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TELESIMULATION AS A REMOTE TEACHING METHOD IN NURSING: SCOPING REVIEW

TELESSIMULAÇÃO COMO MÉTODO REMOTO DE ENSINO EM ENFERMAGEM: SCOPING REVIEW

LA TELESIMMULACIÓN COMO MÉTODO DE ENSEÑANZA A DISTANCIA EN ENFERMERÍA: REVISIÓN DEL ALCANCE

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ABSTRACT

Objective: To map how telesimulation has been applied in nursing education. **Method:** Scoping Review, carried out in October 2023 according to recommendations from the Joanna Briggs Institute and Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews in 14 information sources. The Rayyan application and thematic analysis were used. **Result:** 1811 studies were identified, of which 11 comprised the final sample. Two categories were listed: contemporary trends in the application of telesimulation in nursing education and the benefits and challenges of its practice. **Conclusion:** A predominance of observational synchronous telesimulation was mapped, covering the stages of preparation, participation and teledebriefing, involving nursing professionals, to teach different topics using the Zoom videoconferencing platform. There was a low prevalence of adoption of learning theories and assessment instruments. The main benefit of telesimulation is the opportunity to reach knowledge in distant locations and challenge the Internet connection instability.

Descriptors: Simulation Training; Education, Distance; Education, Nursing; Clinical Competence; Nursing.

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RESUMO

Objetivo: Mapear como a telessimulação vem sendo aplicada na educação em enfermagem. **Método:** *Scoping Review*, realizada em maio de 2023 conforme recomendações do Instituto Joanna Briggs e *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews* em 14 fontes de informação. Utilizou-se o aplicativo Rayyan e a análise temática. **Resultado:** Identificaram-se 1811 estudos, destes 11 compuseram a amostra final. Elencaram-se duas categorias: tendências contemporâneas da aplicação da telessimulação no ensino em enfermagem e os benefícios e desafios da sua prática. **Conclusão:** Mapeou-se um predomínio da telessimulação síncrona observacional abrangendo as etapas de preparação, participação e *teledebriefing,* envolvendo profissionais de enfermagem, para ensinar diferentes temáticas utilizando a plataforma de videoconferência *Zoom*. Houve uma baixa prevalência da adoção de teorias de aprendizagem e instrumentos de avaliação. O principal benefício da telessimulação é a oportunidade de alcance de conhecimentos em locais longínquos e desafio a instabilidade da conexão da *Internet*.

Descritores: Treinamento por Simulação; Ensino à Distância; Educação em Enfermagem; Competência Clínica; Enfermagem.

RESUMEN

Objetivo: Mapear cómo se ha aplicado la telesimulación en la educación de enfermería. **Método:** Scoping Review, realizado en octubre de 2023 según recomendaciones del Joanna Briggs Institute y Preferred Reporting Items para revisiones sistemáticas y extensión de Metanálisis para Scoping Reviews en 14 fuentes de información. Se utilizó la aplicación Rayyan y el análisis temático. **Resultado:** Se identificaron 1811 estudios, de los cuales 11 constituyeron la muestra final. Se enumeraron dos categorías: tendencias contemporáneas en la solicitud de la telesimulación en la educación de enfermería y los beneficios y desafíos de su práctica. **Conclusión:** Se mapeó un predominio de la telesimulación observacional sincrónica, abarcando las etapas de preparación, participación y teledebriefing, involucrando a profesionales de enfermería, para impartir diferentes temas utilizando la plataforma de videoconferencia Zoom. Hubo una baja prevalencia de adopción de teorías del aprendizaje e instrumentos de evaluación. El principal beneficio de la telesimulación es la oportunidad de alcanzar conocimiento en lugares distantes y desafiar la inestabilidad de la conexión a internet.

Descriptores: Entrenamiento Simulado; Educación a Distancia; Educación em Enfermería; Competencia Clínica; Enfermería.

INTRODUCTION

The teaching and learning process has evolved significantly over the years, with the inclusion and encouragement of the use of innovative teaching and learning strategies, based mainly on simulation, to improve skills and clinical reasoning in health.[1]

Defined as a teaching and learning strategy capable of replicating real clinical situations, simulation is permeated by challenges regarding the need for expensive infrastructure, qualified teaching staff, travel of participants, lack of material and human resources, and also the physical presence of students and facilitators in the same place, which highlights the need for methods that overcome these pedagogical difficulties.[1]

In this context, telesimulation stands out given its expanding use in health education, beyond pandemic periods[2], a teaching strategy where telecommunication and simulation resources are used together in education, training and/or assessment of students in an external and remote location.[3]

Scientific research involving telesimulation has been growing and adapting to objectives that go beyond distance education, such as assessment, training and diverse contexts such as teaching specialties in the health area such as pediatrics, surgery, anesthesia and emergency medicine.[4-5]

In the meantime, telesimulation applied to nursing is considered a promising instructional strategy and an evolving field that combines distance learning with face-to-face clinical simulation[6-8], seeking to break down territorial barriers and expand quality teaching to everyone, even when it is impossible for the educator to reach the learners in person, minimizing time constraints, lack of resources or even the lack of available educators.[9]

Although telesimulation appears to be a possibility for redesigning the nursing teaching process, it is a practice that has not yet been explored due to aspects that require greater depth and scientific exploration for its adoption by nursing, its benefits, challenges, purpose of use and effectiveness in order to sustain the quality of planning and execution of its practice.[10-11]

Added to this gap, there are few studies and scientific evidence in the literature that address the use of telesimulation in nursing education in a clear and precise manner, or even how it has been practiced, providing support for better understanding and adherence to this teaching strategy.[11]

It is worth highlighting the lack of a scoping review worldwide that has mapped the application of all telesimulation classifications used to provide the teaching and learning process for nursing students and professionals[11], which justifies the development of this review. Thus, this study aimed to map how telesimulation has been applied in nursing education.

METHOD

This is a scoping review, based on the recommendations of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation[12] and the Joanna Briggs Institute Reviews' manual[13-15] method, in which the research protocol was registered in the Open Science Framework (https://osf.io/476ud).

This scoping review was developed in nine stages, namely: (1) definition and alignment of title, objective and review

question; (2) definition of inclusion criteria; (3) description of the planned research approach with the structuring of the search strategy; (4) screening and selection of evidence; (5) data extraction; (6) synthesis of evidence; (7) analysis of results; (8) presentation of results and (9) summary of evidence in relation to the purpose of the review, described in detail below.

In the first stage, the theme was defined, the use of telesimulation for nursing education, in a national and international context, and to structure the research question, capable of directing the search for this scenario, the formulation acronym Patient-Interest-Context (PCC) was adopted, a variation of Patient-Intervention-Comparison-Outcomes (PICO).[16]

The letter "P" referring to the population addressed by the studies included in the sample of results considered undergraduate nursing students and nursing professionals, the letter "C" inherent to the application of telesimulation and finally, the context that was intended to be reached, delimited by the letter "C", was configured by nursing education. Thus, by joining the acronyms P, C and C, the question was obtained: How has telesimulation been applied in the education of undergraduate students and nursing professionals?

In the second stage, the inclusion and exclusion criteria for the studies that made up the sample of results were established, namely: the following were included: primary and secondary studies; theses and dissertations; capable of describing how telesimulation has been established in nursing; without delimiting time frame and language, published in scientific journals, electronically. They were excluded manuals, books, letters to the editor, abstracts published in proceedings, commentaries, essays and preliminary notes.

The third stage sought findings capable of answering the question outlined in this review and was carried out in May 2023, in the following sources of information: (1) US National Library of Medicine National Institutes Database Search of Health (Medline/PubMed®); (2) Scopus; (3) Embase; (4) *Cumulative Index to Nursing and Allied Health Literature* (CINAHL); (5) Web of Science; (6) ERIC; (7) Latin American and Caribbean Literature in Health Sciences (LILACS) (8) Cochrane; (9) Catalog of Theses and Dissertations of the CAPES Journal Portal; (10) Europe E-Theses Portal (DART); (11) Electronic Theses Online Service (EThOS); (12) Open Access Scientific Repository of Portugal (RCAAP); (13) National ETD Portal; (14) Theses Canada.

After defining the sources for searching for articles, the controlled descriptors and keywords used were

identified and checked, according to each letter of the PCC mnemonic and in accordance with the descriptor libraries of each source. Next, the descriptors and keywords were combined with the Boolean operators AND and OR to develop search strategies, according to the specificities and peculiarities for searching for studies in each source. It is worth noting that, in non-conventional information sources, the keyword Telesimulation was used, in its English and Portuguese versions, since these libraries do not accept the use of advanced search strategies, as shown in Table 1 below.

Table 1 -Information sources used, descriptors, keywords and search strategies. Uberaba, 2022.

Information sources, descriptors and keywords	Search strategies
PubMed® MeSH: (1) *"Students, Nursing";* (2) "*Nurse Practicantes*"; (3) "*Simulation Training*" (4) *"Education, Nursing"* Keyword: (1) *Telesimulation;* (2) *"Virtual simulation*"	("*Students, Nursing*" OR "*Pupil Nurses*" OR "*Nurse Practitioners*" AND "*Simulation Training"* OR "*Training, Simulation*" OR *Telesimulation OR "Virtual Simulation*" AND *"Education, Nursing"*)
SCOPUS MeSH: (1) *"Students, Nursing";* (2) "*Nurse Practicantes*"; (3) "*Simulation Training*" (4) *"Education, Nursing"* Keyword: (1) *Telesimulation;* (2) *"Virtual simulation*"	*TITLE-ABS-KEY*("*Students, Nursing*" OR "*Pupil Nurses*" OR "*Nurse Practitioners*" AND "*Simulation Training"* OR "*Training, Simulation*" OR *Telesimulation OR "Virtual Simulation*" AND *"Education, Nursing"*)
Embase Emtree: (1) *"nurse practicantes";* (2) *"nursing student";* (3) "*simulation training*" (4)*"nursing education"* Keyword: (1) *Telesimulation;* (2) *"Virtual simulation*"	("*nursing student*" OR "*nurse practicantes*" AND "*simulation training*" OR "*telesimulation*" OR "*virtual simulation*" AND "*nursing education*")
CINAHL Títulos/Assuntos: (1) *"Students, Nursing";* (2) "*Nurse Practicantes*"; (3) "*Simulation Training*" (4) *"Education, Nursing"* Keyword: (1) *Telesimulation;* (2) *"Virtual simulation*"	SU(*(*"*Students, Nursing*" OR "*Nurse Practitioners*") AND ("*Simulation Training"* OR *Telesimulation OR "Virtual Simulation*") AND (*"Education, Nursing")*)
ERIC Thesaurus: (1)*"Nursing Students*"; (2) *"Nursing"* (3) *Simulation*; (4) "*Education, Nursing"* Keyword: (1) *Telesimulation;* (2) *"Virtual simulation*"	(*"Nursing Students*" AND *"Nursing" AND Simulation* OR *Telesimulation OR "Virtual Simulation*" AND "*Education, Nursing")*
Web of Science MeSH: (1) *"Students, Nursing";* (2) "*Nurse Practicantes*"; (3) "*Simulation Training*" (4) *"Education, Nursing"* Keyword: (1) *Telesimulation;* (2) *"Virtual simulation*"	AK=("*Students, Nursing*" OR "*Pupil Nurses*" OR "*Nurse Practitioners*" AND "*Simulation Training"* OR "*Training, Simulation*" OR *Telesimulation OR "Virtual Simulation*" AND *"Education, Nursing"*)

LILACS DeCS: (1) “Estudantes de Enfermagem”; (2) “Profissionais de Enfermagem”; (3) “Treinamento por Simulação”; (4) “Educação em Enfermagem” Keyword: (1) Telessimulação and its versions in English and Spanish.	((“Estudantes de Enfermagem”) AND (“Profissionais de Enfermagem”) AND (“Treinamento por Simulação” OR Telessimulação) AND (“Educação em Enfermagem”)) and its versions in English and Spanish.
CAPES Keyword: (1) Telessimulação	https://catalogodeteses.capes.gov.br/catalogo-teses/
DART Keyword: (1) *Telesimulation*	https://www.dart-europe.org/basic-search.php.
EThOS Keyword: (1) *Telesimulation*	https://ethos.bl.uk/SearchResults.do
RCAAP Keyword: (1) *Telesimulation*	https://www.rcaap.pt/
National ETD Portal Keyword: (1) *Telesimulation*	http://www.netd.ac.za/?query=telesimulation&action=search
Theses Canadá Keyword: (1) *Telesimulation*	https://www.bac-lac.gc.ca/eng/services/theses/Pages/list.aspx?AW_S=telesimulation

In the fourth stage, after identifying the manuscripts in the adopted information sources, the sample of articles was selected, initially by reading the titles and abstracts of conventional literature represented by primary and secondary studies, by two blinded researchers, using a free application that helps filter studies in a review, widely used, called Rayyan Qatar Computing Research Institute (RAYYAN QCRI).[17]

Next, the non-conventional literature characterized by dissertations and theses was manually selected by reading the titles and abstracts, by two researchers, and then the entire collection selected was read in full to define the final sample. It is worth noting that the reference lists of the studies read in full were observed to check whether there was any manuscript not included that was present in the reference list of these articles.

In the fifth and sixth stages, with the sample of studies from the integrative review already selected, a validated instrument[18] was used, adapted for use in the present study, to support the extraction of the following data from the sample: authors, year of publication, country of origin, objective, type of study, telesimulation procedure and conclusion.

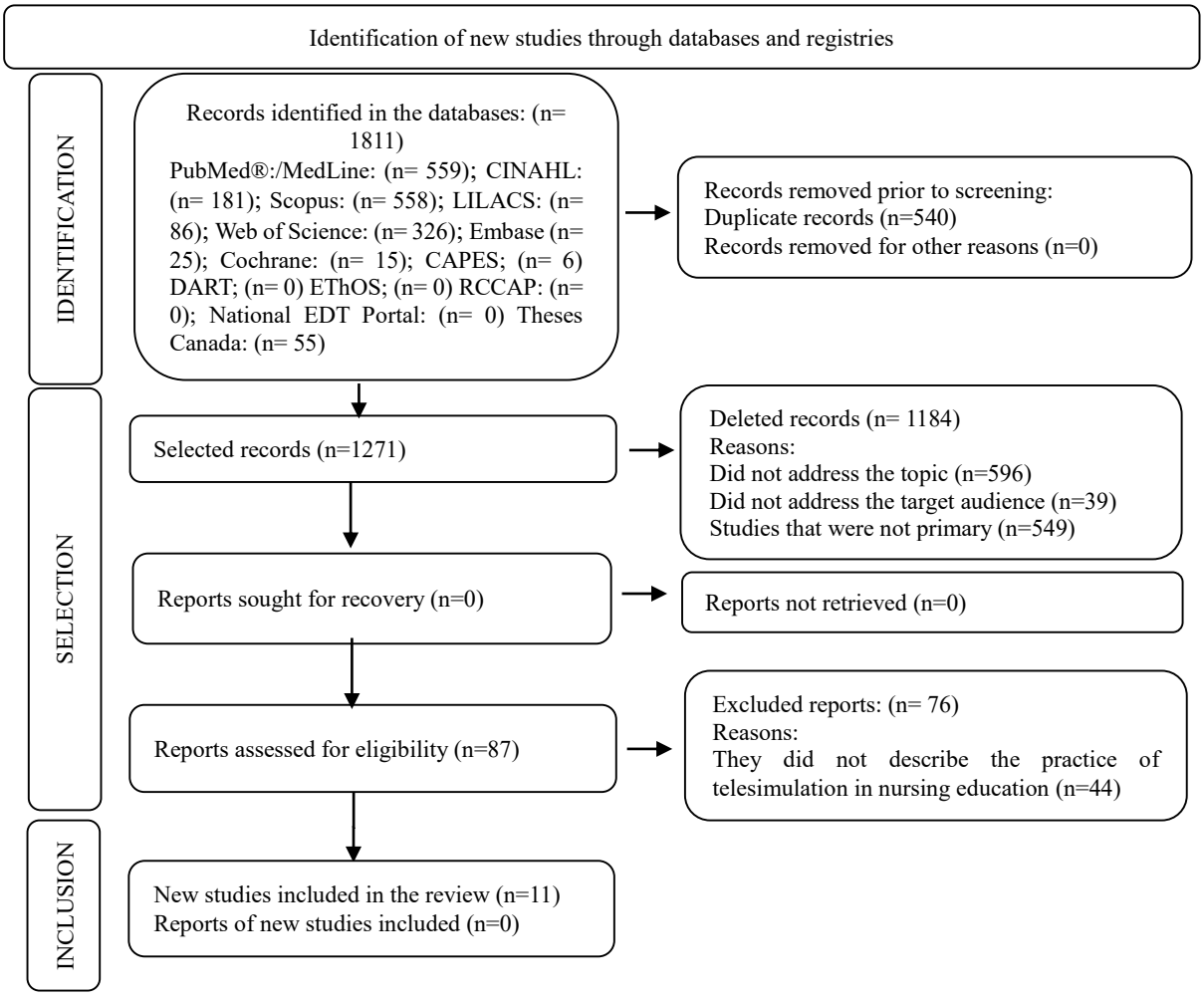
In the seventh stage, to characterize the studies, thematic analysis was adopted, applying three stages, namely: pre-analysis, which addresses the reading of the studies in the sample and the identification of similar findings; exploration of the material,

in which this similar information is gathered, constructing categories or themes of results and, finally; treatment of the results and interpretation, in which each category is analyzed to understand them.[19] In the eighth and ninth stages, the information obtained was interpreted, presenting the narrative synthesis.

RESULTS

Initially, 1811 studies were identified, of which 11 comprised the final sample, as shown in the flowchart shown in Figure 1.

Figure 1 –Flowchart of identification, selection and inclusion of studies, prepared based on the recommendation of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), Uberaba, Minas Gerais, Brazil, 2023



Regarding the 11 (100%) studies included in the sample, there was a prevalence of nine (81.8%) international studies[6-7,20-25, 11] (100%) published between 2020 and 20226-7,11,20-28 and four (44%) of a

quasi-experimental nature[7,20,22,25,28], as demonstrated below.

Table 2 –Characterization of the studies that composed the sample of this integrative review. Uberaba, MG, Brazil, 2023.

Authors/year/ country of origin	Objective and type of study	Telesimulation procedure	Conclusion
Domingues et al., 2022[26] Brazil	To assess the facilities, barriers and perceptions of nursing students. Qualitative study	The activity consisted of three stages: prebriefing, which included an online conference, execution of the telesimulated scenario involving two actors, and debriefing, which included the emotional, descriptive, evaluative, and conclusive phases. A semi-structured questionnaire was applied, containing open-ended questions about the strengths and barriers of nursing students, and the Student Satisfaction and Self-Confidence in Learning Scale.	Telesimulation stimulated the interest of nursing students in other stages of learning, suggesting a space that strengthens knowledge and maintains dialogue with face-to-face practices.
James et al., 2022[20] India	To evaluate the impact of telesimulation training on the management of pediatric shock. Quasi-experimental study	40 telesimulation sessions were conducted via the secure Zoom video telecommunications platform, with all participants and facilitators connected remotely. The pre-briefing scenario and debriefing were developed using plus delta.	Telesimulation is feasible and has improved the process of care, urgent interventions, leadership in simulated and real patients, and shock resolution in real patients.
Liaw et al., 2022[21] Singapore	To evaluate the effectiveness of an online program on knowledge and self-efficacy. Mixed methods	Preceptors participated remotely in the telesimulation via Zoom videoconferencing, in which, in each scenario, two students were selected to connect to the computer with their nursing avatars to participate as a nursing team in the scenario enactment. The Preceptor Self-Efficacy Questionnaire, Knowledge Test, and the Instructional Materials Motivation Survey (IMMS) were used.	The results demonstrated the effectiveness and feasibility of an online preceptor program to enhance the role of preceptors in supporting nursing students' transition to clinical practice.
Wong et al., 2022[22] Hong Kong	To report the results of the evaluation of this new education model during the COVID-19 outbreak. Quasi-experimental study	Telesimulation was performed in two sessions in which the lead instructor provided the case vignette and displayed the physiological parameters (Laerdal SimMan®), ECMO console monitor, and ECMO circuit.After each scenario, co-instructors would lead the debriefing session, reflecting on participants' emotions, feelings, actions, and thought processes.	As more innovative digital technologies are incorporated, telesimulation could further improve the quality of future ECMO training.
Silva, 2022[27] Brazil	Investigate the use of telesimulation in teaching nursing students Prospective	The telesimulation was developed as follows: a) teaching a theoretical class on nursing care for children with intestinal ostomy and completing the Clinical Case Analysis Form; b) telesimulation and completing the Debriefing Experience scales, Student	The study found satisfaction and self-confidence with the students' mastery of content and good

	study, with a sequential mixed approach	Satisfaction and Self-Confidence in Learning scale and the Clinical Case Analysis Form; c) group interview.	experience with debriefing.
Monygomery et al., 2021[23] United States	Describes the development and implementation of a pediatric emergency nursing telesimulation. Descriptive study	The telesimulation was conducted via the Zoom videoconferencing platform, led by two experienced simulation facilitators. Feedback was obtained using the online survey, *Simulation Effectiveness Tool-Modified*(SET-M).	Conducting a multicenter pediatric telesimulation for nursing staff in the community emergency room setting was feasible and well received by nursing students.
Mileder et al., 2021[7] Austria	Investigate the feasibility of telesimulation. Prospective observational pilot study - pre and post intervention.	Telesimulation addressed the communication of bad news. Nursing students were simulated patients and 141 interns divided into seven groups, each with an instructor, interacting with the patient in pairs. Teledebriefing was carried out. The activity was rated as good to excellent.	Telesimulation is an innovative tool for teaching communication skills.
O'Rae et al., 2021[6] Canada	Describe the application of telesimulation. Descriptive study.	A total of 101 nursing students provided care to a family using telesimulation. Prebriefing/briefing, scenario, and teledebriefing were conducted. A telecommunication tool was used to connect students, patients, and facilitators. Simulated patients played the roles of family members. Fifty-six percent of students appreciated the strategy.	Telesimulation supported students' ability to practice their decision making.
Kurji et al., 2021[24] Pakistan	Describe the implementation of a telesimulation. Experience report.	A telesimulation module provided its theoretical component on breaking bad news via PowerPoint, along with an online communication challenge. Nursing students were invited to be simulated patients. The 141 interns were divided into seven discussion groups, each with an instructor. Students were paired to interact with the simulated patient. Faculty and interns took notes of their observations for the teledebriefing.	Telesimulation is an innovative and useful tool for teaching communication skills.
Rocha, 2021[28] Brazil	Analyze students' knowledge before and after using telesimulation. Quasi-experimental study	During the video, there were questions that should be answered according to each undergraduate's perception of what they chose to be correct. At the end of the video, in the teledebriefing, the undergraduates were asked questions using the Promoting Excellence and Reflective Learning in Simulation framework.	During the video, there were questions that should be answered according to each undergraduate's perception of what they chose to be correct. At the end of the video, in the teledebriefing, the undergraduates were asked questions using the PEARLS* structure.

Naik et al., 2020[25] United States	Evaluate the effectiveness of telesimulation. Intervention study	A telesimulation was developed using a high-fidelity simulator, operated locally. Vital signs were displayed on a monitor and a test lung was positioned on the chest of the mannequin, connected to a mechanical ventilator. A portable camera was used to provide images and each group of students performed virtual care. Teledebriefing was conducted.	Students found telesimulation useful and similar to a traditional simulation.

The thematic analysis of the evidence enabled the development of two categories, namely: (1) contemporary trends in application of telesimulationin nursing educationand (2) benefits and challenges of the practice of telesimulation in nursing education.

The first category highlighted an overview of the contemporary trends of application of telesimulationin teaching nursing students and professionals, as described in Table 3.

Table 3– Contemporary trends in application of telesimulation in nursing education. Uberaba, MG, Brazil, 2023.

	Description
Year of telesimulation application	2022[20-22,24,26-27], 2021[6-7,23,28], 2020[25]
Location of telesimulation application	Brazil[26-28], United States[23,25], India[20], Singapore[21], Hong Kong[22], Austria[7], Canada[6], Pakistan[24]
Type of telesimulation	Observational synchronous telesimulation[6-7,20,26-28], hybrid telesimulation of an observational nature.[21-25]
Telesimulation stages	Preparation divided into pre-simulation (prior preparation of learners on the learning theme in which references and study materials are forwarded) and pre-briefing/briefing (moment that precedes the execution of the simulated scenario with the intention of providing explanations about the environment, clinical case, time, instruments, roles of learners, learning objectives, materials, fictional contract, among other information); participation (execution of the simulated clinical scenario transmitted live or through pre-recorded videos) and finally; teledebriefing (analytical moment of reflection and discussion of the telesimulated scenario, observed by learners remotely, led by one or more facilitators).[6-7,20-28]
Teledebriefing method	*Promoting Excellence and Reflective Learning in Simulation*[26-28], Plus Delta[21]
Transmission technologies	Video conferencing platforms Zoom[6,20-23,25,27], Google Meet®[26,28], Microsoft Teams24, portable camera system[7], laptop[25-27], webcam[7,25], computer, internet[6-7,20-28] or smartphone.[7,27]
Target audience	Nursing professionals[6,7,20-23,25] and undergraduate nursing students.[24,26-28]
Learning themes	Home visit and child care[26], pediatric emergencies[20], training of preceptor nurses[21], management of patients on oxygen therapy[22], management of mechanical ventilators[25], management of epilepsy in children[23], neonatal cardiopulmonary resuscitation[7], therapeutic communication[6], communicating bad news[24], neonatal hypoglycemia, intestinal ostomy.[27]
Learning theories	Experiential learning theory[26,28], Kirkpatrick learning[23].

Assessment instruments	Cognitive skills: semi-structured questionnaire[7,20,26,28]. Affective skills: Student Satisfaction and Self-Confidence in Learning Scale (ESEAA)[26-27], Simulation Effectiveness Tool-Modified (SET-M)[6,23], Simulation-Based Education Scale[20] and Debriefing Experience Scale.[27]

Next, the second category, named "Benefits and challenges of telesimulation practice in nursing education", described the benefits and challenges identified in the selected findings, to plan and develop telesimulation in the teaching and learning process of nursing students and professionals. Initially, the following benefits were identified: opportunity to gain knowledge in remote locations[6,7,20-22,25,27-28], possibility of reflection, integration between theory and practice[6,20-22,26], increased satisfaction and self-confidence.[26] In relation to the challenges, the following were listed: instability of the Internet connection[23-24,26-27], difficulty in obtaining non-verbal clues[6,22], limitation in developing psychomotor skills[22,27], possibility of distractions and interruptions, and intercommunication barriers.[26]

DISCUSSION

Based on the findings mapped, it was verified in contemporary times how telesimulation has been applied in the teaching and learning process in nursing, presenting an overview of its practice characterized by the description of year, location, stages, types, teledebriefing methods, transmission technologies, target audience, learning themes, learning theories, assessment instruments, as well as the benefits and challenges of this teaching strategy, findings that confer novelty and advancement of science.

When identifying the temporal and geographic context, it was observed that telesimulation was applied in different countries around the world between 2020 and 2022.[6-7,20-28] The development of this type of simulation occurred mainly in an international context, which can be explained by the fact that telesimulation emerged in Africa in 2009 and its application occurred with greater emphasis outside the national territory.[6-7,20-25]

Although telesimulation was first developed in 2009, its adoption was greatly enhanced and explored during the pandemic period generated by COVID-19 that occurred from 2020 onwards, which characterizes its contemporary practice, confirming the predominance of studies published after the aforementioned year.[6-7,20-28]

There was evidence of a prevalence of the adoption of synchronous telesimulation of an observational nature[6-7,20,26-28], which can be justified by the savings provided by this type of telesimulation due to the possibility of

obtaining a qualified teaching staff remotely, without the need for travel, as well as the lack of available financial, material and human resources.[9]

Furthermore, the use of observational synchronous telesimulation provides benefits similar to face-to-face simulation in the teaching and learning process in nursing, characterized mainly by increased knowledge[6,7,20-22,25,27-28], the possibility of correlation between theory and practice[6,20-22,26] and increased satisfaction and self-confidence.[26]

Observational synchronous telesimulation, like other types, can be developed through three main stages highlighted by preparation divided into pre-simulation and pre-briefing/briefing, participation and teledebriefing.[6-7,20-28]

Although most studies present three stages, in a review of previous literature on observational synchronous telesimulation, carried out by the present author, all the stages that characterize this type of simulation were highlighted, highlighted by the application planning, preparation divided into two phases characterized by pre-simulationand pre-briefing/briefing, participation involving the execution of the simulated scenario, teledebriefing, learner assessment and feedback collection, as well as additional learning.[29]

There was no coherence regarding the steps that constitute telesimulation in the studies analyzed, since most of the manuscripts included in this scoping review do not clearly demonstrate the step-by-step process developed by the researchers, which makes it difficult for facilitators and educators to replicate and adopt them.[6-7,20-28]

Specifically, regarding teledebriefing, there was also a lack of information about its development. In this review, few studies highlighted the method used and those that mentioned it with greater emphasis adhered to structured telebriefing characterized by Structure *Promoting Excellence and Reflective Learning in Simulation* (PEARLS), divided into emotional, descriptive, evaluative, and conclusive phases.[26,28] These phases resemble the stages proposed by*Gather Analyze Summarize*(GAS) debriefing divided into gather, analyze and summarize.[30]

The use of a structured method assists the teledebriefer during the management of the teledebriefing practice, with the intention of achieving the learning objectives through the asking of guiding questions that allow reflection and correlation between the theory and practice of the target audience.[30]

In relation to transmission technologies, a variety of platforms were identified video conferencing with emphasis on Zoom[6,20-23,25,27] and the need to

use essential technologies to enable the transmission of telesimulation, such as the internet, computer[6-7,20-28] or smartphone.[7,27]

The use of these technologies requires knowledge, training and preparation from the teacher, researcher or facilitator for their handling, making it essential to carry out tests before the telesimulated experience with the target audience in order to provide the correct handling of all technological materials involved in this practice.[5]

Furthermore, the person responsible for establishing the teaching process must be prepared to deal with the setbacks established by telesimulation, characterized by the unavailability of technological resources for participants, internet speed, low quality of audiovisual resources, among other factors that may interfere with the success of the proposed activity.[8]

Telesimulation can be applied to different audiences, however, the present study showed a prevalence of research developed with nursing professionals[6,7,20-23,25] compared to nursing students to train skills on a variety of topics.[6-7,20-28]

This teaching and learning strategy is rapidly expanding and has been implemented in different areas and strands to provide education, assessment and, mainly, in the context of nursing, training, as demonstrated by the studies highlighted by this sample.[6-7,20-28]

In addition to the above, it was noted that a limited amount of evidence used learning theories to support the teaching and learning process using telesimulation and those that did use them adopted the Experiential Learning Theory[24,26] and the Kirkpatrick Learning model.[23]

International research highlights the need to understand the different learning theories that guide telesimulation. Among them, the use of Adult Learning Theory is suggested, based on several crucial assumptions about the characteristics that adult learners have, as well as Experiential Learning Theory due to the opportunity for reflection and experience provided by telesimulation.[3]

To measure the development of skills, it is necessary to use instruments that allow the identification of cognitive, psychomotor and affective aspects. It was observed in this research that most studies did not use instruments to assess clinical skills, given the lack of validated tools aimed at assessing the skills developed through the application of telesimulation[6-7,20-28], which encourages the performance of methodological studies that aim to develop and validate instruments for this purpose.

Studies that assessed cognitive skills used semi-structured questionnaires on the themes developed[7,20,26,28] and for affective skills, there was emphasis on the use of the Student Satisfaction and Self-Confidence in

Learning Scale (ESEAA)[26-27] and the Simulation Effectiveness Tool-Modified (SET-M).[6,23]

The ESEAA was created by the National League for Nursing (NLN) and translated for use in Brazil in 2015 to measure learner satisfaction and self-confidence through high-fidelity simulation. Consisting of 13 five-point Likert-type items, this scale is divided into two dimensions characterized by satisfaction and self-confidence and has been frequently used by researchers in Brazil in the context of simulation.[31]

The SET-M was created in 2015 to assess learners' perception of the simulated experience and was translated and adapted into Brazilian Portuguese in 2021. This scale consists of 19 items with three response options capable of assessing perceptions of pre-briefing, learning, confidence and debriefing, making it a useful tool for identifying the effectiveness of the simulation.[32]

It is worth noting that although most studies related to telesimulation are contemporary, it is already possible to present the benefits of this teaching and learning strategy, as well as its challenges. Regarding the benefits, this study mainly highlighted the opportunity to reach knowledge in distant locations.[6,7,20-22,25,27-28]

A study evidenced in the present sample highlighted that telesimulation is capable of strengthening knowledge even with distance limitations, capable of preventing effective and efficient instruction in relation to a given topic, since it offers learning opportunities as a result of dialogue, observation and reflection on the development of the simulated scenario.[26]

Descriptive research highlights that telesimulation is capable of providing value to the community by allowing experts to transmit their knowledge without the need to travel or even saving time traveling to the simulation site to carry out other educational activities.[30]

Regarding challenges, emphasis was placed on Internet connection instability.[23-24,26-27] Failures related to the Internet connection have implications for the scope of monitoring of the telesimulation stages, as well as making it difficult for learners to interact during teledebriefing.[26]

A practical guide to implementing telesimulation in courses highlights the need for the facilitator to check the available resources and, above all, to prepare for interruptions caused by internet connection problems during telesimulated activities, highlighting the importance of having other trained facilitators connected to the videoconferencing platform with the intention of replacing the lead facilitator if he or she leaves.[33]

Initially, the lack of clarity in the manuscripts when addressing the stages of telesimulation, as well as the difficulty in identifying the classification of this type of simulation, is a limitation of this study.

This study contributes to the advancement of teaching, research and care in nursing, by highlighting a contemporary panorama of the main elements that make up the application of telesimulation in nursing teaching together with the benefits and challenges of its adoption, making it capable of supporting the practice of this teaching strategy, as well as research that aims to measure its effectiveness.

CONCLUSION

This scoping review mapped the application of telesimulation in nursing in contemporary times, identifying the adoption of synchronous telesimulated experiences of an observational nature applied in different regions of the world between 2020 and 2022. A predominance of the stages of preparation divided into pre-simulation and pre-briefing/briefing, participation and teledebriefing using a structured debriefing. These experiences were transmitted mostly to nursing professionals, to teach a variety of topics using videoconferencing platforms with an emphasis on Zoom, as well as essential technologies to enable the transmission of telesimulation such as the internet and the computer. To support the teaching and learning process, some studies adopted the Experiential Learning Theory and the Kirkpatrick Learning Model. Regarding the assessment of skills, it was noted that knowledge was measured through semi-structured questionnaires on the topics developed and for affective skills, there was emphasis on the use of the ESEAA and the SET-M.

In view of the mapping of the application of telesimulation for nursing students and professionals, it was noticed gaps in studies when addressing the stages of telesimulation and, mainly, in referring with a lack of clarity to the type of telesimulation used, which encourages the carrying out of studies that coherently present the stages and classifications of telesimulation.

In addition to the steps for carrying out telesimulation, the benefits and challenges of telesimulation in nursing education were listed, highlighting the benefit the opportunity to access knowledge in distant places and in relation to the challenge, the instability of the Internet became evident.

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