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REVIEW

Clinical Simulation in health care training: barriers to efficacy and impact on health care safety

Simulación clínica en la formación de salud: barreras efectividad e impacto en la atención segura

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ABSTRACT

Introduction: clinical simulation considered as a fundamental tool in the training of health professionals promotes autonomy and preparation for real clinical situations. Therefore, the incorporation of advanced technologies, such as high fidelity simulators and virtual reality, facilitates the transfer of theoretical knowledge to practice, generating an educational experience that is both motivating and effective.
Method: research with a qualitative approach, with a bibliographic review of original scientific articles in Spanish, English and Portuguese. Thirty studies were selected by convenience sampling, extracted from indexed sources such as Scopus, Scielo and Dialnet. The data collected were organized in an Excel matrix and analyzed using the CASPe critical reading rubric.
Results: health training faces several challenges, such as the high economic investment in technology, the need for specialized training for instructors and resistance to change on the part of some professionals. However, this methodology contributes significantly to the development of practical skills, improves decision-making in safe environments and fosters collaborative learning.
Conclusion: clinical simulation is recognized as an essential tool in the training of health professionals, since it provides practical experiences in controlled environments that favor autonomy and preparation for real clinical situations. Worldwide, this methodology has promoted curricular restructuring to improve educational quality and safety, incorporating advanced technologies such as high-fidelity simulators and virtual reality.

Keywords: Learning; Vocational Training; Simulation.

RESUMEN

Introducción: la simulación clínica considerada como una herramienta fundamental en la formación de profesionales del área de la salud promueven la autonomía y la preparación frente a situaciones clínicas reales. Por lo que, se planteó la incorporación de tecnologías avanzadas, como simuladores de alta fidelidad y realidad virtual, facilita la transferencia del conocimiento teórico a la práctica, generando una experiencia educativa tanto motivadora como efectiva.
Método: investigación con enfoque cualitativo, de revisión bibliográfica de artículos científicos originales en español, inglés y portugués. Se seleccionaron 30 estudios mediante un muestreo por conveniencia, extraídos de fuentes indexadas como Scopus, Scielo y Dialnet. Los datos recopilados fueron organizados en una matriz en Excel y analizados utilizando la rúbrica de lectura crítica CASPe.
Resultados: la formación en salud enfrenta diversos desafíos, como la alta inversión económica en tecnología, la necesidad de capacitación especializada para los instructores y la resistencia al cambio por parte de

algunos profesionales. Sin embargo, esta metodología aporta significativamente al desarrollo de habilidades prácticas, mejora la toma de decisiones en entornos seguros y fomenta el aprendizaje colaborativo.
Conclusión: la simulación clínica, se reconoce como una herramienta esencial en la formación de profesionales de la salud, ya que proporciona experiencias prácticas en ambientes controlados que favorecen la autonomía y preparación frente a situaciones clínicas reales. A nivel mundial, esta metodología ha impulsado la reestructuración curricular para mejorar la calidad y seguridad educativa, incorporando tecnologías avanzadas como simuladores de alta fidelidad y realidad virtual.

Palabras clave: Aprendizaje; Formación Profesional; Simulación.

INTRODUCTION

Clinical simulation has become a fundamental tool in the education of health professionals, offering practical experiences in controlled contexts that enable the future graduate to become autonomous in the reality of the clinical scenario.[1]

It should be noted that, at a global level, the incorporation of this new teaching methodology is a reality, demonstrating the inherent need for transforming the curricular design of the health professions within a framework of safety and training quality.[2]

On the other hand, this teaching-learning strategy is effective and attractive, incorporating the use of technologies for the recreation of scenarios that simulate situations of the real clinical environment, and at the same time with training practice conducted by professionals or trained teachers, who guide the learning process and apply standardized evaluation methods, focused on the skills and knowledge of each student.[3]

For this reason, clinical simulation makes a significant contribution to the improvement of education, training, and management in healthcare. These digital solutions facilitate continuous, accessible, and flexible training, which optimizes the teaching and learning process. It also expands the possibilities of personalizing and diversifying educational scenarios, favoring a more inclusive education.[4]

In this sense, clinical simulation employs various modalities that enable the recreation of clinical environments within an academic context, according to the levels of care that promote the development of competencies for training, coaching, or evaluating both individuals and teams in front of simulated cases, before they interact with real patients. These modalities include task coaches, standardized virtual patients, high-fidelity simulators, and virtual reality. It is worth noting that virtual environments significantly favor the transfer of theoretical knowledge to practice, in addition to being highly motivating for students.[5]

In the pedagogical context, the teaching staff must have the necessary skills to guide nursing students in the application of care management tools, as well as in the strengthening of their professional skills; therefore, university training in clinical environments should be carried out in a planned manner with a high level of effectiveness, through the implementation of relevant teaching methodologies adapted to the demands of the healthcare environment.[6]

However, this methodology is still lacking at the level of educational policies in the health context, due to the high costs in infrastructure and resources for its operation, which affects higher education institutions with limited budgets; in addition, it can cause problems for students at lower levels regarding adaptation to new learning processes, and patient safety.[7]

In the same way, the transformation of the educational paradigm in the health sciences entails the adaptation of the teaching model on its role in the scenarios, as well as change to teaching facilitator; therefore, the lack of continuous training hinders the complete integration of this methodology in the curricular plans of studies, focused on the needs of the students, as well as the competences that guarantee the quality of the future professionals regarding the quality of care and patient safety.[8]

For this reason, the demands of the field of knowledge, technological advances applied to learning, current educational outcomes, and contemporary didactic techniques require teachers to engage in modeling processes. Likewise, it is up to the academy to redouble its efforts in the face of the digital and technological revolution in the training of health professionals.[9]

METHOD

The research employed a qualitative approach that aimed to understand the meanings and contexts associated with clinical simulation in health training through a deep and detailed exploration of the study object.[10]

In addition, the study employed a descriptive design that utilized methodological strategies to explore specific contexts, detailing the data collection process to provide a clear and precise understanding through the identification of common patterns across the studies. Likewise, it was a literature review that analyzed the

current state of the art, focusing on examining and synthesizing the research problem globally.[11]

The population is a specific set of articles that share one or more particular characteristics of interest in a clinical simulation activity; in this context, this comprised 90 investigations. This selection was made using convenience sampling, taking into account factors such as the availability of the papers, their accessibility, and whether they met the previously defined selection criteria.[12]

Inclusion Criteria

- Original scientific articles.
- Timing within the last 5 years
- Research with clinical simulation topics in health training.

Exclusion Criteria

- Studies from institutional repositories
- Trials
- Review articles

The collection of information was carried out by a researcher, who searched indexed databases such as SCOPUS, SciELO, CINAHL, PUBMED, and REDALYC, using keywords in English (simulation, teaching, training, barriers, effectiveness, impact, science, and health). Spanish (simulación, enseñanza, formación, barreras, efectividad, impacto, ciencia y salud.) and Portuguese (simulação, ensino, treinamento, barreiras, eficácia, impacto ciência e saúde.), in addition to Boolean operators (AND and OR). Subsequently, a second researcher validated the process, verifying compliance with the established selection criteria.

The information collected was organized in an Excel matrix, where data such as authors, year of publication, abstract, method, findings, conclusions, and references were recorded, allowing for the structuring of the studies according to the research questions.

A reflective critical reading, focusing on the analysis of the studies, was carried out using the CASPe method. This approach allowed for the in-depth evaluation of the style and quality of the articles, as well as their validity, under a peer review process conducted by another researcher.

DEVELOPMENT

Barriers presented in the implementation of clinical simulation in the training of health professionals

Education centered on simulated environments is a crucial element in the training of health professionals. This method involves circumstances where people from different disciplines collaborate and acquire mutual knowledge to promote effective collaboration and optimize health outcomes. However, this can generate problems when interpersonal relationships are strained, as well as a sense of superiority among the students.[13]

It should be noted that this innovative methodological teaching process strengthens the autonomy of the future professional in the face of high fidelity simulated cases; however, there is still a lack of information on competencies and care focused on the framework of safety and quality of care for the user.[14]

In addition, its implementation entails significant financial, infrastructure, and technological investments in higher education institutions, as well as policies regarding its articulation in academic training and incorporation into the curriculum, due to the lack of standardization in administrative and educational processes.[15,16]

On the other hand, simulation-based training aims to improve collaboration and communication among healthcare professionals. However, limited focus group participation and staff turnover make it challenging to evaluate the impact of this method comprehensively. Despite these limitations, the results suggest that simulation can be an effective tool to strengthen interprofessional collaboration in critical care settings.[17,18]

In this context, the lack of adequate infrastructure, such as the absence of skills laboratories in many faculties, as well as the pedagogical transition in both teachers and students, which leads to problems of adaptation to new realities, highlights the need for continuous training to avoid bias in its application.[19,20]

For this reason, simulation-based education is a recognized method that complements traditional teaching methods, promoting the development of competencies in healthcare. However, its application highlights the need for trained professionals at both the educational and professional levels, which enables the development of high-fidelity simulations.[21,22]

That is why clinical simulation in the training of health professionals faces several barriers that hinder its adoption; centered in the context of resources, investment and changes in the curricular paradigm; which makes necessary a transformation of educational policies in the context of health professions, as well as the alert on the part of higher education institutions that offer these programs focused on quality, innovation and development of competencies.

Effectiveness of clinical simulation in the development of competencies in healthcare professionals

Clinical simulation as a teaching methodology transforms clinical scenarios that enable the development of

competencies, promoting the active participation of students in the teaching-learning process and fostering autonomy and safety in their activities.[23]

At the same time, it promotes practices in safe environments, transferring the real-life experiences of the care areas to the students, which encourages them to experience more realistic situations and health problems, in line with the learning outcomes.[24]

It should be noted that clinical simulation in health education facilitates the acquisition of competencies, focused on collaborative work, critical reflection that allows students to make decisions according to the cases used, as well as to evaluate deficiencies that promote improvement plans for the educational process focused on humanism, technical-scientific rigor and professional ethics.[25,26]

Similarly, this teaching method facilitates formative evaluation, providing continuous feedback that allows for a review of learning outcomes, the strengths of the student body, as well as the weaknesses that emerge during its development, thereby promoting self-reflection as a process of improvement.[27,28]

In turn, this methodology fosters cognitive, procedural, and attitudinal competencies, thereby promoting autonomy and safety in clinical decision-making, with a focus on the quality of care, as well as the development of collaborative work through enhanced communication skills in interpersonal relationships.[29,30]

Therefore, clinical simulation is an innovative teaching approach that focuses on integrating knowledge in the clinical setting and practice, effectively promoting the acquisition of skills for future professionals. Additionally, it promotes the teacher's pedagogical competencies, emphasizing responsibility, accompaniment, and recognition of educational transformation in health.[31]

For this reason, clinical simulation has been consolidated as a fundamental pedagogical tool in the training of health professionals, allowing the effective development of technical, cognitive and communicative skills in a controlled and safe environment, showing that practice through simulation improves decision making, manual dexterity and the ability to handle critical situations, which translates into greater patient safety. Consequently, clinical simulation represents an effective educational strategy that enhances professional competence and the quality of care in healthcare settings.

Impact of clinical simulation on safety during care

The implementation of educational programs is primarily based on strategies aimed at improving safety and educational satisfaction, thereby ensuring the development of skills in the healthcare area, which enables the management of complex and critical situations. Therefore, simulation promotes safety standards by following protocols, leading to a more positive perception of the advancement of science and technology.[32,33]

In addition, it strengthens teamwork by demonstrating the team's effectiveness in complex procedures within a controlled environment, as well as autonomy in decision-making in realistic cases, which ensures competencies for future professionals.[34,35]

In the same way, the professional identity and empowerment of the role of students in simulated environments experience greater confidence in their ability to perform professional functions, such as clinical reasoning and organization, facilitating the application of theoretical knowledge in practical situations, promoting better decision making in complex health problems, fostering essential skills for safe care in areas of high demand and complexity care.[36,37]

Similarly, this methodology enables students to reduce errors during the training process of specific skills; therefore, it optimizes results in the clinical context, strengthening the competencies that have been the concern to ensure patient safety.[38,39]

In this scenario, this methodology becomes essential, since it offers the student the possibility of reflecting in different phases of learning, this process favors critical reasoning, deliberation and informed decision making, thus contributing to the self-regulation of their training process, being effective to improve the educational quality and prepare students to face the challenges of the real healthcare environment.[40,41]

For this reason, clinical simulation fosters a culture of safety by allowing the identification and correction of errors in a space where learning is viewed as an opportunity to improve, rather than a failure. The implementation of realistic scenarios, even in real clinical settings, has proven effective in detecting and addressing latent threats in healthcare systems, thereby improving the response to critical situations. Also, immediate post-simulation feedback allows professionals to reflect on their performance and implement improvements in their daily practice.

CONCLUSIONS

Clinical simulation is a fundamental tool for strengthening professional competencies and enhancing safety in healthcare. However, its practical implementation requires strategic planning that contemplates overcoming various barriers, such as economic limitations, infrastructural deficiencies, and a shortage of trained personnel, which will enable the consolidation of the pedagogical value of this methodology in the training of health professionals.

Likewise, this educational model promotes the development of critical thinking, effective communication, and collaborative work —essential competencies in the healthcare environment. Immediate feedback and the option of repeating scenarios contribute to enrich the training experience, strengthening both the confidence and the preparation of future professionals to face real clinical situations. Therefore, its incorporation in the curricula represents a need that higher education institutions with programs in the health area should assume to remain at the forefront of innovative teaching processes.

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