Revista Científica
Escola de Saúde Pública do Ceará Paulo Marcelo Martins Rodrigues
1808-7329 (1809-0893)

REVIEW ARTICLE
Education

MOBILE SIMULATION FOR COMPETENCES DEVELOPMENT

SIMULAÇÃO MÓVEL PARA O DESENVOLVIMENTO DE COMPETÊNCIAS

SIMULACIÓN MÓVIL PARA EL DESARROLLO DE HABILIDADES

Natana de Morais Ramos[1], *Andréa Stopiglia Guedes Braide*[2], *Cleyton Carvalho Cândido*[3], *Cleoneide Paulo Oliveira Pinheiro*[4], *Francisco Rafael Pinheiro Dantas*[5] *e* *José Batista Cisne Tomaz*[6]

ABSTRACT
Identify the effectiveness and gaps of mobile simulation as an educational strategy for improving health professionals. Scoping review carried out in eight databases and gray literature. The articles were selected without time frame and languages. They were extracted and summarized by two independent researchers at Mendley. PRISMA-ScR was used, guided by the question: How can mobile simulation effectively contribute to the improvement of health professionals? What are the gaps in the literature? Seven articles were selected, with a prevalence of studies in Canada and carried out in 2021, with level evidence IV. Mobile simulation contributed significantly improvement, developing effective clinical competences with less costs and better time management. However, requires trained and available instructors, in addition to investment to adapt the mobile simulation unit. Mobile simulation has better cost-benefit and less financial impact when compared to in-person simulation, highlighting the importance of the strategy.
Keywords: *Simulation Training; Patient Simulation; Health professionals; Professional qualification*.

RESUMO
Identificar a efetividade e as lacunas da simulação móvel como estratégia educacional para o desenvolvimento de competências em profissionais da saúde. Trata-se de uma revisão de escopo realizada em oito bases e literatura cinzenta, entre dezembro de 2023 a fevereiro de 2024. Os artigos foram selecionados sem recorte temporal e línguas, os quais foram extraídos e sumarizados no Mendley. Utilizou-se o PRISMA-ScR, orientado pela questão: como a simulação móvel pode contribuir efetivamente para o aperfeiçoamento de profissionais da saúde? Quais as lacunas na literatura? Selecionou-se sete artigos, com prevalência de estudos no Canadá e nível de evidência IV. A simulação móvel contribuiu significativamente desenvolvendo competências clínicas efetivas com menos custos e melhor gestão do tempo. Porém, requer instrutores capacitados e disponíveis, além do investimento para adaptação da unidade de simulação móvel. A simulação móvel possui melhor custo-benefício e menos impacto financeiro quando relacionada à simulação presencial, o que evidencia a importância da estratégia.
Descritores: *Treinamento por Simulação; Simulação de Paciente; Profissionais da Saúde; Formação Profissional*.

RESUMEN
Identificar la efectividad y brechas de simulación móvil como estrategia educativa para competencias de los profesionales de la salud. revisión realizada en ocho bases de datos y literatura gris. Los artículos fueron seleccionados sin marco temporal ni idioma y extraídos por dos investigadores independientes. Se utilizó PRISMA-ScR, guiado por la pregunta: ¿Cómo puede la simulación móvil contribuir efectivamente a la mejora de los profesionales de la salud? ¿Cuáles son las lagunas en la literatura? Se seleccionaron siete artículos, prevalencia de estudios en Canadá y realizados en 2021, con nivel de evidencia IV. Simulación móvil contribuyó significativamente a mejora, desarrollando habilidades clínicas efectivas con menos costos y mejor gestión del tiempo. Sin embargo, requiere instructores capacitados y disponibles, además de inversiones para adaptar unidad de simulación móvil. Simulación móvil tiene mejor costo-beneficio y menor impacto financiero en comparación con la simulación presencial, lo que resalta importancia.
Descriptores: *Entrenamiento de Simulación; Simulación de Paciente; Profesionales de la salud; Cualificación profesional*.

[1] Escola de Saúde Pública do Ceará, Fortaleza/CE - Brasil.
[2] Escola de Saúde Pública do Ceará, Fortaleza/CE - Brasil.
[3] Escola de Saúde Pública do Ceará, Fortaleza/CE - Brasil.
[4] Escola de Saúde Pública do Ceará, Fortaleza/CE - Brasil.
[5] Escola de Saúde Pública do Ceará, Fortaleza/CE - Brasil.
[6] Escola de Saúde Pública do Ceará, Fortaleza/CE - Brasil.

INTRODUCTION

Clinical simulation is an educational strategy that allows the development of competencies, especially skills and attitudes, through a reflective and transformative environment that favors patient safety in the performance of care activities, decision-making and execution of essential procedures in patient care, which can culminate in disabilities, injuries or even death.[1]

The use of clinical simulation in the training of skills with health professionals allows for prior contact with interventions and real situations within a controlled environment where it is possible to repeat procedures before experiencing a real situation and interact with simulators and actors, which ensures excellence and high safety standards. which is currently seen as a high-priority issue because it is a problem that involves lives and affects millions of people[2,3].

Therefore, clinical simulation is a health teaching strategy that uses clinical scenarios for the development of competencies related to education, evaluation, research and integration of health systems, which allows recreating and anticipating real-life situations that the professionals involved will soon encounter in the performance of their care activities which contributes to safe care, increasing confidence in future decision-making, in the quality of care offered and, consequently, in public health.[1]

In addition, this educational strategy can be implemented in different realities and contexts, with low, medium and high-fidelity scenarios, used to care for individuals and their families, community members and the vulnerable[4]. Over the last few decades, there has been a great evolution, adding different *designs* for training using simulation.

Simulation can be classified as: clinical with simulators (amplifies real experiences, replicating aspects of the real world in an interactive way, associated with simulators with different technological levels); simulated patient (trained person who plays the role of a patient in real care to reproduce the clinical experience); hybrid (association of two or more simulation modalities to increase the fidelity of the scenario and its integration with the environment, emotions and communication); deliberate practice in rapid cycles (application of the same clinical case several times until the acquisition of the desired competence and objective), virtual (computerized technology that allows an interactive virtual environment); *in situ* (in the patient care environment or workplace), telesimulation (telecommunication and simulation to provide training in an external location) and also mobile simulation[5].

Mobile simulation is a recent and innovative field that arose from the need for access to training with greater agility associated with the use of technologies, without the need for professionals to travel long distances to enjoy the training, even with geographic restrictions or working in non-traditional environments[6].

To meet these demands, mobile laboratories (trucks, buses, vans) and *in situ* displacement devices (within a facility or care environment) have been used, which use a known place or the work environment itself to obtain greater psychological fidelity and stress reduction, favoring the acquisition of competencies and their retention by making them active in the learning process.[1,7] It is emphasized that it is not intended to remove the responsibility of the educational process from the teacher, but to encourage those involved to be autonomous in the process, of which simulation is a part, and should be understood and valued as a complementary strategy to the educational process [3,9], valuing the autonomy and proactivity of students and/or professionals in conducting interdisciplinary situations.[10]

Thus, it is estimated that the development of the present study will contribute to the diffusion of this aspect of clinical simulation, the mobile simulation, with a view to the improvement and proportion of transient environments more adapted to the needs of health professionals, especially in remote areas. That said, the present study aims to identify in the literature the effectiveness and gaps in the use of mobile simulation as an educational strategy for the improvement of health professionals.

METHODS

This is a *scoping review* carried out for immersion in the theme, seeking to examine the extent and nature of scientific productions, as well as to identify in the literature how mobile simulation can effectively contribute as an educational strategy and the possible existing gaps.

For its development, five steps were necessary, according to the *Joanna Briggs Institute* (JBI)[11]: 1- identification of the research question; 2- identification of relevant studies; 3- selection of studies; 4- data extraction; and 5- collection, synthesis and reporting of the results. This protocol was guided by *the guidelines* of the *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews* (PRISMA-ScR). Since this is not a scoping review associated with a systematic review, it was not necessary to record the review protocol [12].

The **guiding question** of the present study is: *How can mobile simulation effectively contribute to the improvement of health professionals? What are the gaps in the literature related to mobile simulation strategy?*

For its composition, the mnemonic PCC was applied, which corresponds to: **P** – Population (health professionals), **C** – Concept (educational strategy for improvement), **C** – Context (mobile simulation), structured in Table 01 below:

Chart 01 – Scoping review search strategy. Fortaleza, Ceará. Brazil, 2024.

Objective/problem: *How can mobile simulation effectively contribute to the improvement of health professionals? What are the gaps in the literature related to mobile simulation strategy?*			
	POPULATION (P)	**CONCEPT (C)**	**CONTEXT (C)**
Extraction	Healthcare Professionals	Continuing education	Simulation Training
Conversion	Professionals AND Health	Continuing AND Education	Training AND Simulation
Combination	Professional + Professionals AND Health	Continuing Education + Continuing Education + Continuing Education	Simulation Training + Simulated Training AND Mobile Simulation

Construction	Professional OR Professionals AND Health	Continuing Education OR Continuing Education OR Continuing Education	Simulation Training OR Simulated Training
Portuguese	("Patient OR Patients AND Health") AND ("Continuing Education OR Continuing Education OR Continuing Education") AND ("Simulation Training + Simulated Training") AND ("Mobile Simulation")		
English	*Health Personnel* AND *Education Continuing* AND *Simulation Training* AND *Mobile Simulation*		
Spanish	*Healthcare Personnel* AND *Continuing Education* AND *Simulated Training* AND *Mobile Simulation*		

Source: Adapted.[13]

Therefore, for stratification and targeting, the following descriptors (DeCS) were used: "Simulation Training"; "Health Professionals"; and "Continuing Education", MeSH: *Health Personnel; Education Continuing; Simulation Training* associated with the keyword: Mobile Simulation.

The search was carried out in the following databases: *Lilacs*; APA *Psycnet*; BDENF; *Medline/PubMed*; *Scopus*; *Cochrane; Embase;* and *Web of Science*. As for the gray literature, the Catalog of Theses & Dissertations (CTD/Capes) and Google Scholar will be considered, being developed in the period from September to December 2023, using the Boolean operators *AND* and *OR* to expand the findings.

For the selection of studies, the following were included: studies with health professionals; in English, Portuguese and Spanish, available in full and witho ut time frame. Duplicate studies in the same database, repeated between databases, were excluded; that involved continuing education in the field of telesimulation, as well as studies that use the training of simulation skills in their general context or other types of simulation that do not correspond to mobile simulation. It is noteworthy that studies from the references of the articles selected to compose the present study and organized according to the PRISMA-ScR flowchart (identification, screening, eligibility and inclusion) were also included.

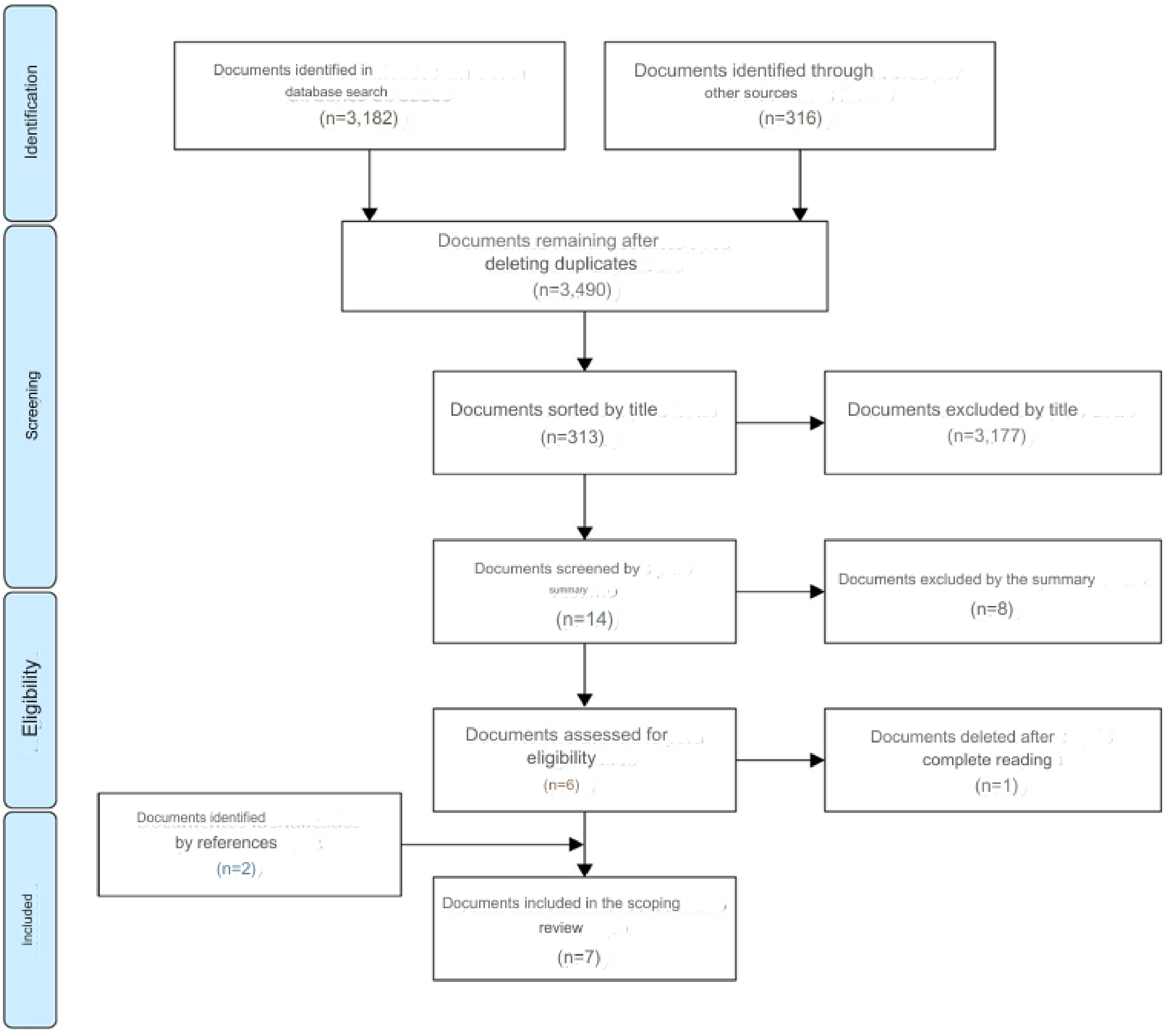
Data extraction consisted of the elaboration of an instrument to summarize the extracted information. In order to minimize selection and analysis biases, the data were extracted by two separate researchers independently. In the organization of the selected articles, the *Mendley software was used*, which allows the operationalization of the exported results, verified in the flowchart in Figure 01. It is noteworthy that the studies were classified into levels of evidence, according to the guidelines of the JBI [(11)] shown in Chart 02 below:

Table 02 – Levels of evidence according to the type of study. Fortaleza, Ceará. Brazil, 2004.

Levels of Evidence according to the type of study, according to JBI (2015)
LEVEL I – Evidence obtained from a systematic review containing only randomized controlled clinical trials.
LEVEL II – Evidence obtained from at least one randomized controlled clinical trial.
LEVEL III – 1 Evidence obtained from well-designed, non-randomized controlled clinical trials.
LEVEL III – 2 Evidence obtained from well-designed cohort or case-control studies, analytical studies, preferably from more than one research center or group.
LEVEL III – 3 Evidence obtained from multiple time series, with or without intervention, and dramatic results in uncontrolled experiments
Opinion from respected authorities, based on clinical criteria and experience, descriptive studies, or expert committee reports (*National Health & Medical Research Council*, 1995).

Source: *Joanna Briggs Institute* [11].

Figure 01 – Flowchart for selection of studies according to the *Preferred Reporting Items for Systematic Review and Meta-Analyses* (PRISMA). Fortaleza, Ceará. Brazil, 2004.



Source: Prepared by the authors (2024).

The data included in the review were organized in an instrument designed to assist in data collection, extracting information such as: authors, title, study design, year of publication, country of study, in addition to the results that answer the guiding questions, as shown in Table 01 below. Thus, since this is a study with secondary data available in the literature, it is not necessary to assess it by the Research Ethics Committee.

RESULTS

The analysis included seven studies that discussed skills training through mobile simulation as an educational strategy that interferes in the development of health professionals' activities for the benefit of the community and valuing patient safety. The selected studies were, predominantly: qualitative (3; 42.86%), descriptive (3; 42.86%), followed by review (1; 14.28%).

Regarding the origin of publications, the largest number of manuscripts were made in Canada (2; 28.6%), followed by Australia (1; 14.28%), Brazil (1; 14.28%), Scotland (1; 14.28%), United States (1; 14.28%), and Ireland (1; 14.28%).

The studies were conducted between 2011 and 2021, with levels of evidence IV (7; 100%). Table 01 summarizes the profile of publications that contemplate scientific production in the context of mobile simulation, corresponding to the object of interest study.

Table 01 – Scientific production in the context of mobile simulation as an educational strategy involving health professionals. Fortaleza, Ceará. Brazil, 2024.

TITLE, AUTHORS, LOCATION/COUNTRY AND YEAR	METHOD	POPULATION	RESULTS
Mobile Surgical Skills Education Unit A New Concept in Surgical Training [13] *- Irlanda* Level of evidence: IV	Qualitative	Medical Residents	Prehospital training in difficult airway management. The mobile unit offered trainees the opportunity to be trained in their own hospitals, with realistic models, in a user-friendly and non-stressful manner, improving technical skills, without compromising patient safety.
Creating a gold medal Olympic and Paralympics health care team: a satisfaction survey of the mobile medical unit/polyclinic team training for the Vancouver 2010 winter games [14] *- Canada* Level of evidence: IV	Descriptive	64 participants (doctors, nurses and respiratory therapists)	Participants were in favor of the training, positively impacting knowledge and skills. The components of the training were evaluated differently: job title, years of experience, and previous event experience. Respondents with little or no experience in large-scale events (45%) rated daily simulations as a valuable component of the training program to strengthen clinical competencies and skills, which demonstrates the effectiveness of simulation training in teamwork. **Limitations/gaps:** Future trainings should conduct pre- and post-training research, linking training and performance to measure patient satisfaction outcomes, complications, or functional outcomes. Similarly, future evaluations could be derived from pre- and post-test knowledge and confidence testing followed by post-deployment validation surveys.
Mobile Simulation Unit: taking simulation to the surgical trainee [15] *- Australia* Level of evidence: IV	Qualitative	55 participants (staff physicians, resident physicians, interns, fellows, and medical students)	Mobile simulation has provided surgery education, proving to be a viable and practical strategy that enables on-the-job training regardless of one's geographic location and with the potential to increase participation in simulation programs by making training more accessible and standardized. **Limitations/gaps**: Poor access to simulation in the workplace. However, they have received positive *feedback* on their experience at MSU, which is feasible, practical, and well-accepted by graduates and surgeons.

Creation and Validation of a Novel Mobile Simulation Laboratory for High Fidelity, Prehospital, Difficult Airway Simulation [16] *– United States.* Level of evidence: IV	Descriptive	19 airway specialists conducted 57 simulation sessions	The mobile simulation lab has been tested by paramedics with extensive experience. The success rate was 33% in the first attempt at intubation in a difficult airway. The mobile simulation lab created a reproducible, high-fidelity learning environment. **Limitations/gaps**: financial barriers or modification expenses to accommodate the experimental design. However, the versatility of the MSL allows this burden to be shared by multiple pre-hospital services, limiting the direct financial burden. In addition, simulation environments can be reconfigured, mitigating the overall cost. In addition, it includes the need for a competent trainer to conduct the sessions and who can provide targeted *feedback* to pre-hospital providers.
Mobile emergency simulation training for rural health providers[17] *- Canada* Level of evidence: IV	Descriptive	131 professionals (nurse, doctor, resident, physician assistant, medical student, emergency medical first aider, paramedics, air ambulance driver)	*Motorhome* converted into a laboratory with a high-fidelity mannequin: talks, breathes, blinks, pulses and reactive pupils. It has answers: CPR, medication, intubation, and ventilation with the aim of improving critical care skills and crisis resource management in distant locations and with difficulty in leaving (rural area), contributing to clinical reasoning, skills, decision-making, and self-reflection. **Limitations/gaps**: strategy that uses multiple and heterogeneous collaborative efforts; scarcity of physicians and training limitations that require linkage with larger institutions, suggesting more critical areas such as rural areas.
Analysis of the use of a mobile simulation unit using the principles of a managed educational network [18] *- Scotland* Level of evidence: IV	Qualitative	125 people from various health councils and other organizations	Supporting the training needs of the National Health Service workforce, especially in remote and rural areas of Scotland. MSU was proposed as part of the solution to the inequity of education delivery using simulation. These results demonstrated the effective use of education-based simulation, ensuring equal access, regardless of geographic location or professional experience. The present study points to the average cost per participant for MSU training at £37.50, whereas to send staff to a central simulation center or provide basic skills training at an external location costs £265 per course, per participant. **Limitations/gaps:** Mainly because the number of professionals who need training and the logistics to send them to a large center are a gap.
Mobile simulation: scientific contributions for the health area [19] *- Brazil* Level of evidence: IV	Revision	-	The mobile simulation contributed to the training of health professionals and people from the community, favoring the development of clinical skills of professionals and proved to be an effective tool for training and capacity building in remote areas. It consists of a modality that contributes to the development of simulated practice as an active teaching method; However, it is still little explored, and it is a challenge to broaden the perspectives of its implementation.

Source: Prepared by the authors.

The analysis of the selected studies pointed to the use of mobile simulation as an effective educational strategy, which helps in the development of clinical reasoning, expansion of skills, decision-making and self-reflection of health professionals, especially those who are in regions with difficult access or far from large simulation centers. which makes training more accessible and standardized, strengthening and acquiring clinical competencies and skills in a friendly and non-stressful way, in addition to valuing patient safety.

Among the limitations and gaps identified, there is the need to conduct pre- and post-training surveys as a way to measure functional results and patient satisfaction, in addition to the application of confidence tests. This strategy, mobile simulation training, requires collaborative efforts from both facilitators/instructors and participating health professionals, requiring trained professionals to conduct and provide adequate *feedback*, which may limit training due to a shortage of trained personnel.

In addition, other barriers can be added, such as: the adaptation of a car to accommodate the mobile training laboratory and the difficult access to health professionals who are in remote locations. Such points can be mitigated by understanding that simulation environments can be reconfigured, meeting the training needs of various services, in the most varied themes and, consequently, sharing the financial burden. However, it is a strategy that is still little explored.

DISCUSSION

MOBILE SIMULATION: STRATEGIES AND GAPS IN THE IMPROVEMENT OF HEALTH PROFESSIONALS

Mobile simulation (MH) is a strategy that provides a safe learning environment and can contribute significantly to behavior change, especially in the development of competencies, especially skills and attitudes, of health professionals who have reduced accessibility and/or are inserted in non-traditional environments. To this end, MS is a recent field of clinical simulation that consists of training through a mobile laboratory that moves in order to reach and improve a larger number of professionals, in addition to providing a safe learning environment and greater effectiveness for learning and retaining knowledge when compared to the traditional method [1,20].

It is noteworthy that the improvement in the field of health can be extremely costly, and the investment in MH is a possible solution when it is understood that the strategy can provide support to the needs of qualification/improvement of several institutions, generating decentralization of costs, which is financially advantageous, as it does not require construction in fixed space, purchase and maintenance of equipment and consumables. as well as hiring staff and facilitators, while having the advantage of providing their trainees with access to modern facilities [15,19].

It is known that in large hospitals it is possible to have training centers with access to modern simulators, but certainly, in small hospitals, especially those located in rural areas, they will hardly have support and structure for their implementation, being unprofitable due to the potential users [15]. However, the need for facilitators with specialized knowledge to conduct training should be taken into account, with availability to constantly cover long distances, to develop clinical reasoning skills, decision-making and early recognition of patient deterioration [17].

A study carried out in Australia, using the strategy through a Mobile Simulation Unit (MSU), adapted with surgical simulators for a team of resident physicians, surgical interns and medical students, was identified as a viable and practical strategy that offers training with fidelity, regardless of location, evidencing the importance and possibility of conducting training in the most varied areas/fields of health knowledge. even though they are very specific areas, such as surgery [15].

According to Carstens *et al.* [7], MS is more challenging than the simulation that occurs in static laboratories, differing from the practicality pointed out in a previous study [15]. However, it also points out that for MS to be successful, it is necessary that the leaders involved must support elements that encompass planning, assessing the needs of participants and their gaps, objectives, budget and teams, since simulation in the laboratory generally enjoys more controlled and predictable learning environments.

According to Brown *et al* [14], it is valid to include pre- and post-test training aimed at validating any result that has not yet been proven. However, they are attributed as limitations of the training courses carried out, for the most part, up to the period of this study, but which can still be a means of assessing satisfaction with the activity.

As for the costs per course, per participant, the training at MSU was calculated at an average of £37.50 (234.31 reais). When comparing this value with the estimated costs of sending health professionals to large health simulation centers for basic skills training, they averaged £265 per course, per participant. In addition to being financially more viable, according to the findings of the study by Backer *et al* [18], it is not necessary for professionals to "abandon" their workplaces beyond the necessary time for training/improvement.

Regarding the duration of the trainings using MS, these were carried out between 90 minutes, at least, and in didactic blocks of 3 to 4 weeks, at most. The time used for the execution of the scenarios in the simulated practices, the literature points out that there are variations depending on the proposed objective and the format required for the simulation, its fidelity and the debriefing method used. Therefore, it is up to the facilitator to identify the necessary time, without being tied to a certain time, to exhaust the proposed scenario so that the participants can interact, reflect and reproduce in a positive way [20].

For the effectiveness of mobile simulation as training, Bischof *et al*[16] emphasize that as a teaching-learning strategy, it has been tested with extensive experience, especially in activities that involve specific and precise techniques, such as intubation in a difficult airway. The activity can have a safety affirmation for the trainee from a reproducible and high-fidelity learning environment. However, there is a concern about barriers and financial limitations that can hinder experiences with these proposals. It is an expensive equipment that, due to the experience with the use of fir st generation simulators, needs trained and competent professionals in the area to perform the function of facilitator and even so, it does not guarantee high performance of the group in training.

The time identified in the selected studies as the minimum time required for the development of MS was 90 minutes, which differs from the recommendation in the literature, which guides the following steps: *briefing* (which should be 5 minutes), scenario (average of 15 minutes, depending on the objective) and *debriefing* (in 20 minutes) [21]. Therefore, it is believed that the scenarios used in MS required more time to conduct because it is a simulated practice with high specificity.

CONCLUSION

Based on the studies analyzed, it was considered that the use of mobile simulation contributes significantly to the development of skills, especially in the field of health, when performed in non-traditional environments, but accessible and compatible with training, which allows access and dissemination of quality training from large simulation centers, without the need to remove professionals from their workplaces. It is known that mobile simulation is still a theme little explored in the literature and that it has as a challenge the identification of available and qualified facilitators/trainers for its implementation, in addition to the initial investment for the structuring of the mobile laboratory.

It is also noteworthy that the studies pointed to a better cost-benefit associated with the use of mobile simulation, due to the lower financial impact per trained professional, when related to face-to-face simulation, in view of the costs involved for the maintenance and transportation of professionals to large centers, depleting health care, which usually has a shortage.

Therefore, the development of this study evidenced the importance of the use of mobile simulation in remote areas, in addition to the need to carry out studies to verify the effectiveness of the implementation of this strategy through the use of pre- and post-tests, aiming to identify palpability, a gap identified in the selected studies. Therefore, the present study is limited due to the few studies identified, in addition to only one article indicating the measurement of the effectiveness of the use of the mobile simulation strategy, which would be pertinent to support the development of the strategy in remote areas.

As for the potential of the present study, it is intended to subsidize the structuring and implementation of the mobile simulation strategy in the State of Ceará, expanding the number of health professionals with access to skills and attitudes training with adequate and innovative resources, in addition to valuing patient safety.

REFERENCES

1. Silva CCR et al. Simulação móvel: contributos científicos para a área da saúde. Texto Contexto Enferm [Internet]. 2021;30:e20200111. https://doi.org/10.1590/1980-265X-TCE-2020-0111

2. Kaneko RMU; Lopes MHBM. Realistic healthcare simulation scenario: what is relevant for its design? Rev Esc Enferm USP. 2019;53:e03453. http:// dx.doi.org/10.1590/S1980-220X2018015703453

3. Jerônimo et al., Use of clinical simulation to improve diagnostic reasoning in nursing.Esc Anna Nery 2018;22(3):e20170442. 10.1590/2177-9465-EAN-2017-0442

4. Akselbo I et al. Simulation as a learning method in public health nurse education. Public Health Nurs [Internet]. 2019 [acesso 2023 Dez 15];36(2):226-32. https://doi.org/10.1111/phn.12560

5. CONSELHO REGIONAL DE ENFERMAGEM DO ESTADO DE SÃO PAULO. Manual de Simulação Clínica para Profissionais de Enfermagem. São Paulo. COREN-SP, 2020

6. Kobayashi, L et al. Educational and Research Implications of Portable Human Patient Simulation in Acute Care Medicine. Acad emerg med. 2008; 15(11): 1166-74. http://10.1111/j.1553-2712.2008.00179.x

7. Carstens, PK et al. Comprehensive healthcare simulation: mobile medical simulation. Geneva (CH): Springer; 2020.

8. Campanati, FLS et al. Clinical simulation as a Nursing Fundamentals teaching method: a quasi-experimental study. Rev Bras Enferm. 2022;75(2):e20201155. https://doi.org/10.1590/0034-7167-2020-1155

9. Gomes, JES et al. Elmoterapia: simulação realística como ferramenta de ensino em saúde. Cadernos ESP, Ceará. 2021; 15(2):32-6.https://doi.org/10.54620/cadesp.v15i2.662

10. Joanna Briggs Institute. Joanna Briggs Institute Reviewers' Manual. Adelaide (AU): Joanna Briggs Institute; 2014. http://www.joannabriggs.org/assets/docs/ sumari/reviewersmanual-2014.pdf

11. Peters, MDJ et al. Scoping reviews. In: Aromataris E, Munn Z, editors. Joanna Briggs Institute Reviewer's Manual. Australia: Joanna Briggs Inst; 2017.

12. Costa MM, Carvalho REFL, SilvaVMGN. Protocolo de revisão de escopo de variáveis para compor um banco de dados eletrônico de pacientes com ostomia. Research, Society and Development, 2022. 11:e319111234471. https://doi.org/10.33448/rsd-v11i12.34471
13. Shaikh FM et al. Mobile surgical skills education unit: a new concept in surgical training. Simul Healthc [Internet]. 2011;6(4):226-30. https://doi.org/10.1097/SIH.0b013e318215da5e
14. Brown et al. Creating a gold medal Olympic and Paralympics health care team: a satisfaction survey of the mobile medical unit/polyclinic team training for the Vancouver 2010 winter games. BMC Research Notes 2013 6:462 https://doi.org/10.1186/1756-0500-6-462
15. Pena, G et al. Mobile Simulation Unit: taking simulation to the surgical trainee. ANZ J Surg [Internet] 2015 [acesso 2024 Jan 29];85(5):339-43. https://doi.org/10.1111/ans.12549
16. Bischof JJ et al. Creation and validation of a novel mobile simulation laboratory for high fidelity, prehospital, difficult airway simulation. Prehosp Disaster Med [Internet]. 2016; 31(5):465-70. https://doi.org/10.1017/ S1049023X16000534
17. Martin D, Bekiaris B, Hansen G. Treinamento em simulação de emergência móvel para provedores de saúde rurais. Saúde Rural e Remota 2017; 17: 4057. https://doi.org/10.22605/RRH4057
18. Baker A et al. Analysis of the use of a mobile simulation unit using the principles of a managed educational network. Rural and Remote Health 2021; 21: 5670. https://doi.org/10.22605/RRH5670
19. Sanko, J et al. What participants learn, with, from and about each other during inter-professional education encounters: A qualitative analysis. Nurse Educ Today [Internet]. 2020;5(88):104386. https://doi. org/10.1016/j.nedt.2020.104386
20. Lioce, L et al. Standards of best practice: Simulation standard IX: simulation design. Clinical Simulation in Nursing [Internet] 2015;11(6):309-15. https://doi.org/10.1016/j.ecns.2015.03.005
21. Cogo, ALP et al. Construction and development of realistic simulation scenarios on safe drug administration. Rev Gaúcha Enferm [Internet]. 2019 [acesso 2024 Jan 29];40(Spe):e20180175. https://doi.org/10.1590/1983-1447.2019.20180175