

Simulation in Medical Education: Scope, Challenges, and Potential Solutions

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ABSTRACT

Gone are the days when medical education was focused on subjective learning through real-world patients. Simulation has revolutionized medical education as a whole. It is a form of learning to experience something without actually going through it in reality. It not only provides opportunities for medical students to learn from an event-based platform, but also makes them avoid errors in patient care without compromising patient safety. It promotes “hands-on” training for undergraduates from an earlier point in their education. Simulation was first introduced by Aviation industry and soon its benefits in medical education were explored. Simulation has brought about innovation in medical curriculum. It ensures laying emphasis on communication skills, team work, and decision-making along with inculcating ethical knowledge. Simulation is hence a tool to bridge the gap between classroom learning and patient care and promotes experience-based learning.

Keywords: Fidelity, Medical education, Simulation.

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INTRODUCTION

From time immemorial, the process of learning has evolved by various methodologies suggested by the ones who have practiced and shaped medicine to what it is today. “Simulation” is one such method which is employed to produce an experience without going through the real event.¹ We have enough historical evidence to illustrate the usage of simulation that was done in medical education by creating clay models to depict patient’s symptoms. Today we observe perfect utilization of computerized mannequins that mimic various patient presentations and case scenarios that elicit a realistic response from the learner. In addition to that, we have platforms like YouTube where cases of virtual reality simulation have been demonstrated for effective learning.

Simulation perfectly illustrates the Chinese proverb: What I listen I forget, what I see I remember, and what I do I know. Simulation centers are bridging the gap between classroom learning and patient care and further help to increase interest and authenticity through experience-based learning. It helps to enhance skills like team work, clinical skills, decision-making, and communication skills along with inculcating knowledge on grounds of ethics and managing stress under emergent situations. Virtual reality ranging from audio-visual effects in a scenario setting, such as road scene or road traffic, to a full immersive environment of a serious game may also enhance the learning experience.²

CLASSIFICATION OF SIMULATORS

Simulators can be classified (on basis of reality) into low fidelity, medium fidelity, and high fidelity.³

- **Low-fidelity simulators:** Less realistic compared to actual clinical situation, for example, simulated administration of injections.
- **Medium fidelity simulators:** More resemblance to actual clinical scenario, for example, breathing sounds, pulse rate.
- **High fidelity simulators:** Physical signs are elicited which can be read my medical care devices and monitors, for example, mannequins.

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SCOPE IN MEDICAL EDUCATION

Simulation is one of the most recent reforms of medical education which promotes “hands-on” training. It is a strategy toward learning on realistic basis by keeping patient safety in mind. The experience makes the learner more psychologically prepared and well equipped to handle a situation as and when it occurs in reality. This aims at reducing the margin of error for unexpected emergencies especially those at unfamiliar locations (e.g., battlefield, high-way, or hospital emergency room).^{4,5} It further enhances the exposure to rare diseases and prepares for emergency conditions where one needs to make instant decisions timely which might be without any supervision.

An early exposure to simulation at an undergraduate level is immensely important so as to inculcate clinical knowledge along with the theoretical knowledge. This early exposure would build confidence to deal with patients from early on in their career and would help to prevent mistakes being done on real-life patients, for example, mannequins being used to teach about life-saving procedures like cardiopulmonary resuscitation. Further, virtual simulation has added a whole new aspect to training without the involvement of larger systems and set-ups. With virtual simulation in the medical field, we utilize virtual

systems to predict and analyze the learner's response and help to eliminate the errors that could be made in patient care in a real case scenario.

The present study for the first time studies the effectiveness of incorporating simulation-based training in teaching undergraduate medical students to improve student's knowledge related to the taught theoretical underpinnings and to improve self-perceived competency.⁶

USE OF SIMULATION IN MEDICAL EDUCATION IN INDIA

Simulation is a new form of teaching that has allowed undergraduates and even postgraduates to challenge their abilities and gradually scaling practical knowledge. The National Medical Commission has introduced a curriculum which includes simulation as an important part to help students attain practical knowledge. It is also observed that although we have come a long way realizing the importance of simulation, its use in medical education is still limited in many parts of the country. We have to still go a long way to inculcate simulation in our current medical education system by introducing it in postgraduate courses as well, and making it mandatory.

IDENTIFIED CHALLENGES

Simulation is an excellent form of teaching that has revolutionized medical education. There are many obstacles that are faced by using simulation in medical education. It has brought about many positive changes but still has limited use due to various reasons.⁷ One of the foremost reasons is lack of knowledge and awareness. Due to this we often see that simulators cannot be utilized to the fullest. For example, if one is unaware of all the functions of a mannequin, ability to make bowel sounds along with breath and hearth sounds, one cannot use those in a case scenario. The process of assembling and transportation of a simulator requires human resource and it is quite time-consuming. It might require the presence of a simulation specialist as and when required. Simulators used nowadays work by wireless connectivity.

These simulators are greatly affected by their environment. For example, cell phones and other wireless devices might interrupt the working of simulator efficiently, and even in controlled environment, some simulators might show poor connectivity. The programming of simulators is a time-consuming and cumbersome task. This requires the presence of educator along with a simulation specialist who has to program the scenario in a simulator step-by-step. Another challenge encountered is the high cost of simulators, which leads to its seldom usage in some medical institutions. Simulation is one of the finest ways of teaching by depicting a case scenario that appears real, but it still is incomparable to an actual situation.

POTENTIAL SOLUTIONS

Simulators might be utilized to its fullest by learning the operating process and information about what all a simulator is capable of doing, through the user manuals provided along with the simulator. Additional information about simulators can be attained by the websites of the respective simulator. Instead of using wireless simulators, hardwired systems might be used in areas with decreased connectivity of the simulator. We should further teach the staff members and familiarize them with the functioning of simulator. The educator along with simulation specialist should work as a team to ensure the attainment of full utilization of simulator during the planning of a case scenario. The cost of manufacturing a simulator should be lowered by consolidation by lowering the cost of processes that do not contribute to the working efficiency of simulator in the field of medicine.

CONCLUSION

The existence of simulation is in itself an asset to medical education. It is an excellent way to enhance the interest of students toward gaining practical knowledge of medicine. With patient safety as its core concept, simulation allows medical students to make mistakes and to learn from them, only to provide better treatment and care to patients when needed. By taking due consideration of the increasing awareness about simulation and its use, along with cost effectiveness, it can be highly effective in medical education.

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