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Review Article

Simulated clinical scenario of basic life support for adults in a hospital context: an integrative review

Cenário de simulação clínica em suporte básico de vida para adultos no contexto hospitalar: revisão integrativa

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ABSTRACT

Objective: to identify the content and materials necessary to compose a simulated clinical scenario of basic life support for adults in a hospital context. **Methods:** integrative review, carried out in five databases: MEDLINE, *Web of Science*, SCOPUS, LILACS, and CINAHL, with no specific time frame or language, using the descriptors "*Simulation Training*" e "*Cardiopulmonary Resuscitation*". **Results:** the 15 articles selected were published in English, from 2015 to 2023. The content found included: chest compression depth, chest compression rate, chest indentation, chest compression fraction, hand positioning, and teamwork. The materials needed included: training manikins/simulators, stepladders, and timekeeping devices. **Conclusion:** the essential elements needed to create basic life support scenarios are divided into content and materials. Supplies, parameters for cardiac arrest, organization, and team coordination stood out. **Contribution to practice:** our findings may help build simulated scenarios related to basic life support, for the permanent education of health care teams and to train new professionals.

Descriptors: Simulation Training; Cardiopulmonary Resuscitation; Hospital Care; Adult; Review.

RESUMO

Objetivo: identificar os conteúdos e materiais necessários para compor o cenário de simulação clínica em suporte básico de vida para o adulto no contexto hospitalar. **Métodos:** revisão integrativa realizada em cinco bases de dados: MEDLINE, *Web of Science*, SCOPUS, LILACS e CINAHL, sem delimitação temporal ou de idioma. Foram utilizados os descritores: "*Simulation Training*" e "*Cardiopulmonary Resuscitation*". **Resultados:** os 15 artigos selecionados foram publicados no idioma inglês, entre 2015 e 2023. Os conteúdos identificados foram: profundidade da compressão torácica, taxa de compressão torácica, recuo torácico, fração de compressão torácica, posicionamento das mãos e trabalho em equipe. Os materiais necessários são: manequins/simuladores, escadotes e dispositivos de contagem. **Conclusão:** os elementos essenciais para a composição de cenários sobre suporte básico de vida dividem-se em conteúdos e materiais, com destaque para os insumos, parâmetros para compressão cardíaca, organização e coordenação da equipe. **Contribuição para a prática:** os achados podem contribuir para a construção de cenários de simulação em suporte básico de vida, destinados para as ações de educação permanente da equipe assistencial e para a formação de novos profissionais.

Descritores: Treinamento por Simulação; Reanimação Cardiopulmonar; Assistência Hospitalar; Adulto; Revisão.

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Introduction

Cardiorespiratory arrests are among the cardiovascular emergencies with the highest rate of morbidity and mortality in the world. Due to their high incidence and potentially fatal outcome, they can be an important global public health issue[1-2].

In Brazil, there are an estimated 200 thousand cardiorespiratory arrests per year, and half these cases take place in-hospital. Therefore, the recovery of individuals is directly connected to the level of knowledge and the assistance provided by health workers. Thus, adequate, immediate, safe, and quality conducts in the hospital context are extremely relevant[3-4].

The health team must be trained in regard to basic life support, since their ability in this regard will have significant effects on patient care and cardiopulmonary resuscitation. Therefore, there must be a qualified team, capable of understanding and evaluating each case, in addition to dominating the coordination of the group and managing equipment[4].

Clinical simulations of basic life support are part of this context as an important training strategy to develop knowledge, ability, and attitudes. This is due to the fact that this teaching method enables the operationalization of a simulated setting involving systematic planning and safer and more controlled health-care decision making[5].

Well-designed and validated simulated clinical activities can improve empathy as a cognitive component of those involved, as well as improve their learning and develop competences and abilities as they carry out procedures[6]. This type of teaching method enables the immersion of students and health workers in practical health care situations, in addition to addressing their critical thinking, self-reflection, and clinical judgment. The confidence of participants also increased, and there were better results in patient care in a controlled and planned environment[7-8].

The simulation is an active methodology, which must be carried out in a structured, standardized way, based on literature, in order to ensure its better use[9-10]. Therefore, to reach satisfactory results, settings must be elaborated from the best scientific evidence available in literature, and based on adequate methodologies to ensure the success of the activity[11].

Thus, settings must be constructed according to scientific literature. Considering the above, the following research question emerges: What content and materials must be part of a simulated clinical scenario of basic life support involving cardiorespiratory arrest in adults in the context of a hospital?

Additionally, this study will add to the knowledge of the scientific community, especially students, processors, residents, and health professionals, as it collaborates to the construction of knowledge for the future application of training sessions about basic life support in adults undergoing cardiorespiratory arrest in hospitals. Therefore, the goal of this review was to identify the content and materials necessary to compose a simulated clinical scenario of basic life support for adults in a hospital context.

Methods

This is an integrative review, carried out in five stages[12], namely: 1) identifying the research question; 2) literature search; 3) evaluation of the data from the studies included; 4) analysis and interpretation of our findings; and 5) synthesis of the knowledge of selected articles. The search protocol was elaborated and registered in the Open Science Framework (doi: https://doi.org/10.17605/OSF.IO/49EPT).

To create the research question, we used the mnemonic strategy PCC (P: Population, C: Concept, C: Context), where the Population were health students and professionals; the Concept included the content necessary for a clinical simulation scenario; and the Context included basic life support in cardiorespiratory arrests in adults within hospitals. Thus, our gui-

ding question was: What content and materials must be part of the simulated clinical scenario of basic life support involving cardiorespiratory arrest in adults in the context of a hospital?

The search was carried out in the databases: MEDLINE, Web of Science, COPUS, Latin American and Caribbean Health Sciences Literature (LILACS), and the Cumulative Index to Nursing and Allied Health Literature (CINAHL). The descriptors used were mapped in English using the Medical Subject Headings (MeSH): "Simulation Training" and "Cardiopulmonary Resuscitation". In Portuguese, they were mapped using the Health Sciences Descriptors (DeCS): "Simulation Training" and "Cardiopulmonary Resuscitation". We used the Boolean operator *AND*, with the following search strategy: (("Simulation Training") AND ("Cardiopulmonary Resuscitation")) in MEDLINE, Web of Science, SCOPUS, and CINAHL. In LILACS, the search strategy was: (("Simulation Training") AND ("Cardiopulmonary Resuscitation")).

The inclusion criteria were: publications that answered the research question and were available in full, in any language. Editorials, letters to the editor, and opinion articles were excluded. It stands out that duplicated studies were only counted once, and there were no time limits.

The studies were identified in July 2023, simultaneously, by two independent researchers, using different electronic devices, according to selection criteria and the protocol elaborated for the study. Databases were accessed using the Journal Platform of the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES), accessed through the *Comunidade Acadêmica Federada* (CAFe), using the access provided by *Universidade Federal do Ceará* and *Universidade Federal do Rio Grande do Norte*. The works found were exported to the Rayyan platform, to facilitate reading, selecting, and excluding duplicates, as recommended in literature[13].

Investigation was selected by reading the titles and abstracts. Then, eligibility criteria were employed to be part of the final sample, and the research was read in full. The three researchers reached a consensus after disagreements were clarified, and the articles were included in the research.

Data was organized in electronic spreadsheets using the Microsoft Excel 2010® software. Results were presented in tables and ordered according to the information in the adapted checklist Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA)[14]. The following variable of interest were extracted from the papers: title; year of publication; authors; journals; impact factor; country of origin; language; type of study; level of evidence[15]; study objective; materials used for clinical simulation; content needed to elaborate the scenario of cardiorespiratory arrest in adults in the hospital. Results were organized in two thematic categories: (1) Materials necessary for a simulated clinical scenario of basic life support for adults in the hospital context; and, (2) Important content in the composition of the clinical scenario simulated.

This study was not submitted to the appreciation of a Research Ethics Committee, as the data used in this review are secondary and publicly available.

Results

The crossing of the descriptors led to 1,142 articles. After reading title and abstract and excluding duplicates, there were 70 articles left for reading in full. 15 of them were selected, after a second consensus, to form the final sample, as Figure 1 shows.

The studies included were published in English (100%), mostly in 2019 (26.6%) and 2015 (20%). Regarding their origin, the United States (US) produced with five (33.3%) publications, followed by India, Ireland, and England, each with two (13.3%). The information used to categorize the studies is in Figure 2.

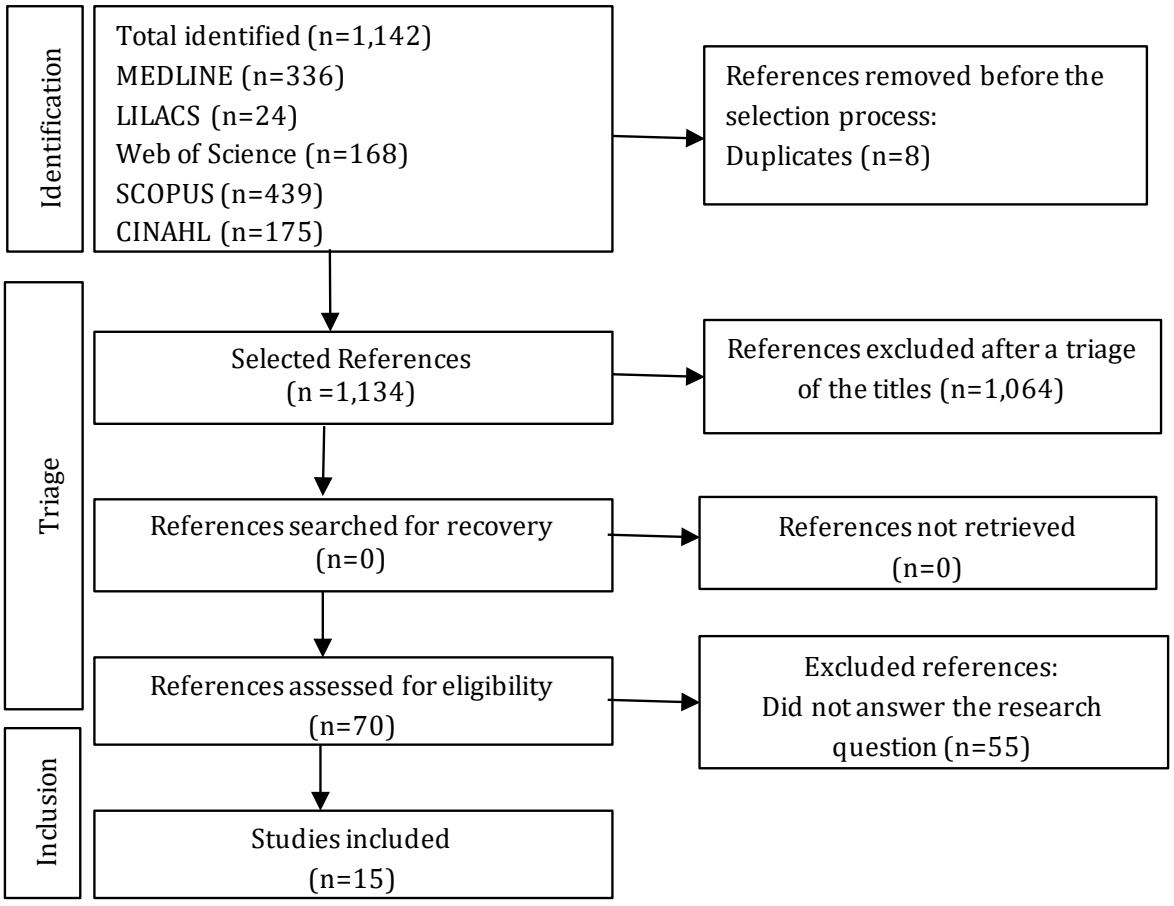

Figure 1 – Flowchart of the literature search, adapted from PRISMA-ScR. Fortaleza, CE, Brazil, 2024

Authors/ Year/country	Journal/ Impact Factor	Type of study/ LE*	Materials	Content
Mroczinski et al[16] 2023 Brazil	Rev Eletr Enferm 0.622†	Quasi-experimental N3	Low-fidelity manikin; urgency cart with materials for cardiorespiratory arrest.	Recognizing cardiorespiratory arrest, coordinating with the team, carrying out cardiopulmonary resuscitation, knowledge about the straight-line protocol, administering drugs, advanced airway management.
Laco et al[17] 2022 USA	Mil Med 1.2‡	Randomized Clinical Trial N2	High-fidelity simulators and simulation operator, tokens for the abilities prescribed by the basic life support curriculum.	Recognizing and activating systems to respond to emergencies, performing chest compression and ventilation, hand positioning, depth of compression, number of compressions, cardiopulmonary resuscitation rate, chest indentation, visible chest elevation on ventilation.
Starosolski et al[18] 2022 USA	Med Sci Monit 3.1‡	Experimental N3	Protective equipment, medical manikin of cardiopulmonary resuscitation and training application.	Mean rate of chest compression per minute, chest indentation, correct depth, quality of ventilation, fraction of chest compression, correct depth of compression, compressions at a good rate.
Arrogante et al[19] 2021 England	Int Emerg Nurs 1.8‡	Cross-sectional N3	Advanced simulation manikin.	Classification of nursing interventions, respiratory monitoring, shock management: volume, cardiac shock management, and chest tube care.

(the Figure 2 continue in the next page...)

Authors/ Year/country	Journal/ Impact Factor	Type of study/ LE*	Materials	Content
Caliskan et al[20] 2021 India	Turk J Emerg Med 0.9‡	Experimental N3	Cardiopulmonary resuscitation manikin for adults, bed on wheels, stepladder, digital stopwatch, feedback device, metronome.	Depth of chest compression, chest frequency and retraction, average compression rate.
Hinduja et al[21] 2020 India	Indian J Forensic Med Toxicol 0.115§	Non-randomized clinical trial N3	High-fidelity manikin with parameter measurement software.	Chest compression depth, chest compression rate, chest indentation, and chest compression fraction.
Habibli et al[22] 2020 Iran	Nurs Pract Today 1‡	Quasi-experimental N3	Calibrated stopwatch, checklist, and cardiopulmonary resuscitation manikins.	Place the patient on a cardiopulmonary resuscitation surface, position of the elbows when compressing the chest, continuing compressions when connecting the external automatic defibrillator, immediate recompression, proper positioning of the head to open the airways, chest compression number and depth.
Beck et al[23] 2019 Ireland	Resuscitation 6.5‡	Randomized Clinical Trial N2	High-fidelity manikin and stopwatch.	Chest compression, compression fraction, hand positioning, chest retraction, compression depth, compression frequency, ventilation with CPR mask pouches, ventilation frequency, and ventilation volume.
Schober et al[24] 2019 England	BMC Med Educ. 3.6‡	Quasi-experimental N3	Patient simulator and external automatic defibrillator.	Activation of the resuscitation team at the detection of cardiac arrest; start, frequency, and depth of chest compressions.
Majer et al[25] 2019 Poland	Clin Cardiol 3‡	Randomized Clinical Trial N2	Simulator and device for adults.	Depth of compressions, frequency of compressions, degree of chest relaxation, and correction of the position of the hands on the chest during compressions.
McCoy et al[26] 2019 USA	West J Emerg Med 3.1‡	Quasi-experimental N3	High- and low-fidelity human patient simulator, including physiological monitoring and hospital devices.	American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care; chest compression ratio, depth, indentation, and compression fraction.
Hunziker et al[27] 2018 USA	J Crit Care 3.7‡	Randomized Clinical Trial N2	High-fidelity manikin whose vital signs and physical changes could be controlled remotely.	Leadership, rapid-start uninterrupted cardiopulmonary resuscitation, checking awareness, breathing, bed height, compression ratio, and ventilation.
Sullivan et al[28] 2015 Ireland	Resuscitation 6.5‡	Randomized Clinical Trial N2	Low-fidelity partial task simulator of cardiopulmonary resuscitation, stepladder, and backrest.	Start and end time of compression, lowering headboards, using stepladder and backrest, lowering side rails, and removing pillow.
Mayrand et al[29] 2015 USA	West J Emerg Med 3.1‡	Randomized Clinical Trial N2	High-fidelity manikin, ladder, bed.	Bed height and angle of the rescuer's arm.
Gonzi et al[30] 2015 Italy	Acta Biomed 0.472§	Cohort N3	Bed, emergency cart, manikin, external automatic defibrillator.	Emergency response system activation time, defibrillation time, practical time, chest compression, correct compression time.

*LE: Level of evidence; †Repercusión Inmediata Cuiden (RIC); ‡Journal Citation Reports (JCR); §Scientific Journal Ranking (SJR)

Figure 2 – Summary of results including author, year, country, journal, impact factor, type of study, level of evidence, materials, and content for the cardiorespiratory arrest simulated scenario in adults in the context of a hospital. Fortaleza, CE, Brazil, 2024

Regarding the study types, most were randomized clinical trials (40%) and quasi-experimental studies (26.6%). Regarding the evidence level of the studies, 60% were classified as N3, and 40% as N2.

The results of the articles selected were organized in two thematic categories, namely: (1) necessary materials for the simulated clinical scenario of basic life support for adults in the hospital context; and (2) Important content for the composition of the simulated clinical scenario.

Regarding the first thematic category, all studies highlighted the importance of using hospital training models, be they manikins or simulators. The use of stepladders was cited by 20% of studies, while timekeeping devices, such as stopwatch and metronomes were mentioned in 26.6%. The studies are described in Figure 2.

Regarding the second thematic category, related to content identified as important for the composition of the simulated scenario, chest compression depth (60%), chest compression rate (26.6%), chest recoil or chest relaxation (33.3%), chest compression fraction (20%), and hand positioning (20%) stood out.

Another element reported as an important piece of content was the fast recognition of cardiorespiratory arrest, present in 20% of articles. Additionally, studies addressed the activation of the reanimation team or the activation of the system of emergency responses (20%), as well as the importance of leadership and coordination in the reanimation team (20%). Moreover, one of the articles highlighted the use of clinical cases and of the Nursing Intervention Classification (NIC) book.

Discussion

This study highlights scientific evidence about the necessary content and materials to compose simulated clinical scenarios for the immediate care of adults undergoing cardiorespiratory arrests in a hospital.

It is noteworthy that simulation teaching is an important strategy that, by representing real events, allows the training of techniques, associating theoretical knowledge to relevant clinical aspects. Also, it reiterates the importance of building the scenario according with good health practices, involving the following stages: planning, objectives, simulation structure and format, case description, perceived realism, pre-debriefing, debriefing, evaluation, materials, resources, and pilot. All these stages are interconnected and interdependent[31].

Concerning the first thematic category, related to the materials, the mapping of the manuscripts pointed at manikins/simulators as the main materials for the simulated cardiorespiratory arrest scenarios, a result similar to literature[32-34]. In this study, timekeeping devices, such as metronomes and stopwatches, stood out, as they are used to establish a stable rhythm and improve the quality of chest compressions

The use of these technologies has significantly improved the quality criteria of cardiopulmonary resuscitation. They include: correct depth of compression, complete chest retraction, and optimal compression ratio. Thus, literature highlights the importance of these timekeeping devices in the composition of scenarios and in clinical practice[20].

Regarding the second thematic category, relative to important content, chest compression technique was the main skill considered necessary for high-quality cardiopulmonary resuscitation. Literature points out that the main skill deficits are related to the correct execution of this technique[35]. The main parameters addressed by the studies are in agreement with the guidelines of the American Heart Association (AHA). The main ones were depth, frequency, and chest relaxation[36]. In this context, these measures are indicated as essential to improve the odds of survival of patients[1].

Other essential aspects of basic life support, mentioned by the articles being studied, include immediate recognition of cardiorespiratory arrest, and the activation of the emergency medical service. It is well known that, if the situation is managed fast and

systematically, by a competent and well-trained team, the patient is more likely to respond well to the actions performed and, therefore, has better chances of survival. Thus, clinical signs of cardiorespiratory arrest must be identified as early as possible[1,37].

Furthermore, the scene recognition time is decisive for a good prognosis of the individual undergoing a cardiorespiratory arrest. Estimates suggest that for every minute that passes with no intervention, the chances of survival decrease by 10%; this demonstrates the importance of a fast identification and early beginning of care[38].

It is also worth noting that cardiorespiratory arrest is influenced by several underlying diseases, especially hypoxia, acute coronary syndrome, hypovolemia, arrhythmias, infection, and cardiac insufficiency. In this regard, addressing different clinical cases in the context of hospitals is very important to acquire competences in the context of simulation learning[19,31].

Thus, literature reiterates the relevance of teaching basic life support in adults, in the hospital context, via simulation, in order to provide safer care to the patients[31]. Additionally, the scenario thus created can contribute for the development and training of skills during graduation and continued education in health, as well as subsidize future studies[39].

As a result, future research should focus on developing and validating the content of simulated scenarios of basic life support in the hospital, since it is essential to ensure that health professionals and undergraduates are constantly updated when it comes to any important aspects of clinical practice.

Study limitations

Limitations of the study include the number of databases searched, since relevant studies may not have been included in the sample. Furthermore, studies found did not detail the simulated scenarios, and such lack of specification limited the possibility of mapping information of interest.

Contributions to practice

Our results can contribute to multiprofessional team care and health students, since they emphasize the importance of recognizing and knowing how to act when confronted with an emergency within the hospital environment. They also contribute to the planning of permanent education actions through this type of training, especially regarding basic life support. It stands out that clinical simulations can help improve the quality of care, increasing the safety and survival of patients in cardiorespiratory arrest.

Conclusion

The essential elements for the elaboration of a simulated scenario for adults in cardiorespiratory arrest in the hospital environment can be divided into content and materials. Supplies, parameters of cardiac compression, organization, and health team coordination are chief among them. Other elements that stood out include the use of manikins/simulators, metronomes/stopwatches, compression techniques that follow American Heart Association guidelines, cardiac arrest recognition, and the activating and leadership of the emergency team.

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Authors' contributions

Concept and project or analysis and interpretation of data; writing of the manuscript or relevant cri-

tical revision of the intellectual content; final approval of the version to be published; Agreement to be responsible for all aspects of the manuscript to be investigated and resolved adequately: Carvalho CG, Martins CCG, Silva IC, Lira ALBC. Writing of the manuscript or relevant critical revision of the intellectual content; Agreement to be responsible for all aspects of the manuscript to be investigated and resolved adequately: Fernandes RM, Dantas JR, Oliveira-Kumakura AR.

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