

The Role Of Simulation Training In Enhancing Emergency Medicine Education And Preparedness

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Abstract

Extensive advancements in emergency medicine have been achieved as a result of medical simulators. While there is a significant increase in the number of applications and research projects related to patient safety, there is a lack of studies that specifically examine the many techniques, professions, and modalities involved in non-technical skills training via the synthesis of simulation studies. The convergence of healthcare simulation, non-technical education, and emergency medicine necessitates an examination of the advancements made across the first twenty years of the twenty-first century. Based on study conducted using the Web of Science Core Collection's Science Reference Index Extended and Social Science Research Abstract editions, it was discovered that medical simulators are useful, practical, and extremely motivating. Simulation-based education is a teaching method that uses simulations to replace high-risk, infrequent, and difficult situations in professional or contextual simulations. The publications were categorized according to certain non-technical abilities, such as collaboration, communication, evaluation, resuscitation, airway management, anesthesia, simulation, and medical education. While mixed-method and quantitative techniques were prevalent at that time, delving into qualitative evidence would significantly enhance the understanding of the experience. The high-fidelity dummy proved to be the most appropriate tool; nevertheless, the use of simulators without specifying the vendor selection highlights the need for a standardized training procedure. The literature review closes by proposing a ring framework as the comprehensive

framework that incorporates the already recognized standards and a wide variety of unexplored research topics that need further investigation.

Keywords: emergency medical, communication, leadership, crew resource management, high-fidelity simulation training.

1. Introduction

The use of medical simulators has gained increasing attention in emergency care due to recent advancements in the use of non-technical abilities. Integrating medical simulators is a crucial stage in the process of developing a curriculum [1]. While earlier research has explored simulation modeling in various healthcare systems [2], there have been few studies that have applied the notion of simulation to a fast-paced, team-oriented specialty. Medical simulation in emergency care is an instructional method that offers learners practical experiences in diagnosing and treating acute conditions, such as trauma and injuries.

So far, the main emphasis of application has been primarily on reducing discrepancies between theory and clinical practice. Realistic medical education employs a diverse array of instructional methods, including anatomical models, mannequins, anatomical specimens, audiovisual teaching aids, simulated medical scenarios, actual patients or actors portraying patients, and other similar resources. While the teacher has the ability to modify patient situations and settings, a systematic approach is necessary to create a realistic environment for physicians and nurses. The use of different subspecialties, advanced digital simulation dummies, well-designed clinical teaching plans for emergency and severe cases, teamwork training, and scenario-based training for various team compositions enables the most realistic portrayal of doctors and nurses in difficult medical situations, enhancing trainees' clinical treatment skills.

2. The impact of non-technical abilities in emergency care

Non-technical abilities have an impact on the quality and safety of emergency care. Frequent unfavorable occurrences often arise during health monitoring, triage, patient hand-off, and emergency management, suggesting a deficiency in cognitive,

social, and personal abilities. Conversely, non-technical skills training are often overlooked in contrast to technical skills training, and the results of training differ across simulation studies. In addition, effectively managing quality and safety care requires certain skill sets, including communication [9], cooperation [10], leadership [11], decision-making [12], coordination [13], collaboration [14], and others [15,16].

These factors need the use of more practical situations in medical education, as opposed to the ones that have been used thus far. Furthermore, the utilization of scientific facts and statistical methodologies might bolster official assessments and evaluations. As the use of information technology increases, there are both prospects and difficulties for innovative user interface design.

Most emergency medical professionals have the potential to actively participate in center-based simulations, which may entail bigger facilities or pilot test activities conducted on-site. During the early days [17], the Tea Bag Model was used to guide the process of medical students joining a specialized department, undergoing three to five years of education, and successfully passing a specialist test in order to become an attending physician. Subsequently, the World Health Organization introduced the idea of competency-based medical education with the aim of specifying the desired outcome of producing health professionals who are capable of practicing medicine at a certain level of skill and expertise [18]. The adoption of a competency-based approach, which forms the basis of a new accrediting model [19], has become popular in medical education. In recent times, research has led to the validation of the notion of experiential learning [20] and the emergence of flipped learning styles [21,22]. However, there has been limited discourse regarding the potential of medical simulation in enhancing non-technical skills training in emergency medicine. This includes identifying the specific non-technical skills that can be developed, the various types of simulators that are accessible, and the necessary analytical methods for analyzing data gathered from real-life clinical settings.

The majority of studies on non-technical abilities have primarily examined the impact of participant responses, often collected by questionnaires, on patient outcomes and the overall efficacy and utility of the assessment tool [23,24]. Currently, there is no comprehensive framework for training

experience design that takes into consideration the gathering of behavioral data and the successful attainment of training objectives from the instructor's point of view. This may be attributed to the fact that application-oriented studies in research are primarily focused on examining the connection between professional responsibilities, characteristics of the medical simulation category, and specific features of the patient scenarios being researched.

Prior literature investigations have primarily concentrated on a singular form of medical simulation, publications from a limited timeframe, singular research methodologies, and studies that lacked comprehensive examination of non-technical skills. Furthermore, these studies did not adequately address the level of the operational clinical environment and the endorsement of high-quality research by medical simulation vendors in this domain.

This study builds upon the research conducted by Zhang et al. [25], focusing on the identification of several types of medical simulation that may be used to develop non-technical skills in the field of emergency medicine. Acquiring and using these abilities is one of the biggest problems in medical education today, yet it does not need exceptional technical knowledge. It is valuable to extract from a complete list of publications the many categories of medical simulation, the professions engaged, the research methodologies used, the particular areas of non-technical abilities, the sources of behavioral data, the operational clinical setting, and the vendor. An in-depth analysis is conducted on the fundamental connections between educational ethics, individuals involved, and the teacher. This leads to the development of a comprehensive framework that may serve as a model for subsequent simulation projects.

3. Summary

This literature review provides a comprehensive analysis of past simulation efforts that specifically focused on training non-technical abilities in the field of emergency care. Scientific research findings and statistical approaches have been used to make breakthroughs in several areas of medical simulation throughout the years. The papers focused on the connections between medical simulations, training in non-technical skills, and emergency medicine.

Furthermore, the literature review uncovers a significant amount of research-supported methods that enhance the development of training programs for enhancing communication, collaboration, leadership, coordination, and decision-making. The inclusion of patient cases and the participation of specialists demonstrate how the previous study methodology may be expanded to include more intricate patient situations. Simulation-based education should be prioritized as a teaching method to replace high-risk, infrequent, and intricate scenarios in technical or situational simulations. Therefore, the proposal suggests using the ring model as a comprehensive framework to conceptualize the creative design process. The main objective of this approach is to facilitate the transfer of results from simulation-based training to an actual working environment.

More than twenty years have passed since the release of the influential study 'To Err Is Human: Building a Safer Health System' [330]. The increasing recognition of medical errors is driving interest in the education of not just technical, but also non-technical abilities. This field of study has often been overlooked, especially in the context of emergency care. The medical system should be reconceptualized as a socio-technical system that encompasses the many activities and interactions occurring inside the medical pathways.

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