Original Article

# Development of a telesimulation design for basic life support

## Desenvolvimento de um *design* de telessimulação para o suporte básico de vida

## Elaboración de un diseño de telesimulación para el soporte vital básico

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## Abstract

**Objective:** To construct and validate a synchronous and observational telesimulation design in nursing for care according to in-hospital basic life support protocol for adults.

**Methods:** A methodological study based on the phases of the theoretical procedure carried out through a scoping review; empirical phase developed through the telesimulated design content validity and analytical phase in which the content validity index was adopted.

**Results:** A care design was constructed according to the basic life support protocol, going through six steps: planning, preparation, participation, teledebriefing, assessment and feedback and additional learning, with a Content Validity Index of 0.96.

**Conclusion:** The developed design was considered valid in content to plan and execute telesimulation by nursing and still be adapted to other educational contexts.

## Resumo

**Objetivo:** Construir e validar um *design* de telessimulação síncrona e observacional em enfermagem para o atendimento segundo o protocolo de suporte básico de vida intra-hospitalar no adulto.

**Métodos:** Estudo metodológico baseado nas fases do procedimento teórico realizado por meio de uma *scoping review*; fase empírica desenvolvida através da validação de conteúdo do *design* telessimulado e fase analítica em que adotou-se o índice de validade de conteúdo.

**Resultados:** Construiu-se um *design* para o atendimento segundo o protocolo de suporte básico de vida percorrendo seis etapas: o planejamento, preparação, participação, *teledebriefing*, avaliação e *feedback* e a aprendizagem adicional, com Índice de Validade de Conteúdo de 0,96.

**Conclusão:** O *design* desenvolvido foi considerado válido em conteúdo para planejar e executar a telessimulação pela enfermagem e ainda ser adaptado a outros contextos educacionais.

## Resumen

**Objetivo:** Elaborar y validar un diseño de telesimulación sincrónica y observacional de enfermería para la atención de acuerdo con el protocolo de soporte vital básico intrahospitalario en adultos.

**Métodos:** Estudio metodológico basado en las fases del procedimiento teórico realizado por medio de una *scoping review*, fase empírica llevada cabo a través de la validación de contenido del diseño telesimulado y fase analítica en la que se adoptó el índice de validez de contenido.

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**Conflict of interest:** nothing to declare.

**Resultados:** Se elaboró un diseño para la atención de acuerdo con el protocolo de soporte vital básico que atravesó seis etapas: planificación, preparación, participación, *teledebriefing*, evaluación y *feedback* y aprendizaje adicional, con un Índice de Validez de Contenido de 0,96.

**Conclusión:** El diseño elaborado fue considerado válido en contenido para planificar y ejecutar la telesimulación por parte de enfermeros y además puede adaptarse a otros contextos educativos.

## Introduction

The long pandemic period experienced since 2020 has strongly implied the way of educating in health and nursing, requiring the migration from the on-site environment to the virtual teaching environment and evidencing as a consequence an exponential growth in telesimulation use as a pedagogical strategy.[1,2]

Telesimulation is a virtual teaching modality that encompasses telecommunication and simulation resources capable of providing education, training and assessment for students who are in an external location,[3] classified according to the synchronicity between student and professor as synchronous, based on the simultaneous participation of both and asynchronous or hybrid, performed offline with videos and another online with instructor.[4,5] Also, according to the nature of students' participation, such as mobile telesimulation, sending materials and mannequins for the participant to remotely train their psychomotor skills and observational telesimulation, characterized by the contemplation of the simulated scenario at a distance and participation in teledebriefing.[4,5]

Among these classifications, synchronous and observational telesimulation has gained considerable pedagogical space with the simultaneous presence, online and in real time of facilitators and students, in addition to remote simulation observation by students,[4,5] permeated by the preparation, participation and teledebriefing steps.[3,6,7]

The telesimulation preparation step is divided into the pre-simulation phase, a moment of study and individual preparation of each student, subsidized by references provided by the facilitators, which precedes scenario observation, and the pre-briefing/briefing phase, which consists of presentation/explanation of all the elements that will involve the telesimulated scenario for students' understanding, carried out moments before its execution.[6,7]

The participation step corresponds to the execution of the simulated clinical scenario broadcasted live to students, followed by teledebriefing, an analytical moment of reflection and discussion of the observed telesimulated scenario, conducted by one or more facilitators.[3] Thus, to confirm that a telesimulation was performed correctly, it is necessary to plan and execute its three steps, especially when the intention is to facilitate learning in nursing on topics that involve patient survival and safety, such as teaching basic life support (BLS).[8,9]

It is already possible to observe the adoption of synchronous and observational telesimulation in the teaching of cardiopulmonary resuscitation (CPR) and the favorable outcomes of this pedagogical practice for developing clinical skills in nursing.[9] However, scientific evidence on telesimulation in this context is still incipient, which makes it difficult to manage this educational strategy, weakening the telesimulated teaching of cardiac arrest (CA) care.[9]

Added to this scientific gap is the lack of a telesimulation design that contains the description of all simulation steps and that is aimed at teaching basic intra-hospital life support for an adult patient for nursing to sustain the quality of telesimulation planning and execution, justifying the development of a methodological study that intends to elaborate and validate a construct capable of directing professors and facilitators in an online simulation in nursing and still be easily used later for other pedagogical contexts.[6,9]

Faced with the importance of exploring this theme and advancing the science of nursing in the scope of telesimulation, subsidizing it with reliable scientific tools, this study aimed to construct and validate a synchronous and observational telesimulation design in nursing for care according to the in-hospital BLS protocol in adults.

## Methods

This is a methodological study, carried out at a university in Minas Gerais, Brazil, between November 2021 and September 2022, for the construction

and validity of a telesimulated design in three steps:[10] (1) theoretical procedure step – compilation of scientific evidence capable of substantiating the design through a scoping review, guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation and by CPR guidelines;[11] (2) empirical step – design content validity by specialist nurses in simulation and emergency; and (3) analytical step – analysis of validity results.[12]

Step 1 began with a scope review, completing the following steps: (1) research question identification; (2) identification of relevant studies; (3) selection of studies for review; (4) data mapping; and (5) collection, synthesis and reporting of results.[13]

The research question was based on the Population – Concept – Context (PCC)[14,15] strategy, with the acronym P (population): students and health professionals, given the scarcity of studies that applied telesimulation in students and nursing professionals; acronym "C" (concept): synchronous and observational telesimulation practice; and acronym "C" (context): clinical competence development - cognitive, psychomotor and affective skills in health.

The union of acronyms resulted in the following question: what steps and components are necessary for the practice of synchronous and observational telesimulation aimed at developing clinical skills in students and health professionals?

Afterwards, a search for evidence was carried out in November 2021 using conventional information sources: US National Library of Medicine National Institutes Database Search of Health (MEDLINE/PubMed®), Scopus, Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Science, Education Resources Information Center (ERIC), Latin American and Caribbean Literature in Health Sciences (LILACS); and unconventional sources: Coordination for the Improvement of Higher Education Personnel (CAPES - *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*) Journal Portal Thesis and Dissertation Catalog, Europe E-Theses Portal (DART), Electronic Theses Online Service (EThOS), Open Access Scientific Repository of Portugal (RCAAP), National ETD Portal and Theses Canada.

Information sources, descriptors, keywords and search strategies are presented below (Chart 1).

The keywords Virtual Simulation and Telesimulation were adopted to sensitize the search for manuscripts in relation to the object of study and the term Telesimulation, in its versions in English, Spanish and Portuguese in the repositories, since such sources do not allow using advanced strategies.

Primary research, literature reviews, editorials, dissertations and theses, which addressed the steps and/or components necessary for a synchronous and observational telesimulation design, aimed at the education of students and health professionals, without delimiting time frame and language, published in electronic form, were included. Manuals, books, abstracts published in annals, comments, essays and previous notes were excluded.

Initially, the articles identified in conventional sources were exported to a free web review application, with a single version, called Rayyan Qatar Computing Research Institute (Rayyan QCRI), capable of excluding duplicate articles, facilitating the initial screening, blinding the auxiliary researcher and incorporating a high level of reliability in the selection process.[16] In this program, titles and abstracts were read by two independent researchers, experts in the field of simulation. A total of 37 articles presented divergence of selection between the researchers, sent to a third evaluator, responsible for the decision to include them or not in the sample.

Then, the manual selection of the identified gray literature was carried out, in which theses and dissertations were gathered in a folder on the computer without the support of Rayyan QCRI, and began with the reading of titles and abstracts by two researchers and then the reading of the entire selected literary collection (articles, dissertations and theses) to define the final sample. The reference list of the studies that composed the sample was checked, in order to verify the possibility of new inclusions; however, no new evidence was inserted.

A validated instrument was used to extract the following information from the selected materi-

**Chart 1.** Presentation of information sources, descriptors, keywords and search strategies

| Information sources, descriptors and keywords | Search strategy |
|---|---|
| MEDLINE/PubMed®<br>MeSH: Students, Health Occupations"; "Health Personnel"; "Simulation Training"; "Clinical Competence" and the keywords: Telesimulation; "Virtual Simulation". | ("Students, Health Occupations"[All Fields] OR "Health Occupations Students"[All Fields] OR "Health Occupations Student"[All Fields] AND "Health Personnel"[All Fields] OR "Personnel, Health"[All Fields] OR "Health Care Professionals"[All Fields] OR "Health Care Professional"[All Fields] AND "Simulation Training"[All Fields] OR "Training, Simulation"[All Fields] OR Telesimulation[All Fields] OR "Virtual simulation"[All Fields] AND "Clinical Competence"[All Fields] OR "Competency, Clinical"[All Fields]) |
| Scopus<br>MeSH: "Students, Health Occupations"; "Health Personnel"; "Simulation Training"; "Clinical Competence" and the keywords: Telesimulation; "Virtual Simulation". | TITLE-ABS-KEY(({Students, Health Occupations} OR {Health Occupations Students} OR {Health Occupations Student} OR {Occupations Student, Health} OR {Occupations Students, Health} OR {Student, Health Occupations}) AND ({Health Personnel} OR {Personnel, Health} OR {Health Care Professionals} OR {Health Care Professional}) AND ({Simulation Training} OR {Training, Simulation} OR Telesimulation OR {Virtual simulation}) AND ({Clinical Competence} OR {Competency, Clinical})) |
| Embase<br>Emtree: "Health Student"; "Health Care Personnel"; "Simulation Training"; Clinical Competence" and the keywords: "Telesimulation" and "Virtual Simulation". | ("Health Student" AND "Health Care Personnel" AND "Simulation Training" OR Telesimulation OR "Virtual Simulation" AND "Clinical Competence") |
| CINAHL<br>Títulos/Assuntos: "Students, Health Occupations"; "Health Personnel"; "Simulation Training"; "Clinical Competence" and the keywords: Telesimulation; "Virtual Simulation". | SU(("Students, Health Occupations") AND ("Health Personnel") AND (Telesimulation OR "Virtual simulation") AND ("Clinical Competence")) |
| ERIC<br>Thesaurus: "Graduate Study"; "Health Personnel"; "Simulation"; "Competence" and the keywords: Telesimulation; "Virtual Simulation". | ("Graduate Study" AND "Health Personnel" AND Simulation OR Telesimulation OR "Virtual simulation" AND Competence) |
| Web of Science<br>MeSH: "Students, Health Occupations"; "Health Personnel"; "Simulation Training"; "Clinical Competence" and the keywords: Telesimulation; "Virtual Simulation". | AK=(("Students, Health Occupations" OR "Health Occupations Students" OR "Health Occupations Student" OR "Occupations Student, Health" OR "Occupations Students, Health" OR "Student, Health Occupations" AND "Health Personnel" OR "Personnel, Health" OR "Health Care Professionals" OR "Health Care Professional" AND "Simulation Training" OR "Training, Simulation" OR Telesimulation OR "Virtual simulation" AND "Clinical Competence" OR "Competency, Clinical")) |
| LILACS<br>DeCS: Descriptors in Portuguese, English and Spanish. The Portuguese version was demonstrated: "Students of Health Sciences", "Health Personnel", "Simulation Training", "Clinical Competence" and the keyword: Telesimulation. | Portuguese: (("*Estudantes de Ciências da Saúde*") AND ("*Pessoal de Saúde*") AND ("*Treinamento por Simulação*" OR *Telessimulação*) AND ("*Competência Clínica*"))<br>English: (("Students, Health Occupations") AND ("Health Personnel") AND ("Simulation Training OR Telesimulation) AND ("Clinical Competence"))<br>Spanish: ("*Estudiantes del Área de la Salud*" AND "*Personal de Salud*" AND "*Entrenamiento Simulado*" OR *Telesimulación* AND "*Competência Clínica*") |
| CAPES | Use of keyword: *Telessimulação* (https://catalogodeteses.capes.gov.br/catalogo-teses/) |
| DART | Use of keyword: Telesimulation (https://www.dart-europe.org/basic-search.php.) |
| EThOS | Use of keyword: Telesimulation (https://ethos.bl.uk/SearchResults.do) |
| RCAAP | Use of keyword: *Telessimulação* (https://www.rcaap.pt/) |
| National ETD Portal | Use of keyword: Telesimulation (http://www.netd.ac.za/?query=telesimulation&action=search) |
| Theses Canada | Use of keyword: Telesimulation (https://www.bac-lac.gc.ca/eng/services/theses/Pages/list.aspx?AW_S=telesimulation) |

als:(17) author; year of publication; country of origin; objective; study design; telesimulation practice; outcomes; target audience; clinical scenarios; and assessed skills.

To categorize the outcomes, thematic analysis was adopted, following three steps: (1) pre-analysis: evidence text skimming and organization of converging information, called recording units; (2) material exploration: grouping of units of similar records; and (3) data processing: structuring and description of categories.[18] Finally, the telesimulated design was constructed, leaving it for content assessment by a committee of judges in May 2022.

In the second step, judges were selected through the analysis of résumés on the *Plataforma Lattes*, in which the identified résumés were analyzed according to specific criteria for calculating the score, which considered four points for having a PhD with thesis in the area of interest of the study; three points for having a PhD; three points for a having master's degree with a dissertation in the area of interest of the study; two points for having a master's degree; two points for publication of an article in a reference journal in the area of interest of the study and two points for professional experience of at least 2 years in the area of interest. A minimum value of 5 points was established for inclusion.[19]

The judges were contacted via e-mail and then sent a Google Forms with a deadline of 30 days for a response containing the letter of invitation, Informed Consent Form and a collection instrument with three parts: (1) judge characterization; (2) script content; (3) content assessment criteria measured by a Likert-type scale, with scores from 1 to 4, addressing the criterion's relevance/representativeness, namely: 1 - non-relevant/representative

item, equivalent to strongly disagree; 2 - item needs major review to be representative, equivalent to disagree; 3 - item needs minor review to be representative, equivalent to agree; and 4 - relevant/representative item, equivalent to strongly agree.[20]

In sequence, the third step of content validity[10] was carried out, organizing the findings in an Excel spreadsheet, with double typing by two researchers. For the analysis of judge characterization, descriptive statistics were used with frequency, percentage and mean defined in the Statistical Package for the Social Sciences (SPSS) version 22 for Windows. For content analysis, the Content Validity Index (CVI) measure per item and the total CVI of the design were adopted.[12]

To calculate the CVI per item, answers 3 and 4 of the judges were added, arranging them in the formula: number of answers 3 or 4/total number of judges. To obtain the total CVI of the design, all the CVIs were added up, dividing the result by the total number of design criteria.[12] Thus, if the design reached a value lower than 0.00: poor agreement; 0.00 – 0.20: slight agreement; 0.21 – 0.40: acceptable agreement; 0.41-0.60: moderate agreement; 0.61 – 0.80: considerable agreement; 0.81 – 1.00: almost perfect agreement. In this study, a CVI > 0.80 was considered to indicate the valid construct in content.[20] The Delphi technique was considered if there was no inter-rater agreement.[21] This research was approved by the Research Ethics Committee of the *Universidade Federal do Triângulo Mineiro* under Opinion 5.344.929 and CAAE (*Certificado de Apresentação para Apreciação Ética* - Certificate of Presentation for Ethical Consideration 57388522.0.1001.5154).

## Results

First presenting the outcomes from the scoping review, 1,901 studies were identified and nine made up the final sample (Figure 1).

Studies produced on synchronous and observational telesimulation are mostly from 2021[1,5,22-25] of American origin,[5-7,22-26] descriptive,[1,6,22-25] with medical focus[1,5-7,22-26] and in emergency.[5-7,23,26]

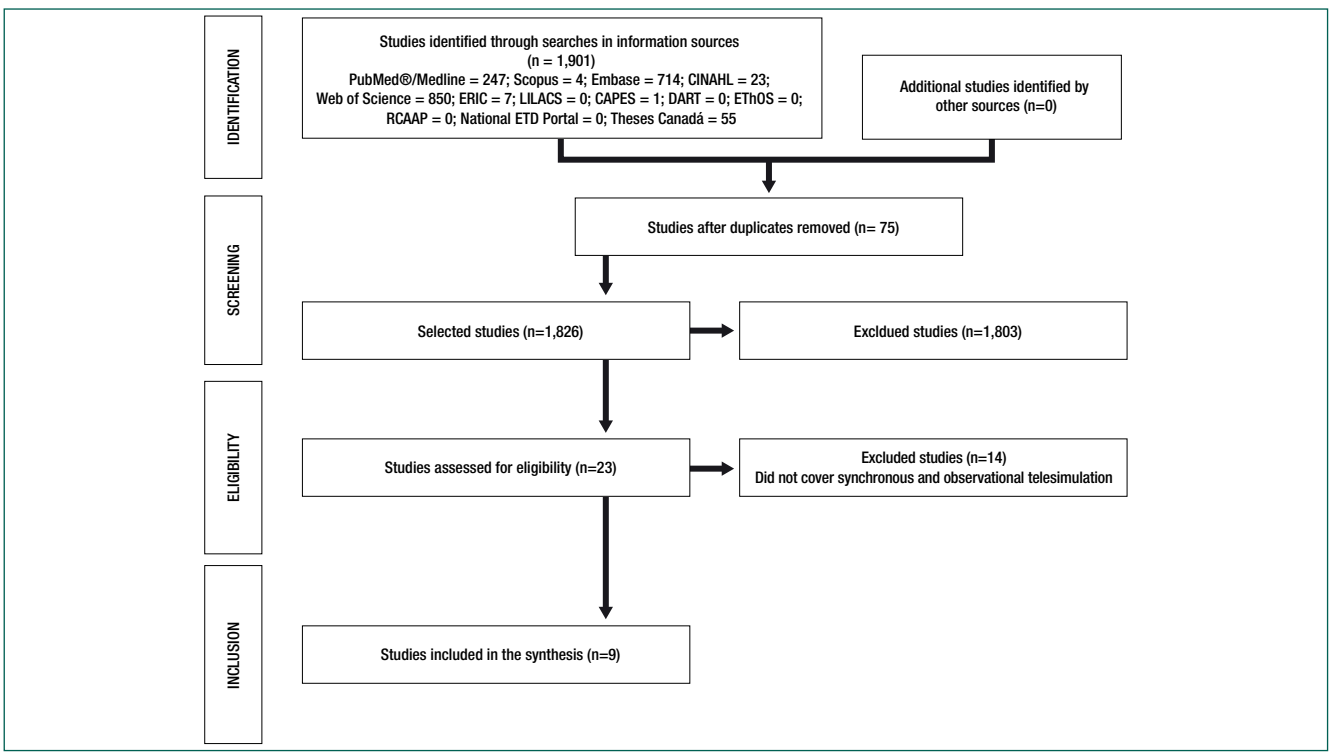


**Figure 1.** Flowchart of identification, selection and inclusion of studies, prepared from the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation recommendation

Based on the findings of the scoping review, a six-step design was developed: (1) planning step, consisting of a description of 21 components; (2) preparation step, divided into pre-simulation phases with two components and the pre-briefing/briefing phase, consisting of 11 components; (3) participation step, covering phases a, b, c and d; (4) teledebriefing step; (5) student assessment and feedback collection step and (6) additional learning step. This construct was submitted to content assessment, initially selecting 50 judges and obtaining the participation of 11. Of this population, eight (72.70%) were female and three (27.30%) were male, with a mean age of 42.63 years (SD=7.99; range of 33-57 years), 20.27 years of training (SD= 7.17; range 12-35 years), 12.45 years of experience with simulation/telesimulation (SD= 4.84; range 5-22 years) and average production of 10 articles on the theme (SD= 8.87; range from 0-25 articles). The presentation of content validity results and inter-rater agreement was shown in Table 1.

**Table 1.** Distribution of judges' answers (11), Content Validity Index of the steps, related to telesimulated design assessment regarding relevance/pertinence and clarity/accuracy

| Content validity | Components that composed the telesimulated instructional design | Number of valid answers "3" or "4" | CVI% |
|---|---|---|---|
| Relevance/ pertinence | Step 1 – Planning | 11 | 100 |
| | Step 2 – Preparation | 10 | 90.90 |
| | Step 3 – Participation | 11 | 100 |
| | Step 4 – Teledebriefing | 11 | 100 |
| | Step 5 – Student assessment and feedback collection | 11 | 100 |
| | Step 6 – Additional learning | 10 | 90.90 |
| Clarity/ accuracy | Step 1 – Planning | 11 | 100 |
| | Step 2 – Preparation | 10 | 90.90 |
| | Step 3 – Participation | 11 | 100 |
| | Step 4 – Teledebriefing | 11 | 100 |
| | Step 5 – Student assessment and feedback collection | 11 | 100 |
| | Step 6 – Additional learning | 10 | 90.90 |

Almost perfect agreement was obtained, above 0.81%,[20] in the criterion judgment of the six design steps for telesimulation as well as a total CVI of 96.96%, which indicates the content validity of this construct.[27,28] In this way, the construct was returned to judges, without the need to proceed with the Delphi technique rounds, given the inter-rater agreement already obtained. The following suggestions from the judges involved were highlighted: (1) degree of complexity versus level of fidelity of scenery and mannequin; (2) description of the adopted online broadcast technology and (3) reduction of proposed learning objectives for telesimulation. In short, synchronous and observational telesimulation is composed of six steps that supported the telesimulated design construction, namely: (1) planning, highlighted as the moment that instructors/facilitators describe and validate their design; (2) preparation, divided into pre-simulation and pre-briefing/briefing, providing students with prior study and preparation on the subject of learning and peculiarities for online and remote participation in the telesimulated activity, followed by the introduction of facilitators and application of pre-test instruments; (3) participation, constituted by the development of three phases, namely: (A) telesimulated clinical scenario design planning; (B) telesimulated scenario design validity; (C) scenario pilot test; (4) teledebriefing, characterized as an analytical moment of reflection/discussion of the telesimulated scenario, observed by students remotely, online and live; (5) student assessment and feedback collection, which occurs through the definition of tools or instruments for assessing cognitive and affective skills that are intended to be developed through the proposed telesimulated educational strategy; (6) additional learning, characterized by the instructional support resources made available after the end of tele-simulation to enhance knowledge on the selected topic. The final version of telesimulation design can be viewed in Annex 1.

## Discussion

The development and validity of a telesimulation design for teaching BLS in adults, adaptable to other realities and pedagogical contexts, is relevant and makes nursing science unique for presenting, for the first time and especially at a national level, an easy-to-apply course for telesimulation practice, basing it on scientific evidence.[1,5-7,22-26]

The accelerated production of manuscripts on telesimulation at the international level and its scarcity in the national territory encourage the explora-

tion of this theme in Brazil for health and nursing education, with the intention of promoting simulation-based teaching for students and professionals, remotely, online and also in distant places.[1,5-7,22-26]

Still, the characterization of telesimulation as an innovative and emerging theme can justify the constitution of the sample of articles that subsidized the design elaboration, with most of them being descriptive, of low level of evidence, given the need for conceptual deepening and description of the first lived experiences, a condition that signals the importance of advancing science by investing in methodologically well-designed, quasi-experimental and randomized experimental studies to verify and/or compare the effectiveness of telesimulation with other simulated modalities or different pedagogical strategies in nursing.[1,6,22-25]

In this context, it is emphasized that establishing validity processes for tools and constructs, capable of guiding the planning of pedagogical strategies that have not yet been adopted and, therefore, subject to mistakes in their execution, is essential to obtain quality and achieve educational objectives in nursing.[8,29] However, despite this importance, a contemporary challenge to establish validity of content in simulation and telesimulation is the difficulty in obtaining a considerable number of specialists in an area that is still expanding, which interferes with conducting studies. methodologies with the purpose of validity.[29,30]

Methodological studies carried out in Brazil, with the aim of constructing and validating constructs in content, had a limited number of judges (between four and seven judges). The studies pointed out the shortage of judges as a limitation, since small samples of specialists can generate biased values and, consequently, wrong conclusions about the assessed construct.[29,30]

The total CVI of the telesimulated design showed almost perfect agreement, which indicates that the construct has relevance, pertinence, clarity and accuracy to what it aims at.[27,28] Although CVI calculation is a relevant step used in methodological research, in the national territory, there are no studies that aimed to construct and validate constructs in the context of telesimulation, and with regard to international research, these opt for descriptive studies or even depart for the telesimulated experience, without validating the path. Thus, the need to develop and validate tools in this area capable of offering reliability and better learning outcomes in nursing is justified.[1,6,22-25] Research with on-site clinical simulations is already cultural, especially in Brazil, where the simulated design validity process is carried out.[8,31]

A national validity study of a simulated script to plan and execute the first step of clinical simulation in the scope of BLS in adults in CA corroborates with the present research, by evidencing a CVI of 0.90 characterized as an almost perfect agreement, indicating that there was a scientific recognition and criticality in content assessment for achieving the proposed objectives.[8]

In South Korea, a study that developed and validated a scenario to improve patient safety during the care of patients with asthma, identified a similar result when obtaining a CVI greater than 0.80, obtaining almost perfect agreement, which demonstrates that this construct presents reproducibility and coherence for the scope of teaching and learning.[32]

In this research, judges' suggestions to enhance the proposed design were valued, such as the questioning about adopting the terminology "degree of complexity" instead of "level of fidelity" both to characterize simulated scenarios and for mannequins.

On this note, it is worth considering that both concepts have been adopted as synonyms by the literature specialized in simulation and that the degree of fidelity or complexity of the scenario overlaps that of the mannequin, i.e., the fact of not obtaining a high-tech mannequin during telesimulation is not the only factor to be considered to characterize the complexity of a scenario.[33,34]

References such as the International Nursing Association of Clinical and Simulation Learning (INACSL) advocate using the term degree of fidelity and define it as the combination of physical, conceptual and psychological aspects used in order to achieve the objectives, in order to create the necessary perception of realism that will allow students

to be meaningfully involved in the teaching and learning process.[35]

Checking clarity in the description of the technology for broadcast adopted in the proposed telesimulated design was also a factor pointed out by judges, an indispensable criterion for the success of telesimulation, since this simulated pedagogical modality needs technological resources to be made viable.[1,5-7,22-26]

A study carried out in the United States, which applied telesimulation with the intention of promoting teaching to medical students, shows the importance of clearly describing the technologies used and highlights the main resources used to promote this type of simulation, characterized by telecommunications equipment that allows audiovisual gathering and broadcasting (they can vary from a simple smartphone, computer or web camera, to sophisticated audiovisual equipment in simulation centers), an Internet connection and software with teleconferencing capabilities.[7]

At the national level, it is difficult to establish a more technological education, given the scarcity of material and financial resources available in educational institutions. However, due to the benefits of telesimulation, there is a need to invest in technological structures, mainly in state, federal and public undergraduate courses in order to promote effective teaching online for distant places or in situations of social distancing.[1,7,26]

Finally, the better delimitation of the learning objectives in telesimulation design was also a concern of judges and, in view of this, the number of objectives was reduced to five, a coherent amount to the execution time of a telesimulated scenario and possible to be developed and achieved in this context, as specified by learning references used in nursing.[36]

The INACLS Health Simulation Standards of Best Practices state that learning objectives must be supported by Bloom's Taxonomy and that these must consider the needs and what students intend to achieve as a result of participating in the simulated experience.[37]

The present study presents as a limitation the small number of judges, although it is considered adequate due to the methodological framework used.

## Conclusion

The developed tele-simulated design presented six steps and proved to be valid, obtaining a CVI of 96.96%, capable of demonstrating the agreement between judges regarding relevance/pertinence and clarity/accuracy; therefore, the design has been validated to be used as a teaching-learning resource for nursing students with regard specifically to CA care in in-hospital adults with BLS. It is expected that this design will help professionals, facilitators and professors from other educational institutions to plan and execute the telesimulation with the intention of promoting quality teaching through the achievement of the proposed objectives, the articulation of theory and practice, decision-making assertiveness and patient safety.

## Collaborations

Bernardinelli FCP, Amorim GC, Nascimento JSG, Fonseca LMM, Domingues TAM, Condeles PC and Chavaglia SRR contributed to the project design, data analysis and interpretation, article writing, relevant critical review of intellectual content and approval of the final version to be published.

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**Annex 1.** Design: synchronous and observational telesimulation aimed at assisting in-hospital CA in adults with BLS

| DESIGN: SYNCHRONOUS AND OBSERVATIONAL TELESIMULATION AIMED AT ASSISTING IN-HOSPITAL CARDIAC ARREST IN ADULTS WITH BASIC LIFE SUPPORT | |
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| **Step 1 – Planning**<br>**Description:** Initial step of telesimulation aimed at the description, organization and validity of the process carried out by facilitators/instructors. | |
| **Components** | **Component description** |
| (1) Determination of the theoretical references adopted to plan the proposed telesimulation | - Scientific evidence mapped through a Scoping Reviews, carried out in 2022 by the author herself, specifically for the construction of this instructional design;<br>- Simulation guidelines based on the International Nursing Association for Clinical Simulation and Learning (INACSL) (INACSL, 2016);<br>- Assumptions of Bloom's Taxonomy (ADAMS, 2015);<br>- Updated American Heart Association (AHA) guidelines for adult in-hospital cardiopulmonary resuscitation (CPR) (AHA, 2020). |
| (2) Learning theme: | In-hospital CA care, in adults, with basic life support (BLS) and automated external defibrillator (AED) use. |
| (3) Target audience: | Nursing undergraduate students (adaptable to nursing professionals and other health areas). |
| (4) Learning objectives and clinical skills developed. | Main objective:<br>- Develop cognitive and affective skills in undergraduate nursing students focused on telesimulated care for in-hospital CA in adults with BLS and AED use.<br><br>Specific objectives (based on the hierarchy of learning stages proposed by Bloom's Taxonomy):<br>As for the cognitive aspects: telesimulation involves the learning stages of the cognitive domain, characterized by knowledge and understanding, referring to Bloom's taxonomy)<br>- Define in-hospital CA care in adults with BLS and AED use;<br>- Understand the actions relevant to the In-hospital Chain of Survival Links in adults;<br>As for the affective aspects: telesimulation involves all learning stages of the affective domain referring to Bloom's taxonomy - Reception, Response, Assessment, Organization and Characterization.<br>- Make nursing students satisfied and self-confident for in-hospital CA in adults with BLS and AED use.<br>(NASCIMENTO et al., 2021; ADAMS, 2015; AHA, 2020) |
| (5) Description of the instructional material and learning environment/platform adopted for pre- and post-telesimulation: | Instructional materials:<br>- Video lesson and video simulation on in-hospital CA care in adults using BLS and AED (ALVES et al., 2018a; ALVES et al., 2018b).<br>- Updated AHA Guidelines for Adult In-Hospital CPR (AHA, 2020).<br>Learning platform:<br>- Microsoft Teams collaborative platform, Google Forms. |
| (6) Description of elements that will be presented in pre-briefing/briefing and didactic contract established between facilitators and students. | Telesimulation environment presentation; clinical case; activity duration; scenario start and end triggers; instruments and materials available; learning objectives; clues offered to students and aspects related to the didactic contract. |
| (7) Description of phases and components of the telesimulated scenario design: | Phase A: Simulated clinical scenario design planning – components: responsible for scenario elaboration and facilitation; classification of adopted telesimulation; scenario theme; theoretical-methodological framework to elaborate the scenario; learning theme theoretical foundation; scenario fidelity; physical space where the scenario will be broadcasted; target audience; inclusion and exclusion criteria; skills developed; general and specific learning objectives; scenario duration; instruments; clinical case; scenario start and end triggers; actions and script for training actors, standardized patients or students who will participate on-site in the scene; decision tree; material resources for the scene.<br>Phase B: Telesimulated scenario design validity (See the description of this process in the participation step - phase B).<br>Phase C: Scenario pilot test (See description of this process in the participation step - phase C). |
| (8) Definition of scenario complexity: | Complexity: Degree to which a simulated experience approximates reality, measured by dimensions: (1) environment (equipment, tools, simulators, makeup, noise, adornments); (2) psychological factors: (participants' emotions, beliefs and self-awareness); (3) social factors (motivation and goals of participants and instructors; group culture; degree of openness and trust, participants' way of thinking) (PEREIRA et al., 2021).<br>Complexity of the proposed scenario: medium complexity. |
| (9) Definition of the type of simulation instrument adopted: | Little Anne QCPR® simulator, characterized as an adult/torso mannequin capable of providing real-time feedback on compressions and ventilations. |
| (10) Characterization of the simulator's technological degree: | Low technological level, consisting of a mannequin that does not present a verbal, visual, physiological or motor response, used for CPR (PEREIRA et al., 2021). |
| (11) Organization of the necessary human resources: | Laboratory technicians for simulated activities, specific technicians for the online and live broadcast of telesimulation, professors/facilitators and students. |
| (12) Description of materials needed to establish the clinical scenario: | - Permanent materials: Little Anne QCPR® simulator; emergency trolley; stepladder; bag-valve-mask unit; complete gas gauge, with devices attached such as an oxygen humidifier, containing distilled water at the minimum estimated level; aspiration system with bottle; AED for training; hospital stretcher; pulse oximeter; electrodes for cardiac monitoring; sheet; pillow and goggles;<br>- Student consumables: procedure gloves (S, M and G) and surgical-type face masks, gel alcohol. |
| (13) Definition of technological resources for telesimulation broadcast: | Teleconferencing platform (Microsoft Teams), computers, internet, camcorders, online broadcast mechanisms (microphone, cutting table, digital soundboard, lighting). |
| (14) Definition of technological resources for remote student observation: | Personal computer, phone or tablet, internet and internet network equipment. |
| (15) Method and technique of debriefing adopted: | Method: Structured and Supported Debriefing (G.A.S debriefing). |
| (16) Student feedback mechanisms: | A verbal description of students' perception of the telesimulated experience, immediately (YANG et al., 2021; DIAZ; WALSH, 2020). |

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| (17) Time available for each step of telesimulation: | - Planning and validity: Planning (30 days); instructional design validity (60 days);<br>- Preparation: Pre-simulation (10 days), pre-briefing/briefing (10 minutes);<br>- Participation (15 minutes);<br>- Teledebriefing (30 minutes);<br>- Assessment (30 minutes).<br>(NASCIMENTO et al., 2021b) |
| (18) Telesimulation instructional design validity: | Submit the proposed instructional design to the content validity process by experts (See description of this process in the participation step - phase B) |
| (19) Guidelines for the alignment meeting of facilitators and staff involved in telesimulation: | - After validating the instructional design, it is recommended to hold an on-site meeting at the place where telesimulation will be broadcasted, with the filming and broadcast team and clinical skills laboratory technicians, to test the equipment and define the materials used as well as the explanation of the proposed activity, removal of doubts and scheduling of pilot test.<br>- Then, hold an online meeting to align those involved in the execution of the telesimulated clinical scenario, presenting the instructional design, explaining the proposed activity, removing doubts and defining roles and functions. The telesimulation team will consist of:<br>*Facilitator responsible for telesimulation: will execute the telesimulation steps (Preparation, conducting the scenario and teledebriefing) and assessing students;<br>*Assistant facilitator: responsible for imitating the mannequin's speech during scenario execution and assisting in the simulation steps;<br>Comments:<br>*Explanatory scripts will be made establishing the activity, organizing it and defining the functions;<br>*On the date to be developed the telesimulation, T-shirts will be delivered that identify the role of each of the team members. |
| (20) Pilot test: | Description of the test procedure for functionality of the proposed clinical scenario. A scene will be performed, with the conduction of two facilitators, participation of four students for the execution of telesimulation and of 15 students for observing the telesimulated activity (See description of this process in the participation step - phase C) |
| **Step 2 – Preparation (Pre-simulation and Pre-briefing/briefing)** | |
| **Pre-simulation**<br>**Description:** Step that provides the study and prior preparation of students on the subject of learning and peculiarities for online and remote participation in the telesimulated activity. This step can be made possible by instructional platforms of the educational institution, or via electronic mail (students' email), providing references and study materials on the activity. | |
| **Components** | **Component description** |
| (1) Procedures, references and study materials: | - To enable the scientific preparation of students, before observing the telesimulated scenario, the study materials on the proposed theme relevant to the teaching and learning process will be made available during the 10 days prior to scenario execution, configured by previously validated video lesson and video simulation about adult CPR and guidelines to support this procedure. The materials can be sent through the Classroom® platform (Google). The study references adopted are presented below:<br>- Video lesson: CPR in adults with BLS using AED in the hospital environment (https://www.youtube.com/watch?v=MT4DJ5sazik&t=435s);<br>- Simulation video: CPR in adults in BLS using AED in the hospital environment (https://www.youtube.com/watch?v=xvmOepMeQd4&t=62s);<br>- Material entitled "*Destaques da AHA 2020 – Atualização das Diretrizes de RCP e ACE - Resumido em Portuguese*" (https://cpr.heart.org/-/media/CPR-Files/CPR-Guidelines-Files/Highlights/HghIghts_2020ECCGuidelines_Portuguese.pdf). |
| **Step 2 – Preparation (pre-briefing/briefing)**<br>**Description:** After students' online reception, the facilitators present themselves and pre-test instruments are applied, if necessary, for assessment. Then, the pre-briefing/briefing phase is established, by the facilitators, consisting of the explanation of all the components that involve and allow executing the telesimulated scenario, carried out in ten minutes. | |
| **Components** | **Component description** |
| (1) Teaching contract: | This is the pact made between facilitators and students for the smooth running of the clinical scenario and subsequent teledebriefing, containing: maintaining silence by remote students and keeping the cameras off (offline) during scenario execution and also the need to turn on the cameras and participate in teledebriefing after scene execution. Also, note by remote students of all the points necessary for discussion during teledebriefing and about the impossibility of researching external sources during the pre- and post-test. Moreover, for security reasons, students will be asked to position a second device (cell phone) with a camera so that their screen can be monitored during assessment. |
| (2) Explanation about the assessment tool: | The process, instruments and platform for assessing students will be explained (pre-test, post-test and scales for attitudinal assessment). |
| (3) Simulation environment presentation: | Configured by an emergency room of an emergency room, in a public teaching hospital. |
| (4) Explanation of clinical scenario duration: | Duration of approximately 15 minutes. |
| (5) Explanation of scenario start and end triggers: | Despite being a telesimulation, the simulated scenario will involve four students who are interested in participating on-site, with the intention of executing the scene, providing remote observation of the others. After reading the case by the lead facilitator, the roles for carrying out the scene will be distributed and agreed upon between facilitators and students, explaining that the scene will start with a nurse entering the emergency room and visiting the bedside of the patient in question, and the scene will end with the return of the patient's central pulse, after five cycles of CPR (See description of this process in the participation step - phase A). |
| (6) Definition of instruments (simulator/standardized patient/simulated patient) | Characterizes the type of simulator used to carry out the proposed scenario (See description of this process in the planning step - item 9). |
| (7) Clarification of learning objectives: | It will present what is intended with telesimulation, in general, for student learning (See description of this process in the planning step – item 4). |
| (8) Materials available: | Mention and demonstrate in the environment, the location of all permanent and consumable materials necessary for scenario execution (See description of this process in the planning step - item 12). |

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| (9) Clues that will be offered by facilitators to conduct the scene: | During the scene, it may be necessary to launch certain clues, carried out by the facilitator, for conducting and executing the clinical case by students, according to and depending on the decisions taken (See description of this process in the participation step presented through the decision tree (ANNEX 2). |
| (10) Explanation of the clinical case proposed for learning: | The clinical case will address a cardiac emergency of an adult patient (See description of this process in the participation step - phase A - item 14). |
| **Step 3 – Participation**<br>**Phase A: Telesimulated clinical scenario design planning**<br>**Description:** The participation step corresponds to the execution of the clinical scenario telesimulated by students, broadcasted live and online to remote participants. | |
| **Components** | **Component description** |
| (1) Responsible for preparing and facilitating (conducting) the scenario: | Person in charge of elaboration: _____<br>Person in charge of facilitation: _____ |
| | Synchronous and observational: facilitators and students experience the activity in real time, in which students remotely observe the clinical scenario execution and participate in teledebriefing (DUFF et al., 2021; NAIK et al., 2020). |
| (2) Classification of telesimulation adopted: | Attendance to CA in adults in an in-hospital environment with BLS and AED use. |
| (3) Scenario theme: | - In order to understand the fundamental planning elements of a telesimulated scenario design, there was a basis on mapped scientific evidence (NASCIMENTO et al., 2021; FABRI et al., 2017; NEVES; PAZIN-FILHO, 2018; NEGRI et al., 2019; KANEKO; LOPES, 2019; ALMEIDA et al., 2015; PEREIRA et al., 2021);<br>- Scientific evidence mapped through a scoping review, carried out in 2022 by the author specifically for the construction of this instructional design;<br>- Guidelines for simulation based on INACSL (INACSL, 2016);<br>- Assumptions of Bloom's Taxonomy (ADAMS, 2015); |
| (5) Theoretical foundation of the learning theme: | AHA Guidelines for CPR (2020) (AHA, 2020; NASCIMENTO, 2021; ALVES, 2018). |
| (6) Scenario fidelity: | Medium fidelity (PEREIRA et al., 2021). |
| (7) Physical space where the scenario will be broadcasted: | Laboratory of simulated clinical practices. |
| (8) Target audience: | Nursing undergraduate students (adaptable to nursing professionals and other health areas). |
| (9) Inclusion and exclusion criteria: | Undergraduate students in nursing aged 18 years or older, who have completed the Technical Bases of Nursing Care discipline, will be included, as they have already been exposed to fundamental technical knowledge. Nursing students who had previous contact with the BLS theme less than 12 months ago and those who do not have equipment or technological conditions to follow the intervention remotely will be excluded. |
| (10) Skills to be developed through the telesimulated activity: | Cognitive (knowledge) and affective (attitudinal/emotional) skills on in-hospital CA care in adults with BLS and AED use. |
| (11) General and specific learning objective: | Main objective:<br>- Develop cognitive and affective skills in nursing students focused on telesimulated care for in-hospital CA in adults with BLS and AED use.<br>Specific objectives:<br>• Early recognize CA;<br>• Activate the emergency medical service;<br>• Perform high-fidelity immediate CPR;<br>• Apply rapid defibrillation.<br><br>(AHA, 2020; NASCIMENTO, 2021; ALVES, 2018) |
| (12) Scenario duration: | Duration of approximately 15 minutes. |
| (13) Instruments: | A low-fidelity simulator of the Little Anne QCPR® type will be adopted. To maintain realism, an auxiliary facilitator will voice the mannequin/patient, communicating with student during scene execution. |
| (14) Clinical case: | Information for the student:<br>A patient (Mr. Alfredo), 50 years old, admitted to an emergency room at a public teaching hospital, two hours ago, with a history of vomiting, precordial pain, irradiation to the posterior thoracic region and medical diagnosis of acute myocardial infarction (AMI). He is oriented, breathing room air, monitored with a heart monitor and pulse oximeter. A nurse arrives to carry out the shift and goes to Alfredo's bed, approaching him for the visit. You can start the scene by visiting Mr. Alfredo and ask how he is doing! (This far will be read to the student).<br>Information for the facilitator only (for conduction and clues, if necessary).<br>- Student: "Good morning, Mr. Alfredo! How are you, sir?" (The auxiliary facilitator will voice Alfredo, answering the student about his clinical status)<br>- Mr. Alfredo: "Hi! I'm not very well! I'm feeling a pain here in my chest"<br>- Student: The student is expected to say: "From 0 to 10, how much is your chest hurting, Mr. Alfredo?"<br>- Mr. Alfredo: 09, darling, it hurts a lot! (Mr. Alfredo makes a sound of pain, until he stops talking altogether)<br>- Student: In view of patient's absence of speech, she says: Mr. Alfredo? Mr. Alfred? (Expect to call staff help at this point and allow CPR to begin)<br>(NASCIMENTO, 2021; ALVES, 2018) |
| (15) Description of scenario start and end triggers: | Despite being a telesimulation, the simulated scenario will involve four students on-site, with the intention of executing the scene, allowing the remote observation of the others. After reading the case, by the lead facilitator, the roles for performing the scene will be distributed and agreed between facilitators and students, explaining that the scene will start with a nurse entering the emergency room and visiting the bedside of the patient in question, and the scene will end with the return of patient's central pulse, after five cycles of CPR. |

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| (16) Roles of students during the simulated scenario: | Student 1: Nurse leader: responsible for starting the scene, visiting Mr. Alfredo, talking to him and checking the occurrences from then on;<br>Student 2, 3 and 4: They will be called to the bedside only when the lead nurse decides.<br>Only for the facilitator:<br>Student 1: Identifies and leads CPR; calls the team and starts external chest compressions (ECC);<br>Student 2: Performs ventilation with a bag-valve-mask;<br>Student 3: Performs AED;<br>Student 4: Switch ECCs after 2 minutes. |
| (17) Expected performance of on-site students: | Students must:<br>• Early identify CA;<br>• Touch intensely at the level of patient's shoulders and with an intense auditory stimulus, confirm unresponsiveness for five to ten seconds;<br>• Call for help from other professionals to assist and request an emergency cart and AED;<br>• Properly use the necessary PPE for care: procedure gloves and mask;<br>• Completely expose victim's chest;<br>• Correctly assess pulse and respiration simultaneously;<br>• Correctly position patient in bed;<br>• Carry out the insertion of compression board on patient's back before starting ECC;<br>• Correctly position the rescuer for assistance;<br>• Correctly position the overlapping hands, interlaced on the chest two fingers above the xiphoid process during ECC;<br>• Maintain the correct depth for ECC in centimeters;<br>• Maintain the correct frequency of ECC;<br>• Allow chest recoil after compression;<br>• Minimize interruptions between compressions;<br>• Interrupt ECC every 2 minutes, not exceeding 10 seconds, assessing the return of spontaneous circulation (presence of a pulse);<br>• Take turns with the rescuer during ECC interruptions – every 2 minutes, not exceeding 10 seconds;<br>• Connect the bag-valve-mask to the oxygen humidifier, checking that it is working before starting ventilation;<br>• Correctly open the airways for bag-valve-mask ventilation;<br>• Perform ventilation correctly with a bag-valve-mask device;<br>• Ensure oxygen flow at 15L per minute;<br>• Avoid excessive ventilation;<br>• Maintain the correct compression-ventilation ratio (30:2) without advancing the airway;<br>• Attach the mask to the victim's face with the thumb and forefinger, pressing it, and the other fingers pulling the mandible, without escaping air;<br>• Use AED correctly;<br>• Ensure the quality of ECC during adherence of AED pads to the victim's chest;<br>• Ensure that everyone is away from the victim when requested by AED;<br>• Ensure that the oxygen flow is interrupted and away from the victim when applying the shock;<br>• Restart CPR immediately after applying the shock until further command from AED;<br>• Assess patient response (pulse and breathing) when shock was not indicated (if absent: restarted CPR; if present: implemented the indicated measures for after return of spontaneous circulation);<br>• Identify CRP rhythms;<br>(NASCIMENTO, 2021; ALVES, 2018) |
| (18) Decision tree for conducting students, if they are responsible for executing the scene: | The decision tree layout is found in ANNEX 2. |
| (19) Material resources for the scene: | Permanent and consumable materials described in the planning step (See description of this process in the planning step - item 12). |
| **Step 3 – Participation<br>Phase B: Telesimulated scenario design validity** | |
| **Components** | **Component description** |
| (1) Design content validity: | The proposed telesimulation instructional design will be submitted to the content validity process by professional nurses, emergency specialists, experts in the field of clinical simulation and/or telesimulation, following the Delphi technique until reaching a total Content Validity Index equal to or greater than 0.80 (SANTOS et al., 2020; PASQUALI, 2009). |
| **Step 3 – Participation<br>Phase C: Scenario pilot test** | |
| **Components** | **Component description** |
| (1) Pilot test description: | At a pre-scheduled time, establishing a number of participants to carry out the pilot test, in accordance with the guidance of a professional statistician, all the steps of telesimulation will be carried out: Preparation, participation and teledebriefing, with the intention of align the activity and avoid biases. All elements of the participation step for conducting the scenario will be practiced during the execution of a scene, with the conduction of two facilitators, participation of four students for executing telesimulation and 15 students for observing the telesimulated activity.<br>(See description of this process in the planning, preparation, participation and teledebriefing step). |
| **Step 4 – Teledebriefing**<br>**Description:** Step characterized by an analytical moment of reflection/discussion of the telesimulated scenario, observed by students remotely, online and live, conducted by one or more facilitators. It is recommended to carry out teledebriefing until all learning objectives are discussed and contemplated. It usually lasts twice as long as it takes to perform the clinical scenario. It must be based on a debriefing method and technique. | |
| **Components** | **Component description** |
| (1) Technique: | Oral teledebriefing with a facilitator: a debriefing performed by an instructor, verbally online and live for reflection and discussion by remote students about the observed scene (HONDA; MCCOY, 2021). |

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| (2) Method: | Structured and Supported Debriefing (G.A.S debriefing): a debriefing method developed by the Winter Institute for Simulation Education and Research at the University of Pittsburgh, in partnership with the AHA, in 2009 (NASCIMENTO et al., 2021a), which follows the following structured steps:<br>G: Gather – Gather information and reassure students' feelings: "How are you feeling after the experience?<br>A: Analyze – Analyze the experience and articulate it to the theoretical framework: "Describe how you assisted Mr. Alfredo"; "What are the positive points in this service?"; "What points need improvement?"<br>S: Summarize – Summarize the experience, and articulate it to the learning objectives: "what caught your attention in this experience?"; "What do you take from that experience to your professional life?"<br>(NASCIMENTO et al., 2021a; PHRAMPUS, O'DONNELL, 2013)<br>It should be noted that debriefing will be directed both to participants in the on-site scene and to remote students. In this way, the question will first be directed to on-site students and repeated and directed to students who observed, fulfilling teledebriefing. |
| (3) Procedure: | After executing the scenario, teledebriefing will be directed simultaneously to on-site students and students who watched the scene remotely. The G.A.S, debriefing questions will be asked to generate discussion triggers first to on-site students and then to remote students. Both on-site and remote students must express themselves and can, at any time, ask and interrupt the discussion, making comments and removing their doubts. Teledebriefing will only be finalized after the learning objectives are contemplated.<br>(HONDA; MCCOY, 2021; NASCIMENTO et al., 2021a; PHRAMPUS, O'DONNELL, 2013) |
| (4) Duration: | Until reaching the learning objectives (approximately 30 minutes). |
| **Step 5 – Student assessment and feedback collection**<br>**Step description:** Definition of tools or instruments for assessing cognitive and affective skills intended to be developed through the proposed telesimulated educational strategy. Organization of the selected feedback format for feedback on the telesimulated activity from facilitators' and students' perspective. | |
| **Components** | **Component description** |
| (1) Assessment instruments: | - Instrument for assessing cognitive ability (knowledge) on telesimulated CA care in adults, in-hospital, with BLS, pre- and post-test, with 20 questions (NASCIMENTO, 2021; ALVES et al., 2019).<br>- Instrument for assessing the development of affective skills (satisfaction and self-confidence) in the telesimulated CA care in in-hospital adults with BLS called "Student Satisfaction and Self-Confidence in Learning Scale" (ALMEIDA et al., 2015). |
| (2) Duration: | 30 to 40 minutes. |
| **Step 6 – Additional learning**<br>**Step description:** Support instructional resources, made available after the end of telesimulation to enhance knowledge on the selected topic. | |
| **Components** | **Component description** |
| (1) Additional learning description: | A podcast called "10 minutes with the specialist" will be available on the WhatsApp application, in which the researcher will trigger the following guiding question "What are the clinical skills necessary for nurses to perform CPR with BLS?", and the specialist in the subject will forward the answer through an audio containing 10 minutes for students to listen to. |

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**Annex 2.** Decision tree