REALISTIC SIMULATION AS A TEACHING-LEARNING STRATEGY IN INITIAL CARE FOR TRAUMA VICTIMS

SIMULAÇÃO REALÍSTICA COMO ESTRATÉGIA DE ENSINO-APRENDIZAGEM NO ATENDIMENTO INICIAL A VÍTIMA DE TRAUMA

LA SIMULACIÓN REALISTA COMO ESTRATEGIA DE ENSEÑANZA-APRENDIZAJE EN LA ATENCIÓN INICIAL A LAS VÍCTIMAS DE TRAUMA

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ABSTRACT: This article evaluated realistic simulation as a teaching strategy for initial care for trauma victims, applied to undergraduate nursing students. This is a quasi-experimental, analytical study with a quantitative approach. 45 students participated. Data collection took place in three moments: pre-test, educational intervention, and post-test. Descriptive analyses and inferential analyses were performed by applying Bowker's statistical tests, with significance through p-value <0.05. The average in the pre-test was 6.4 points, and after the intervention, it increased to 8.3 points in the post-test. Overall, scores ranged from 2 to 9 points before the intervention and from 5 to 10 points after the simulation intervention. The results showed that cognitive learning increased significantly after performing the realistic simulation. The importance of using this pedagogical strategy in nursing education institutions is highlighted, with a view to training future professionals.

KEYWORDS: First Aid. Preparation for Emergency Situations. Academic Training.

RESUMO: *Este artigo avaliou a simulação realística como estratégia de ensino ao atendimento inicial a vítima de trauma, aplicada para estudantes de graduação em enfermagem. Trata-se de estudo quase experimental, analítico, com abordagem quantitativa. Participaram 45 estudantes. A coleta de dados ocorreu em três momentos: pré-teste, intervenção educativa e pós-teste. Foram realizadas análises descritivas e análises inferenciais mediante aplicação dos testes estatísticos de Bowker, com significância através do p-value <0,05. A média no pré-teste foi de 6,4 pontos e, após a intervenção, aumentou para 8,3 pontos no pós-teste. No geral, as notas variaram de 2 a 9 pontos antes da intervenção e de 5 a 10 pontos após a intervenção com a simulação. Os resultados apontaram que a aprendizagem cognitiva aumentou significativamente após a realização da simulação realística. Destaca-se a importância do uso dessa estratégia pedagógica nas instituições de ensino de enfermagem, visando à capacitação dos futuros profissionais.*

PALAVRAS-CHAVE: *Primeiros Socorristas. Preparação para Situações de Emergência. Treino Acadêmico.*

RESUMEN: *Este artículo evaluó la simulación realista como estrategia de enseñanza para la atención inicial a víctimas de trauma, aplicada a estudiantes de pregrado en enfermería. Se trata de un estudio cuasiexperimental, analítico, con enfoque cuantitativo. Participaron 45 estudiantes. La recolección de datos ocurrió en tres momentos: pretest, intervención educativa y post test. Se realizaron análisis descriptivos y análisis inferenciales aplicando las pruebas estadísticas de Bowker, con significación a través del valor de p <0,05. La media en el pretest fue de 6,4 puntos y, tras la intervención, aumentó a 8,3 puntos en el post test. En general, las puntuaciones oscilaron entre 2 y 9 puntos antes de la intervención y entre 5 y 10 puntos después de la intervención de simulación. Los resultados mostraron que el aprendizaje cognitivo aumentó significativamente después de realizar la simulación realista. Se destaca la importancia de utilizar esta estrategia pedagógica en las instituciones de formación en enfermería, con vistas a la formación de futuros profesionales.*

PALABRAS CLAVE: *Primeros Auxilios. Preparación para Situaciones de Emergencia. Formación Académica.*

Introduction

In modern society, trauma is a frequent and overlooked cause of death, primarily affecting individuals in the first half of life. Each year, 5.8 million people die from accidents that are caused by external causes. This number is 32% higher than the sum of deaths from malaria, acquired immunodeficiency syndrome, and tuberculosis. Additionally, thousands of people suffer temporary or permanent sequelae for every million deaths from accidents (Silveira; O`Dwyner, 2017).

Studies in the field of trauma demonstrate that to provide quality care, professionals need essential competencies. However, it is noticeable that training in trauma care in nursing education is limited, either minimally addressed or treated simplistically and not thoroughly explored (Silva *et al.*, 2020a).

Therefore, determining educational priorities for the development of specific interventions on this topic in nursing curricula is crucial, particularly in promoting the use of simulated practices during the teaching process (Souza, 2021). Realistic simulation is an effective tool in health education and, consequently, in trauma through practical performance or the acquisition of skills in a safe environment (Silva *et al.*, 2020a).

Healthcare students and future professionals can experience real trauma situations through simulated clinical cases, with predefined scenarios, actors, or mannequins. This simulation helps develop cognitive, technical, attitudinal, and affective skills, allowing students to learn from their mistakes fictitiously and safely (Morais *et al.*, 2022; Canever *et al.*, 2022).

Simulation enables students to practice non-technical skills such as communication, leadership, interaction with the multidisciplinary team, and crisis management, which are more challenging to learn in the classroom. This is an active learning methodology that is becoming increasingly present in nursing education, as it enhances students' self-confidence (Leite *et al.*, 2021).

Research in the field of realistic simulation involving trauma victims is justified by the scarcity of studies in the area and the intention to identify the benefits acquired in relation to learning by undergraduate nursing students in the presence of trauma victims and their level of knowledge in the protocols used. Considering that, during undergraduate studies, students must develop confidence and learning so that they can be competent and accurate for patient care (Coutinho, 2022; Santana *et al.*, 2023).

Given the complexity of trauma victims and the importance of quality care to reduce morbidity/mortality, this study aimed to compare realistic simulation as a teaching-learning

strategy for initial trauma victim care among undergraduate nursing students at two institutions, one using active methods and the other using traditional methods.

Realistic simulation is a teaching strategy aimed at improving the quality of care by reproducing complex or less complex situations, which consequently increases students' ability to handle situations in their professional daily lives.

Method

This is an almost experimental before-and-after study, analytical, with a quantitative approach to treatment and data analysis, conducted at two higher education institutions. Institution A is a public university in northern Paraná that adopts an active methodology in the curriculum, and Institution B, is an educational foundation in a municipality in the interior of São Paulo, which adopts a traditional methodology in the curriculum.

The 45 students were included in the study based on the inclusion criterion of being final-year nursing undergraduates. Six undergraduates who were nursing technicians at Institution B were excluded; there were no technical students at Institution A.

Data collection, conducted from December 2020 to January 2021 at Institution A and from April to May 2021 at Institution B, occurred in three stages: administration of the knowledge questionnaire (pre-test); implementation of the educational intervention through dialogic exposition and care in a controlled setting, using realistic simulation as a teaching strategy; and administration of the post-test questionnaire.

The questionnaire administered was previously validated by experts using Pasquali's content validation model (2009). It consisted of ten multiple-choice questions, with four alternatives and only one correct answer, covering aspects of the initial trauma victim care stage according to the XABCDE mnemonic, which corresponds to the sequence of initial trauma victim assessment: X - Exsanguinating Hemorrhage; A - Airway and Cervical Spine Control; B - Breathing and Ventilation; C - Circulation and Hemorrhage Control; D - Disability and Neurologic Status; and E - Exposure and Environmental Control (American College of Surgeons, 2018; National Association of Emergency Medical Technicians, 2020).

For the simulation as an educational intervention, a simulated scenario was developed and subsequently validated by expert judges in the field. Classes were formed with a maximum of 10 students each, with the scenario planned to be executed by pairs at both participating institutions. Initially, a briefing was conducted, during which instructions and information

regarding the use of materials and supplies, interaction with the simulated patient, participant, and observer posture during scenario execution were provided to the students.

After the scenario execution, a debriefing session was conducted, during which students, with the assistance of the researcher, had the opportunity to reflect on and discuss their performance, receiving feedback on the duo's performance in executing the scenario. The aim of this stage is to promote an environment for the assimilation and consolidation of knowledge for meaningful learning (Meakim *et al.*, 2013).

The collected data were organized into spreadsheets using Microsoft Excel 2010 software and analyzed using JMP® Pro software, version 13 (SAS Institute Inc.). Descriptive analyses were performed by calculating absolute and relative frequencies, and inferential analyses were conducted using the Bowker statistical test, adopting a significance level of p-value <0.05.

The study obtained favorable approval from the Research Ethics Committee of the State University of Londrina with Opinion number 3,989,981 (CAAE: 28941520.3.1001.5231), respect to those involved in the research, in accordance with Resolution nº 466/2012 of the National Health Council.

Results

Of the 45 students participating in the research, according to personal, professional, and institutional characterization data, there was a predominance of single women, 31 students (68.9%). Regarding age, it ranged from 20 to 59 years, with a mean of 25.1 years. Regarding the work-study relationship, most participants stated that they did not have a work bond, with 23 (51.1%) of them solely studying and another 22 (48.9%) studying and also working. The administration of the post-test, after intervention with realistic simulation, demonstrated an increase in knowledge in 8 out of the 10 questions addressed, with emphasis on the question-identifying stages of the primary assessment, which achieved 100% accuracy, as presented in Table 1.

Table 1 - Percentage of correct answers on the knowledge questionnaire before and after the intervention with a realistic simulation of initial trauma victim care[4]

Questions	Moment		*p-value*
	Pre-test n (%)	Post-test n (%)	
1- Trauma kinematics	40 (88,9)	37 (82,2)	0,4054
2- Primary concerns for evaluating the trauma patient	34 (75,6)	37 (82,2)	0,4913
3- Stages of primary assessment	35 (77,8)	45 (100,0)	0,0016
4- Victim care planning	42 (93,3)	44 (97,8)	0,3173
5- bout controlling exsanguinating hemorrhage	10 (22,2)	10 (22,2)	1,0000
6- About airway control	34 (75,6)	40 (88,9)	0,1088
7- Patient immobilization	29 (64,4)	33 (73,3)	0,4497
8- Suspected chest trauma	34 (75,6)	44 (97,8)	0,0039
9- Signs of shock	30 (66,7)	33 (73,3)	0,5316
10- Neurological dysfunction	1 (2,2)	3 (6,7)	0,3173

Source: Authors' elaboration.

Table 2 presents the mean percentage of correct answers on the knowledge questionnaire administered before and after the intervention with realistic simulation in both higher education institutions.

It is noted that all 10 questions of the knowledge questionnaire showed an increase in correct answers after the intervention, except for the first question in institution A, which pertains to trauma kinematics.

[4] Londrina/PR, Brazil, 2023.

Table 2 - Comparison of the average correctness of the knowledge questionnaire before and after the intervention with realistic simulation as a teaching strategy in trauma[5]

Question	Institution A		Institution B	
	Pre-test n (%)	Post-test n (%)	Pre-test n (%)	Post-test n (%)
1	26 (96,30)	20 (74,07)	14 (77,78)	18 (100,00)
2	20 (74,07)	24 (88,89)	13 (72,22)	16 (88,89)
3	0 (0,00)	27 (100,00)	14 (77,78)	18 (100,00)
4	27 (100,00)	26 (96,30)	15 (83,33)	18 (100,00)
5	3 (11,11)	15 (55,55)	6 (33,33)	12 (70,59)
6	23 (85,18)	24 (88,89)	14 (77,78)	15 (88,23)
7	0 (0,00)	20 (74,07)	8 (44,44)	18 (100,00)
8	26 (96,30)	26 (96,30)	13 (72,22)	14 (82,35)
9	3 (11,11)	20 (74,07)	6 (33,33)	15 (88,23)
10	0 (0,00)	18 (66,67)	1 (5,55)	11 (64,70)
Median	**47,40**	**81,48**	**57,77**	**88,29**

Source: Authors' elaboration.

Table 3 shows the students' average correctness before and after the intervention, considering the number of questions. The average correctness was 6.4 questions before the intervention and increased to 7.2 after the simulation. Overall, the scores ranged from 2 to 9 points in the pre-intervention and from 5 to 9 in the post-intervention.

Table 3 - Average correctness of the knowledge questionnaire before and after the intervention with realistic simulation as a teaching strategy in trauma[6]

Measure	Moment	
	Pre-test n (%)	Post-test n (%)
Mean	6,4	7,2
Standard deviation	1,3	1,1
Minimum	2,0	5,0
Q1	6,0	7,0
Median	6,0	7,0
Q3	7,0	8,0

[5] Londrina/PR, Brazil, 2023.
[6] Londrina/PR, Brazil, 2023.

Maximum	9,0	9,0
p-value	-----	0,0035

Source: Authors' elaboration.

To assess whether the increase in scores was significant or not, the paired t-test was used to compare the pre-test and post-test, considering that the same student took both exams. The obtained p-value was 0.0035, leading to the conclusion that the overall score increase was significant between the two moments.

The results obtained demonstrated that, in both institutions, there was a significant increase in knowledge regarding the initial care of trauma victims after the teaching strategy with realistic simulation. Particularly noteworthy is question 3, concerning the steps of the primary assessment, which, after the intervention, reached 100% correctness in both institutions.

Discussion

The quality of initial trauma victim care is essential for patient recovery, as it affects the conditions under which the victim will be transferred to the reference service. In this initial assistance, it is necessary to assess the victim's situation and identify the existence and degree of sequelae they may have (National Association of Emergency Medical Technicians, 2020).

Professionals working in emergency situations need to have theoretical and practical knowledge, as the environment is unpredictable, and care must be prompt, coordinated, and effective. Additionally, the professional must be physically and psychologically prepared to face possible adversities that may arise (Luchtemberg; Pires, 2015).

The role of nursing professionals in trauma care is poorly understood, as this service is not heavily emphasized in the undergraduate curriculum. Nursing professionals need to understand the mechanisms involved in their work in this type of care (Santos *et al.*, 2020).

Although the intervention through applied simulation was related to initial trauma victim care, this research was limited to discussing the results with studies using the same pedagogical intervention, as there are few studies in Brazil and Latin America on the training of students or professionals in the healthcare field in trauma care, with research on cardiopulmonary resuscitation being more common (Roel; Bjork, 2020; Alves *et al.*, 2019; Smereka *et al.*, 2019; Barbosa *et al.*, 2019).

Among the results, the majority of students stated that they did not feel adequately prepared (66.7%), perhaps because they had not experienced this practice during their undergraduate studies. Other studies involving simulations in urgency and emergency also describe this sentiment among students due to the lack of this approach in the curriculum, which results in a weakness in the training of future nursing professionals (Silva *et al.*, 2020a; Silva *et al.*, 2020b).

Regarding the cognitive learning of the participants obtained by comparing pre-test and post-test scores, improvement was observed after the educational intervention with realistic simulation, corroborating with other studies (Roel; Bjork, 2020; Kose *et al.*, 2019; Carbogim *et al.*, 2018).

Questions in which the topic was addressed in simulations with actors showed higher rates of correct answers in the post-test. This result demonstrates that skills training contributes to immediate knowledge retention, as also evidenced by Costa, Melo, and Reis (2020). In the cited study, nursing students were trained in Cardiopulmonary Resuscitation maneuvers using simulation as a teaching strategy, and post-test questions that employed simulation with mannequins showed higher rates of correctness.

On the other hand, contents covered only in theoretical classes showed reduced values and even no change in question correctness when compared to those using actors. Such results also occurred in research with undergraduates using realistic simulation as a teaching-learning strategy (Costa; Melo; Reis, 2020; Roel; Bjork, 2020; Oermann *et al*., 2020).

Question 1, which provided information about trauma kinematics, was the only one where the percentage of correct responses decreased from 88.9% to 82.2% between the pre-test and post-test, but the difference was not significant (p-value = 0.4054). Trauma kinematics involves searching for clues of potential injuries hidden in the exchange of energy between tissues and the environment and information related to trauma obtained at the accident scene (Costa; Melo; Reis, 2020).

The study scenario depicted an emergency room setting, with information about the accident scene provided by a bystander, and perhaps for this reason, this question generated doubts. It did not show improvement in correct responses after the simulation, confirming the importance of practical skills for knowledge construction and self-confidence.

A study by Bortolato-Major *et al.* (2020) reported that after simulation practice with nursing students in emergency situations, students reflected on their actions, relating theory to

practice, resulting in increased knowledge about the practiced topic and a positive increase in self-confidence.

Conducting the research in educational institutions with different learning methodologies, one using an active method and the other a traditional method, was essential to compare the effects of this methodology in different pedagogical approaches. The scarcity of research demonstrating that realistic simulation can be effective for both active and traditional teaching methods, provided there is integration between theory and practice, motivated this action.

Among the ten questions comprising the knowledge questionnaire, the ones regarding the primary assessment stages, planning of trauma victim care, and suspicion of thoracic trauma, respectively, were the ones with the highest number of correct answers after the method application. Additionally, it is noted that the question about initial trauma victim care had a 100% accuracy rate; the simulated scenario victim had an open chest injury, demonstrating the effectiveness of the post-simulation learning practice.

Simulated scenarios provide psychomotor, cognitive, and affective experiences and contribute to the effective use of classroom knowledge in clinical settings. These experiences enable students to reinforce correct procedures and improve on aspects that were unsatisfactory, contributing to knowledge retention (Teixeira; Felix, 2020).

In the context of treating a trauma victim, nurses must be prepared to make quick decisions, identify priorities, and provide comprehensive victim care through a critical, organized, and committed approach. Thus, realistic simulation contributes to the formation of more capable nurses with reflective thinking, developing competencies in a controlled environment, and prioritizing patient safety.

Regarding trauma care, involving students in this theme and using simulation teaching methods shapes and consolidates knowledge, skills, and techniques, reducing errors. As students have the opportunity to learn in a simulated environment, they become skilled and confident, which enhances the quality of care provided (Fonseca *et al.*, 2016).

Study Limitations

One limitation of the study was the scarcity in the literature regarding research supporting the discussion of the results found in this study, as well as mentioning the use of simulation in the context of trauma victim care, specifically in initial treatment. Another limitation was the timing of the COVID-19 pandemic, which hindered the conduct of in-person meetings for the development of the simulation strategy due to the need for social distancing, resulting in a reduced final population.

Contributions to Nursing Education

The results of this study contribute to the qualification of nursing care provided to trauma patients in emergency services, as it enhanced the knowledge and skills of nursing students in a simulated setting. This, potentially, will lead to better performance and quality of care provided by these future professionals in trauma victim care. Additionally, it provides relevant information to nursing educators by guiding the development of learning activities in trauma care.

Final remarks

The results revealed a significant increase in students' cognitive learning after realistic simulation, corroborating the effectiveness of this educational strategy. This approach allows students to experience situations they will encounter in future professional practice, while also promoting the development of critical thinking and the ability to make decisive decisions in simulated scenarios. Therefore, the relevance of using this pedagogical methodology in nursing education institutions is emphasized, aiming to prepare future professionals adequately.

One of the main contributions of this research was that it was the first to be conducted with nursing students in two different higher education institutions. This not only allowed for evaluating the effects of the methodology in different pedagogical approaches but also deepened the concepts necessary for the initial care of trauma victims.

This study also paves the way for additional experimental research on the topic, as its approach focused on assessing the knowledge acquired by students during the training process, without fully exploring other investigative possibilities.

REFERENCES

ALVES M. G.; CARVALHO M. T. M.; NASCIMENTO J. S. G.; OLIVEIRA, J. L. G.; CYRILLO, R. M. Z.; BRAGA, F. T. M. M.; FONSECA, L. M. M.; DALRI, M. C. B. Construção e validação de Exame Clínico Objetivo Estruturado (OSCE) sobre ressuscitação cardiopulmonar. **Reme: Revista Mineira de Enfermagem**, *[S. l.]*, v. 23, e-1257, 2019. DOI: 10.5935/1415-2762.20190105. Available at: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1048393. Accessed in: 12 Mar. 2022.

AMERICAN COLLEGE OF SURGEONS. ATLS. **Advanced Trauma Life Support**. 10. ed. Chicago: Committe on Trauma, 2018.

BARBOSA, G. S.; BIAS, C. G. S.; AGOSTINHO, L. S.; OBERG, L. M. C. Q.; LOPES, R. O. P.; SOUSA, R. M. C. Eficácia da simulação na autoconfiança de estudantes de enfermagem para ressuscitação cardiopulmonar extra-hospitalar: um estudo quase experimental. **Scientia Medica**, *[S. l.]*, v. 29, n. 1, e32694, 2019. DOI: 10.15448/1980-6108.2019.1.32694. Available at: https://revistaseletronicas.pucrs.br/ojs/index.php/scientiamedica/article/view/32694/17918. Accessed in: 17 July 2020.

BORTOLATO-MAJOR, C.; MANTOVANI, M. F.; FELIZ, J. V. C.; BOOSTEL, R.; MATTEI, A. T.; ARTHUR, J. P.; SOUZA, R. M. Autoconfiança e satisfação dos estudantes de Enfermagem em simulação de emergência. **Reme: Revista Mineira de Enfermagem**, *[S. l.]*, v. 24, e-1336, 2020. DOI: 10.5935/1415.2762.20200073. Available at: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1135986. Accessed in: 12 Mar. 2022.

CANEVER, B. P; COSTA, D. G.; MAGALHÃES, A. L. P.; GONÇALVES, N.; BELLAGUARDA, M. L. R.; PRADO, M. L. Treinamento de habilidades por simulação no desenvolvimento de competências de estudantes de Enfermagem. **Reme: Revista Mineira de Enfermagem**, *[S. l.]*, v. 26, 2022. DOI: 10.35699/2316-9389.2022.38545. Available at: https://periodicos.ufmg.br/index.php/reme/article/view/38545. Accessed in: 7 Jan. 2023.

CARBOGIM, F. C.; BARBOSA, A. C. S.; OLIVIERA, L. B.; DIAZ, F. B. B. S.; TOLEDO, L. V.; ALVES, K. R.; FRIEDRICH, D. B. C.; LUIZ, F. S.; PÜSCHEL, V. A. A. Educational intervention to improve critical thinking for undergraduate nursing students: A randomized clinical trial. **Nurse Education in Practice**, *[S. l.]*, v. 33, n. 1, p. 121-126, 2018. DOI: 10.1016/j.nepr.2018.10.001. Available at: https://www.sciencedirect.com/science/article/abs/pii/S147159531730536X?via%3Dihub. Accessed in: 12 Mar. 2021.

COSTA, C. R. B.; MELO, E. S.; REIS, R. K. Simulação no ensino de emergência para estudantes de enfermagem. **Revista Cuidarte**, *[S. l.]*, v. 11, n. 2, e853, 2020. DOI: 10.15649/cuidarte.853. Available at: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1118337. Accessed in: 12 Mar. 2021.

COUTINHO, V. R. D. Simulação realística em contexto de Enfermagem. **Revista Enfermagem Contemporânea**, *[S. l.]*, v. 11, p. e4217, 2022. DOI: 10.17267/2317-3378rec.2022.e4217. Available at:

https://www5.bahiana.edu.br/index.php/enfermagem/article/view/4217. Accessed in: 13 July 2023.

FONSECA, L. M. M.; AREDES, N. D. A.; FERNANDES, A. M.; BATALHA, L. M. C.; APÓSTOLO, J. M. A.; MARTINS, J. C. A.; RODRIGUES, M. A. Computer and laboratory simulation in the teaching of neonatal nursing: innovation and impact on learning. **Revista Latino-Americana de Enfermagem**, Ribeirão Preto, v. 24, e2808, 2016. DOI: 10.1590/1518-8345.1005.2808. Available at: https://www.scielo.br/j/rlae/a/qj9qKGwg38RDgG9Wqmfhqrg/?lang=pt. Accessed in: 12 Mar. 2021.

KOSE, S.; AKIN, S.; MENDI, O; GOKTAS, S. The effectiveness of basic life support training on nursing students' knowledge and basic life support practices: a non-randomized quasi-experimental study. **African health sciences**, *[S. l.]*, v. 19, n. 2, 2252–2262, 2019. DOI: 10.4314/ahs.v19i2.51. Available at: https://pubmed.ncbi.nlm.nih.gov/31656511/. Accessed in: 12 Mar. 2021.

LEITE, K. N. S.; NASCIMENTO, A. K. F.; SOUZA, T. A.; SOUSA, M. N. A. Utilização da metodologia ativa no ensino superior da saúde: revisão integrativa. **Arquivos de Ciências da Saúde da UNIPAR**, *[S. l.]*, v. 25, n. 2, p, 133-144, 2021. Available at: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1252377. Accessed in: 12 Mar. 2021.

LUCHTEMBERG, M. N.; PIRES, D. E. P. O que pensam os enfermeiros do SAMU sobre o seu processo de trabalho. **Cogitare enfermagem**, *[S. l.]*, v. 20, n. 3, p. 457-466, 2015. DOI: 10.5380/ce.v20i3.40964. Available at: https://revistas.ufpr.br/cogitare/article/view/40964. Accessed in: 12 Mar. 2021.

MEAKIM, C.; BOESE, T.; DECKER, S.; FRANKLIN, A. E.; GLOE, D.; LIOCE, L.; SANDO, C. R.; BORUM, J. C. Standards of best practice: simulation standard i: terminology. **Clinical Simulation in Nursing**, *[S. l.]*, v. 9, 6S, S3-S11, 2013. DOI: 10.1016/j.ecns.2013.04.001. Available at: https://www.nursingsimulation.org/article/S1876-1399%2813%2900071-6/fulltext. Accessed in: 12 Mar. 2021.

MORAIS SOARES, F. M.; MAGALHÃES, D. S.; CÂNDIDO DUARTE, M. P.; DOS SANTOS ALMEIDA, R. G.; NEGRI SANTOS, E. C.; DE MIRANDA, F. A. N. Parada cardiorrespiratória e cerebral: construção e validação de cenário simulado para enfermagem. **Revista de Enfermagem do Centro-Oeste Mineiro**, *[S. l.]*, v. 12, 2022. DOI: 10.19175/recom.v12i0.4617. Available at: http://periodicos.ufsj.edu.br/recom/article/view/4617. Accessed in: 2 Jan. 2023.

NATIONAL ASSOCIATION OF EMERGENCY MEDICAL TECHNICIANS. **PHTLS:** Atendimento Pré-hospitar ao Traumatizado. 9. ed. São Paulo: Artmed, 2020.

OERMANN, M. H.; KRUSMARK, M. A.; KARDONG-EDGREN, S.; JASTRZEMBSKI, T. S.; GLUCK, K. A. Training interval in cardiopulmonary resuscitation. **PloS one**, *[S. l.]*, v. 15, n. 1, e0226786, 2020. DOI: 10.1371/journal.pone.0226786. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6964847/. Accessed in: 12 Mar. 2021.

PASQUALI, L. Psicometria. **Revista da Escola de Enfermagem da USP**, *[S. l.]*, v. 43, Esp, p. 992-999, 2009. DOI: 10.1590/S0080-62342009000500002. Available at: https://www.scielo.br/j/reeusp/a/Bbp7hnp8TNmBCWhc7vjbXgm/abstract/?lang=pt. Accessed in: 5 Mar. 2024.

ROEL S., BJORK, I. T. Comparing Nursing Student Competence in CPR before and after a Pedagogical Intervention. **Nursing Research and Practice**, *[S. l.]*, v. 2020, ID7459084, 2020. DOI: 10.1155/2020/7459084. Available at: https://www.hindawi.com/journals/nrp/2020/7459084/. Accessed in: 12 Mar. 2021.

SANTANA, T. C. P.; SILVA, L. M.; SOUSA, L. N.; SILVA, V. V. L.; FERREIRA, T. C. M.; SILVA, E. V.; BARBOSA, J. F. A.; ANDRETO, L. M. Percepção de estudantes de enfermagem no desenvolvimento das habilidades e competências na simulação realística. **Revista Eletrônica Acervo Saúde**, *[S. l.]*, v. 23, n. 6, p. e12634, 2023. DOI: 10.25248/reas.e12634.2023. Available at: https://acervomais.com.br/index.php/saude/article/view/12634. Accessed in: 11 June 2023.

SANTOS, A.P.; FERREIRA, R. B. S.; FONSECA, E. O. S.; GUIMARÃES, C. F.; CARVALHO, L. R.; OLIVEIRA, R. F.; OLIVEIRA, E. S. Dificuldades encontradas pela equipe de enfermagem no atendimento pré-hospitalar. Revista Eletrônica Acervo Saúde, *[S. l.]*, n. 51, e3598, 2020. DOI: 10.25248/reas.e3598.2020. Available at: https://acervomais.com.br/index.php/saude/article/view/3598. Accessed in: 12 Mar. 2021.

SILVA, D. A.; ALMEIDA, C. L.; CAPELLINI, V. K.; SILVA, R. G. Nursing education: creation of an academic league for urgent and emergency education. **Research, Society and Development**, *[S. l.]*, v. 9, n. 3, p. e159932656, 2020a. DOI: 10.33448/rsd-v9i3.2656. Available at: https://rsdjournal.org/index.php/rsd/article/view/2656. Accessed in: 12 July 2021.

SILVA, R. P.; SANTOS, V. S.; MORAES, J. S.; ANDRADE, I. R. C.; ABREU, R. N. D. C.; FREITAS, J. G. Aplicabilidade da simulação realística na graduação de enfermagem: experiência em incidentes com múltiplas vítimas. **Revista Baiana de Enfermagem**, *[S. l.]*, v. 34, e34648, 2020b. DOI: 10.18471/rbe.v34.34648. Available at https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1115325. Accessed in: 12 Mar. 2021

SILVEIRA, E. S.; O'DWYER, G. Centro de Trauma: modelo alternativo de atendimento às causas externas no estado do Rio de Janeiro. **Saúde Debate**, *[S. l.]*, v. 41, n. 112, p. 243-254, 2017. DOI: 10.1590/0103-1104201711220. Available at https://www.scielo.br/j/sdeb/a/nYZszXfcG7DTFLgWn6MbL4b/. Accessed in: 12 Mar. 2021.

SMEREKA, J.; SZARPAK, L.; CZEKAJLO, M.; ABELSON, A.; ZWOLINSKI, P.; PLUSA, T.; DUNDER, D.; DABROWSKI, M.; WIESNIEWSKA, Z.; ROBAK, O.; FRASS, M.; SIVRIKAYA G, U.; RUETZLER, K. The TrueCPR device in the process of teaching cardiopulmonary resuscitation: A randomized simulation trial. **Medicine**, *[S. l.]*, v. 98, n. 27, e15995, 2019. DOI: 10.1097/MD.0000000000015995. Available at: https://pubmed.ncbi.nlm.nih.gov/31277091/. Accessed in: 12 Mar. 2021.

SOUZA, C. O. Estudantes de enfermagem frente a estimulação cognitiva: um relato de experiência. *In*: DAL MOLIN, R. S. **Teoria e prática de enfermagem:** da atenção básica à alta complexidade. Guarujá, SP: Editora Científica, 2021.

TEIXEIRA, I. N. D. O.; FELIX, J. V. C. Simulação realística como ferramenta de Ensino na comunicação de situação crítica em cuidados paliativos. **Escola Anna Nery**, *[S. l.]*, v. 03, n. 24, 2020. DOI: 10.1590/2177-9465. Available at: https://www.scielo.br/j/ean/a/3xqH84Zz3mwxjysxtQskWvG/?format=pdf&lang=pt. Accessed in: 17 Sep. 2023.

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