Cogitare Enfermagem

ORIGINAL ARTICLE

EDUCATIONAL MODELING WITH SIMULATION FOR THE CONSOLIDATION OF PROFESSIONAL COMPETENCE IN CONTINUING EDUCATION*

HIGHLIGHTS

1. Educational modeling technology with simulation.
2. It closes the gap between education and practice.
3. It contributes to innovation in the educational process.
4. Educational modeling that can be replicated and adapted to different subjects.

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ABSTRACT

Objective: to describe the development, application, and evaluation of educational modeling technology with simulation. **Method:** a methodological study carried out in 2022 in southern Brazil. Nursing and medical leaders and residents took part in two phases (identification of patient safety gaps and definition of educational sub-themes) and 10 stages (learning objectives; theoretical foundation; learner knowledge; scenario design; evaluation and adjustments to the simulation scenario; training of actors and guidance for observers; development of scenes; observation; and debriefing). **Results:** gaps in patient safety: developing communication between the interprofessional team, understanding the importance of protocols, and including the patient in the care process. Educational technology with simulation was evaluated as a tool that provides the opportunity to replicate and contrast everyday practice with patient safety precepts and to learn. **Conclusion:** The replicability of the methodology for different contexts and audiences is an important contribution to practice.

KEYWORDS: Educational Technology; Simulation Training; Competency-Based Education; Interprofessional Education; Patient Safety.

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INTRODUCTION

Simulation is an educational methodology that reproduces, in whole or in part, a situation[1]. It applies to professional training and is suitable for continuing education because it provides learning opportunities in an environment that is risk-free for the recipient of care[2-3]. In addition, the setting of the scenario is aimed at developing certain previously defined skills or competencies, meeting the learning objectives.

Modeling is defined as the act of modeling, drawing up a model for the development of an activity. In the health field, modeling makes it possible to guide or build a model to guide the activity[4]. By adding simulation, reality is replicated, with the Roll Play modality representing a real situation using actors[5].

As a strategy for the continuing education of health professionals, the simulated environment provides the opportunity to contextualize gold-standard care and the care provided daily. In this way, this methodology can be used according to the need that arises6; and it consists of a special opportunity to review concepts and proceed collectively to constructive criticism about the determinants that contribute to the quality of care.

Considering that continuing education contributes to technical-scientific learning and to the development of competencies aimed at filling gaps in professional practice[3], this research was aimed at developing, applying, and evaluating an educational strategy to promote professional competencies in patient safety.

The participants in this research were nursing and medical professionals training in health residency programs, and simulation was applied as a methodology for continuing and permanent education. It was assumed that professional practice is developing, which is an opportune moment to introduce and update concepts relating to patient safety. The study aimed to describe the development, application, and evaluation of educational modeling technology using simulation.

METHOD

The methodological research was applied to the development, validation, and evaluation of the strategy[7], which corresponded to the phases that comprise the stages for the development of adaptive technological modeling.

The study was carried out between April and December 2022 at a federal teaching hospital in the state of Paraná. The criteria for inclusion and invitation of leaders were nomination by quality management and teaching and research management. The following inclusion criteria were observed for inviting residents: age ≥18 years and being enrolled in the first or second year of the corresponding Residency Program (Child and Adolescent Health, Women's Health, Cardiology, Urgency and Emergency, Oncology and Hematology and Medicine in Clinical Medicine)[7]. No exclusion criteria were adopted.

The following were included: identifying weaknesses and gaps in patient safety, preparing support material, structuring and validating the simulated scenario, and evaluating the set; the process aimed to consolidate patient safety skills. The theoretical-practical roadmap by Fabri et al[8] was used for the research and adapted for this study (Chart 1).

Chart 1 - Roadmap by Fabri et al. (2017)8 versus roadmap adapted for the research. Curitiba, PR, Brazil, 2023.

Script from a Brazilian study[8]		Adapted script for the research	
Significance unit	Significance sub-unit	Phases	Stages
Learner's prior knowledge	Identifying the theoretical basis of the subject/ prior knowledge	1 - Identification of gaps in patient safety and definition of sub-themes sub-themes	1 - Professional and patient safety competencies and strategic objectives 2 - Focus group
Learning objective	Primary and secondary learning objectives		
Theoretical foundation	References Sending pre- and post-training material		
Scenario development	Evolution of the situation Critical factor of the scenario Clues Estimated scenario time/ should be short	2 - Structuring the simulation scenario	1 - Learning objectives 2 - Theoretical foundation 3 - Learner knowledge 4 - Designing the simulation scenario 5 - Evaluating and adjusting the simulation scenario 6 - Training the actors and orientation for observers 7 - Scene development and critical observation 8 - Debriefing
Debriefing	Theoretical foundation Debriefing/planning Points to be discussed in the debriefing/critical points		
	Theoretical foundation Debriefing/planning		
	Points to be discussed in the debriefing/critical points Estimated debriefing time		
Evaluation	Activity evaluation		

Source: The authors (2023).

The first phase was carried out between April and June 2022 and involved identifying educational gaps and healthcare weaknesses, with a focus on nursing and medical residents. This phase was organized in two stages: in the first, the competencies for health training, patient safety guidelines, and corresponding strategic objectives were compiled. The content was used to prepare support material, which was discussed in the second stage with representatives appointed by the following sectors: Health Surveillance, Teaching Management Sector, Extension Activities Management, Nursing Professional Axis Coordination, and Multiprofessional Residency Program Coordination, in a focus group meeting.

The second phase took place between July and December 2022 and consisted of the structuring, validation, and execution of the scenario, followed by the evaluation of the educational modeling technology. The first and second stages involved defining the learning objectives, based on the weaknesses and gaps identified by the leaders and drawing up the theoretical-practical compilation. This was used in stage 3 when workshops were held to bring nursing and medical residents closer to the topic and to contextualize theory with care and training practice.

In the fourth stage, the scenario was developed, including a narrative text with characters in a hypothetical care environment, to be developed in a simulated environment. The fifth stage involved validation of the scenario by the leaders, using an instrument designed for the research. The questions answered were related to the scenario's contribution to the perception of gaps related to communication (1), adherence to standards (2), patient involvement (3), and transversality of the theme in care (4); stimulating the approximation between theory and care practice (5) and stimulating reflection on care practice (6); the last question was related to the case's contribution to achieving the educational objective (7). The alternatives in the instrument answered by the leaders have judgment scores on a scale: (1) Totally Disagree, (2) Disagree, (3) Indifferent, (4) Agree and (5) Totally Agree.

To analyze the validity of the scenario, the Average Ranking indicator was used to measure the degree of agreement, with corresponding values: <3 lowest agreement, =3 indifferent, neutral or no opinion, and >3 highest agreement[9]. The Content Validity Index was used to assess whether the content covered in the scenario meets the intended construct; the sum of each item in the instrument with a response of "4" or "5" (agree and totally agree) was taken, the product of the sum was divided by the total number of responses, with a result ≥0.80[10] being defined as valid.

The reliability of the results was assessed using Cronbach's alpha test, using the Likert scale; the results were analyzed on a scale with correspondence: > 0.90 - excellent; 0.81 to 0.90 - good; 0.71 to 0.80 - acceptable; 0.61 to 0.70 - questionable; 0.51 to 0.60 - poor and 0.41 to 0.50 - unacceptable11. The scenario was considered valid when the targets set were achieved in the indicators' Average ranking, with agreement >3, Content validity index, and reliability ≥0.80 by Cronbach's alpha[11].

The sixth stage involved training residents and leaders to develop the scenario, defining their role as actors or observers. In this stage, the research participants received the narrative text and the sociodemographic identification and evaluation instruments prepared for the research.

In stage 7, the simulation was carried out by four residents playing the role of actors, and observed by the other participants, at the end of which the instruments were filled in. The last stage, stage 8, took the form of a conversation circle and corresponded to the debriefing developed in a structured way, following the guidelines of a Brazilian study[8]. The information observed in the simulation was added to the initial discussion, linking theory and practice and encouraging reflection on the situation observed. The instrument used for evaluation by observers and actors was the debriefing script, which lasted an estimated 40 minutes and was conducted by the researchers.

The quantitative results, relating to the number and characteristics of the participants and evaluation data, were recorded in a Microsoft Excel@ spreadsheet and analyzed using absolute and relative numbers.

The study was approved by the Research Ethics Committee under opinion no. 5.300.257 and followed all the ethical precepts in health.

RESULTS

The six leaders appointed by the managers and 103 nurses and doctors in training from the first and second-year residency programs were invited. Five leaders took part in the focus group meeting and the scenario validation. Fifteen nursing residents and two

medical residents took part in the two workshops. Twelve nursing residents and two leaders took part in developing the scenario, evaluating the simulation, and debriefing.

In the first phase, stages 1 and 2, the compilation of competencies common to nursing and medicine courses was presented in a focus group meeting with the leaders: health care, decision-making, communication, leadership, continuing education, administration, and management[12]. The competencies proposed by the Canadian Patient Safety Institute were put into context and organized into six domains associated with safety culture, teamwork, communication, risk management, human and environmental factors, and adverse events[13]. On the same occasion, the World Health Organization's 2021-2030 goals were presented: zero harm, high reliability of health systems, process safety, patient and family involvement, professional protection and training, information flow, and multisectoral involvement[14].

After discussing the content and contrasting it with the institutional reality, the sub-theme 'communication' was identified by the leaders as the main weakness to be tackled. This was contextualized with professional practice in terms of adherence to standards and protocols, teamwork, continuity of care, and inclusion of patients in care.

Developing communication between the interprofessional team, understanding the importance of protocols, and including the patient in the care process were defined as learning objectives by the leaders, and contextualized with the apprentices, including gaps for patient safety. The simulation scenario was then structured. The corresponding critical points, both adequate and inadequate, were intentionally included about the patient safety precepts and the learning objectives. In the same way, we sought proximity with the contextualization resulting from the focus group and workshops about the central theme, educational sub-themes, and similarities with the care environment. Routines and protocols in the research field regarding communication and the feasibility of the scene being developed in a period of up to ten minutes were considered, as well as the availability of equipment, materials, and the physical environment for the development of the scenario, which contained the four scenes elaborated.

The complexity of the set, actors, characterization and role, lines (intonation) and body expression, and the performance of the observers were established. To support this, various tools were drawn up (scenes, a checklist of materials and equipment, a structured script for the scene, a form for identifying the actors and observers, and a script for observing and evaluating the scenes); and physical resources were defined (materials and equipment, and the setting for developing the scenes).

The simulation script included information on how long it would take to develop the scenes, approximately ten minutes for evaluation and forty minutes for debriefing, and activities to be carried out by the actors and observers and conducted by the facilitators (researchers). The scenes followed a narrative text about a hypothetical care context (Table 1) to be performed by four actors: two nurses, a doctor, and a patient, with critical observation by the other participants.

Table 1 - Description of the scenes. Curitiba, PR, Brazil, 2023.

Scene 1	Maria (nurse 1) and Joana (nurse 2) start the shift change at the nursing station. The doctor (José) starts reading Patient 1's chart (Elaine).
Scene 2	The nurses go to room 101 and finalize the transfer of care. The doctor remains reading Patient 1's chart.
Scene 3	Nurse 1 leaves the scene. Nurse 2 remains at the nurse's station on the phone. The doctor goes to room 101 and communicates with Patient 1. The doctor returns to the nursing station and tries unsuccessfully to communicate with Nurse 2. The doctor leaves the scene.
Scene 4	The alarm bell in room 101 rings, nurse 2 goes into the room and communicates with Patient 1.

Source: The authors (2023).

The narrative text guided the organization of the scene, which consisted of a hospital unit, with a nursing station (computer, desk, chair, medical records, telephone), corridor, and ward, with two identified beds (one with a puppet and the other with an actor, both wearing an identification bracelet), with high railings.

The scenes covered communication between the different actors, intending to promote the contextualization of communication and educational sub-themes (Table 2) in patient safety, including learning objectives. Positive and negative aspects of patient safety were included.

Table 2 - Educational sub-themes addressed in each scene. Curitiba, PR, Brazil, 2023.

SCENES	SUB-THEMES ADDRESSED
1 and 2	Communication Transversality of the Patient Safety Theme Continuity of care and teamwork Adherence to the unit's rules and protocols
3 and 4	Communication Transversality of the Patient Safety Theme Continuity of care and teamwork Adherence to the unit's standards and protocols Patient involvement

Source: The authors (2023).

In stage 5, the scenario was evaluated by five leaders and met the parameters established for validation. In addition to the textual evaluation, the scenario was evaluated on-site by four of the five participants, on a set day and time, according to the availability of the evaluators. On this occasion, a recap of the patient safety gaps was provided, and the learning objectives were given. In addition to presenting the simulation environment and explaining how the scenes would be developed, questions were answered about the scenario, case, and narrative text. Considering the subsequent return of the evaluation instrument by the participants, they were asked to make additional considerations and suggestions for adjustments. Initially, only one completed form was sent, but after an active search and a new request for collaboration, the other four participants evaluated the scenario.

The average ranking was 4.4 for the evaluation of the scenario's contributions to the perception of gaps related to communication, adherence to standards, patient involvement, and transversality of the theme. As for the scenario, its contributions to stimulating reflection between theory and care practice, and its evaluation resulted in an average ranking of 4.2. The evaluation of the case's contributions to achieving the educational objective resulted in an average ranking of 4.0; therefore, all the variables exceeded the minimum grade of 3 among the evaluators.

The Content Validity Index was satisfactory for the construction of the scenario, reaching a CVI of 1.00; as for the case's contribution to achieving the educational objective, the CVI corresponded to 0.80. The Cronbach's alpha coefficient was 0.95, demonstrating almost perfect internal consistency and reliability. Only one round of evaluation was carried out, as the CVI, MR, and Cronbach's α were achieved, under the minimum targets set, and the script presented was considered valid.

The evaluators' suggestions, which were incorporated into the narrative text about the changes, were: the inclusion of fictitious names for the characters; division of the scenes into separate sheets for the actors; information on how long the simulation and debriefing would last; information on how the professionals being trained in the nursing and medicine residency programs would be organized in the development of the scene.

The following suggestions were not incorporated into the text, as they did not meet the objective of the work, with justification given to the evaluators: using homonymous patients (leader 5); highlighting the risk of changing medication and fully applying the simulation according to the script of a Brazilian study8 (leader 3).

The scenario was run and evaluated in a single period, corresponding to stages 6 and 7, followed by the debriefing - stage 8. Once the study participants had gathered, the researchers informed them about the dynamics of the stages and the development of the scenes, the use of a script for the development of the scenes, and the observation tool. The training of the actors and orientation for the observers, stage 6, took place before the development of the scenes and in separate environments. The actors were chosen at random and voluntarily; once they had the script, they were instructed on the role of each actor so that they could highlight the scenes in which they were to take part and their respective lines in the text. The scenes were then revised, along with a demonstration of the actors' physical positioning in the environment, their lines and voice intonation, and a brief training session. The other participants were given the task of observing the scenes and evaluating them at the same time, after guidance and clarification of doubts. The observers, apprentice leaders, and managers were then directed to the same environment where the scenes were being developed.
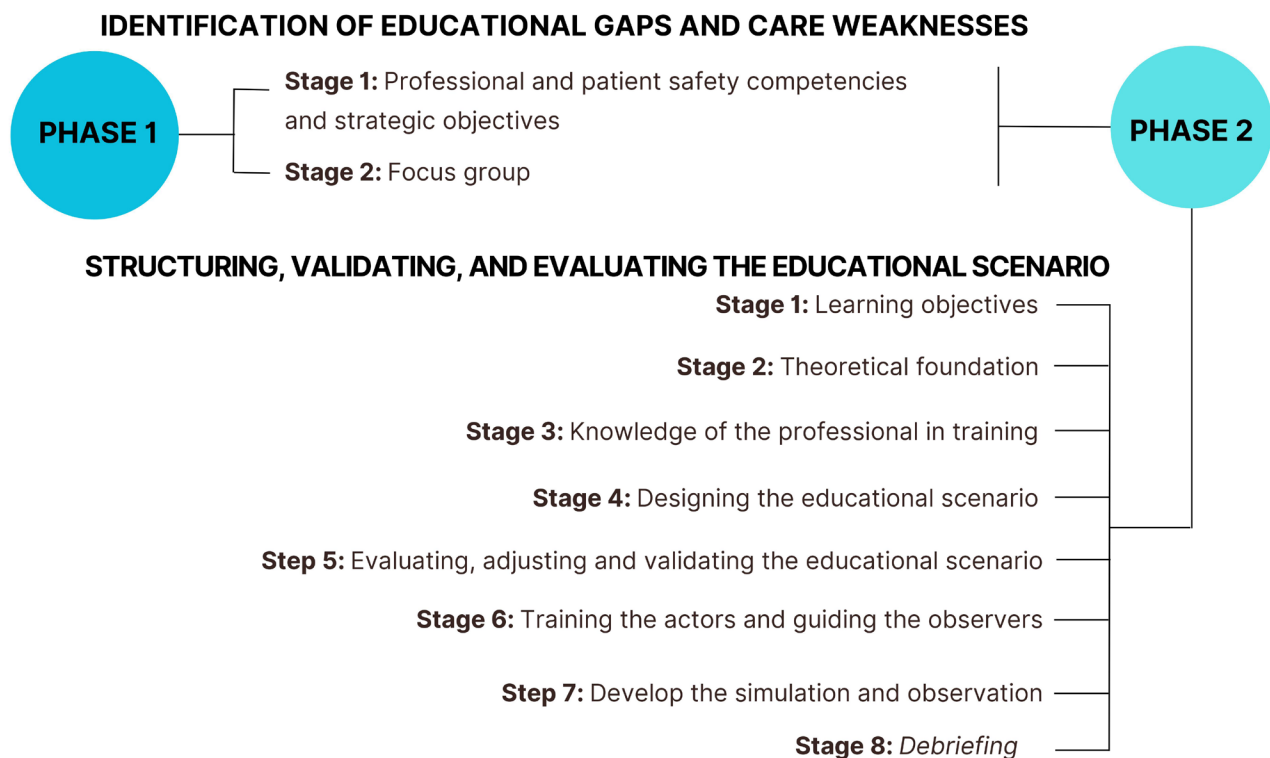
Once the actors were positioned in the physical setting and the observers were in a place where they could see and hear the lines, Scene 1 began and was followed by Scenes 2, 3, and 4, which lasted a total of ten minutes. Four residents took part as authors, in whose scenes they were observed and accompanied concomitantly by ten observers (leaders and residents). At the end of the scenario development, the actors also receive the evaluation tool and fill it in, before the debriefing begins.

The debriefing, stage 8, was led by the researchers who acted as facilitators of the round table discussion, encouraging communication, self-analysis, feedback, and reflection, lasting 40 minutes, with the participation of the leaders, nursing, and medical residents. During the debriefing, the facilitators used a questionnaire prepared for the research, divided into two parts: analysis of the observation of the simulation with the educational sub-themes; and analysis of the simulation as an educational resource for developing patient safety skills.

The results of the debriefing show that participation in the construction of the educational model enabled leaders and residents to learn significantly. The deduction is based on reflection and contextualization between approximations and distances between the simulated scenario and individual and team practice and contrasted with the quality of care offered. Another aspect highlighted by the participants was the execution or observation of routine actions in a safe environment, with a focus on identifying positive and negative aspects associated with safe care. The simulation provided an opportunity to reflect on the extent to which the themes of patient safety and communication are present in day-to-day care, and the relevance of details to the quality of care.

A summary of the phases and stages was drawn up, resulting in a diagram of the educational modeling structure, using simulation (Figure 1).

Figure 1 - Diagram of the structure of educational modeling with simulation for the consolidation of professional competencies. Curitiba, PR, Brazil, 2023.

IDENTIFICATION OF EDUCATIONAL GAPS AND CARE WEAKNESSES

PHASE 1

Stage 1: Professional and patient safety competencies and strategic objectives

Stage 2: Focus group

PHASE 2

STRUCTURING, VALIDATING, AND EVALUATING THE EDUCATIONAL SCENARIO

Stage 1: Learning objectives

Stage 2: Theoretical foundation

Stage 3: Knowledge of the professional in training

Stage 4: Designing the educational scenario

Step 5: Evaluating, adjusting and validating the educational scenario

Stage 6: Training the actors and guiding the observers

Step 7: Develop the simulation and observation

Stage 8: *Debriefing*

Source: Brazilian study[8] adapted by the authors (2023).

DISCUSSION

The simulated practice must be structured by the defined objective, to achieve the intended effects[6]. The inclusion of leaders and/or managers as participants in this research helped to broaden the identification of weaknesses related to patient safety and made it possible to develop the scenes in such a way as to refer to professional practice and the gaps in patient safety.

Considering leaders as less fluctuating members, they have great potential for critical institutional analysis. On the other hand, listening to the apprentices' perception of individual and collective care performance, linking it to institutional conditions and training, is a unique opportunity when the aim is to improve quality. Thus, this research considered the theoretical precepts relating to the desired professional competencies, linking them to those relating to patient safety and international targets. These were linked, through contextualization, with leaders and learners, to achieve the educational objectives, giving authenticity to the planning and execution of simulation as an educational tool.

Thus, based on the educational sub-themes and objectives, an environment analogous to reality was created with a detailed script. This contributed to the participants' understanding of the complexity of daily care and favored the interpretation of the case in a clear and standardized way[15].

A study aimed at describing and analyzing the most recent initiatives carried out to implement and strengthen the national policy on permanent education in health points out that it is necessary to identify weaknesses in each reality[16]. Our research identified communication as the main weakness. This was also identified in a study as one of the factors hindering the reporting of adverse events[17] and is one of the biggest challenges in multi- and interdisciplinary work.

By identifying the weaknesses and setting goals in a shared way, using focus group (phase 1; stage 2) and workshop (phase 2; stage 3) strategies, the aim was to sensitize participants to the educational strategy. Raising participants' awareness makes them propagators for training new players involved in care and prevention[18]. Group reflection helped to relate hypothetical situations to hospital practice, as well as to identify causes of errors and potential individual and collective preventive actions.

The description of the scenes, in narrative text format, provided an opportunity to simulate trivial care situations, such as some of those contextualized by the participants. In this way, the narrative text described the scenario, the scenes, the space, the time, the actors, the causes, and the possible consequences in the narrated situation[19], contributing to the replication and adaptation of the structure of educational modeling with simulation for other audiences, skills, and themes.

Stage 4, guidance for building a scenario, is fundamental for teaching and learning, according to Brazilian research[8]. This theoretical-practical roadmap was the basis for building a scenario about patient safety, applying simulation as an educational technology for developing competencies. Adaptations were made to this script, including, excluding and reorganizing some phases and stages to meet the objectives of the activity. The scenario was built with the participation of four actors in mind and, in addition to training them, it is important to provide them with the tools they need to embody the character in a way that meets the proposed objectives and realism[20]. In this way, previous awareness-raising during the workshop was considered important in providing context for situations like the simulated one.

The construction and validation of simulated scenarios are progressively necessary as a methodology for the education of health professionals, at different levels of training and on various topics[21-23]. Validation corresponds to the structuring of evidence, single or multiple[7]; it gives the possibility of adjustments and improvements, to make the scenario an appropriate tool for achieving educational objectives. The scenario also contributed to directing the group participating in the simulation (actors, observers, and educational activity conductors) toward critical and reflective analysis, to revisit, update, or build knowledge around the topic addressed.

We believe that the process contributed to the integration of the group, including the researchers. There were several opportunities offered and used to build this integration,

starting with the opportunity for leaders and apprentices to have their say and opinions heard, the critical analysis of the scenario and its execution and observation, and the final analysis at the debriefing. This also gave the group another opportunity for integration and meaningful learning, based on reflection and contextualization. The debriefing with leaders, residents, and researchers provided an opportunity to share experiences and learn. It is considered that learning depends on the integration of experience and reflection between participants, which allows them to assimilate new interpretations[24]. According to Martins et al.[5], the discussion of a race situation, the learning, and the decisions made at the end of the simulation consolidate the participants' knowledge.

Debriefing makes it possible to understand and transfer knowledge, skills, and attitudes to promote better practices, quality of care, and the professional development of participants[5]. This effect has also been observed by researchers[25] who defend it as a time for self-assessment and reflective, meaningful learning. This is in line with the assertion that making the student the protagonist of their professional preparation favors the development of meaningful learning, which represents the incorporation of knowledge into existing knowledge[26]. When used as a tool for continuing education, simulation contributes to the education of all participants, including the leaders in this study.

We, therefore, reiterate the assertion that integration is one of the main goals of learning, as it gives individuals the opportunity to put into practice what they have seen in theory[15], and the different stages of this research contributed to this. In this way, it should be noted that learning through simulation begins long before the scenario is executed and observed if it is structured in a participatory way. The transformation of the learning process has proved to be favorable and captivating, as it enables knowledge to be built collectively, as well as individually.

The limitations in the development of educational modeling correspond to the low participation of medical residents in the research, compromising the contextualization and evaluation of the strategy by this professional category.

CONCLUSION

The educational simulation modeling was developed with the participation of nursing and medical leaders and residents, helping to bring the scenario closer to the institutional context. The result, in the form of a guide, contributes to innovation in the educational process through its replicability and adaptation to different themes, audiences, and healthcare scenarios, for the development of professional skills.

The experience of the methodological path also points to the potential incorporation of the strategy into the educational practices of the institution in which the research was carried out, both for the internal public and for apprentices.

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Santos B dos, Cruz ED de A, Brusamarello T, Nazário S da S**. Drafting the work or revising it critically for important intellectual content - **Santos B dos, Cruz ED de A, Brusamarello T, Nazário S da S.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **LSantos B dos.** All authors approved the final version of the text.