019;11(9):920-7. doi: https://doi.org/10.1016/j.cptl.2019.05.006

26. Gannon JM, Egelund EF, Genuardi F, Simon LV, Morrissey TK, Gautam S, et al. Multistation simulations and deliberate practice to reinforce huddle behaviors in interprofessional student teams. Clin Simul Nurs. 2020; 40:17-24. doi: https://doi.org/10.1016/j.ecns.2019.11.008

27. Bartlett JL, Kinsey JD. Large-group, asynchronous, interprofessional simulation: identifying roles and improving communication with student pharmacists and student nurses. Curr Pharm Teach Learn. 2020;12(6):763-70. doi: https://doi.org/10.1016/j.cptl.2020.01.023

28. Guilding C, Hardisty J, Randles E, Statham L, Verde A, Bhudia R, et al. Designing and evaluating an interprofessional education conference approach to antimicrobial education. BMC Med Educ. 2020;20:360. doi: http://dx.doi.org/10.1186/s12909-020-02252-9

29. Sharkas AR, Ali Sherazi B, Sayyed SA, Kinny F, Steichert M, Schwender H, et al. Development and evaluation of interprofessional high-fidelity simulation course on medication therapy consultation for German pharmacy and medical students: a randomized controlled study. Pharmacy. 2024;12(4):128. doi: http://dx.doi.org/10.3390/pharmacy12040128

30. Costa AD, Pereira LC, Pinho DLM. The effect of interprofessional simulation practice on collaborative learning: a randomized controlled trial. J Interprof Care. 2023;39(1):14-21. doi: https://doi.org/10.1080/13561820.2022.2147153

31. Costa CRB, Santos SS, Godoy S, Alves LMM, Silva IR, Mendes IAC. Strategies for reducing medication errors during hospitalization: an integrative review. Cogitare Enferm. 2021;26:e79446. doi: https://doi.org/10.5380/ce.v26i0.79446

32. Agência Nacional de Vigilância Sanitária (ANVISA). Boletim de Farmacovigilância n. 8: erros de medicação [Internet]. 2019 [cited Nov 25, 2025]. Available from: http://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/monitoramento/farmacovigilancia/boletim-de-farmacovigilancia-no-08.pdf

33. Koppel R, Telles J, Schwartz DG. Medication errors only make sense in specific contexts: a context-sensitive understanding of medication errors. Stud Health Technol Inform. 2025;326:116-20. doi: https://doi.org/10.3233/shti250250

34. Thomas B, Abdulrouf P, Elkassem W, Hail A, Stewart D. A systematic review of incidence/prevalence, nature and causes of medication errors among hospitalized patients in Middle Eastern countries. Eur J Hosp Pharm. 2019;26:A276. doi: https://doi.org/10.1136/ejhpharm-2019-eahpconf.595

35. Kwiecień-Jaguś K, Mędrzycka-Dąbrowska W, Kopeć M. Compreendendo erros de medicação em ambientes de terapia intensiva e salas de cirurgia: revisão sistemática. Medicina. 2025;61(3):369. doi: https://doi.org/10.3390/medicina61030369

36. Assiri GA, Shebl NA, Mahmoud MA, Aloudah N, Grant E, Aljadhey H, et al. Epidemiology of medication errors, error-related adverse events and risk factors in adults in community care contexts: a systematic review. BMJ Open. 2018;8:e019101. doi: https://doi.org/10.1136/bmjopen-2017-019101

37. Braiki R, Douville F, Gagnon MP. Factors influencing the reporting of medication errors and near misses among nurses: a systematic mixed-methods review. Int J Nurs Pract. 2024;30(6):e13299. doi: https://doi.org/10.1111/ijn.13299

38. Reeves S. Why we need interprofessional education to improve the delivery of safe and effective care. Interface (Botucatu). 2016;20(56):185-97. doi: https://doi.org/10.1590/1807-57622014.0092

39. Cadet T, Cusimano J, McKearney S, Honaker J, O'Neal C, Taheri R, et al. Describing the evidence linking interprofessional education interventions to improving the delivery of safe and effective patient care: a scoping review. J Interprof Care. 2024;38(3):476-85. doi: https://doi.org/10.1080/13561820.2023.2283119

40. Alhur A, Alhur AA, Al-Rowais D, Asiri S, Muslim H, Alotaibi D, et al. Enhancing patient safety through effective interprofessional communication: a focus on medication error prevention. Cureus. 2024;16(4):e57991. doi: https://doi.org/10.7759/cureus.57991

41. 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. 2023;120:105619. doi: https://doi.org/10.1016/j.nedt.2022.105619

42. Pan American Health Organization. Interprofessional health teams for integrated care. Washington (DC): PAHO; 2025. doi: https://dx.doi.org/10.37774/9789275129791

43. Lioce L, Downing D, Chang TP, Robertson JM, Anderson M, Diaz DA, et al. Healthcare simulation dictionary. Rockville: Agency for Healthcare Research and Quality; 2020.

44. World Health Organization. Framework for action on interprofessional education & collaborative practice [Internet]. 2010 [cited Nov 25, 2025]. Available from: https://iris.who.int/bitstream/handle/10665/70185/WHO_HRH_HPN_10.3_eng.pdf

45. Kilroy S, Marks B, Sawyer KM, Vanderzwan K, Karczmar C, Koronkowski M, et al. Utilizing simulation-enhanced interprofessional education to identify differences in healthcare students' col-

laborative practice behaviors: a mixed method study. Nurse Educ Today. 2025;147:106569. doi: https://doi.org/10.1016/j.nedt.2025.106569

46. Almendingen K, Sparboe-Nilsen B, Gravdal KL, Saltyte BJ. Core competencies for interprofessional collaborative practice among teacher education, health and social care students in a large scaled blended learning course. J Multidiscip Healthc. 2021;14:2249-60. doi: https://doi.org/10.2147/JMDH.S325086

47. Zenani NE, Sehularo LA, Gause G, Chukwuere PC. The contribution of interprofessional education in developing competent undergraduate nursing students: integrative literature review. BMC Nurs. 2023;22(1):315. doi: https://dx.doi.org/10.1186/s12912-023-01482-8