

Research Article

Ethical Dilemmas in Medical Education: The Misplaced Priority of High-Fidelity Simulators in Health care Institutions

Thirunavukkarasu Arun Babu¹, Vijayan Sharmila²

¹Professor of Pediatrics & Head, ²Professor, Department of OBG, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India

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Corresponding Author:

Thirunavukkarasu Arun Babu, Department of OBG, All India Institute of Medical Sciences (AIIMS), Mangalagiri, Andhra Pradesh, India

E-mail Id:

babuarun@yahoo.com

Orcid Id:

<https://orcid.org/0000-0003-1123-5270>

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A B S T R A C T

Simulation-based learning is an essential tool in modern medical education, providing students with a safe environment to develop clinical skills. However, the increasing focus on high-fidelity simulators, particularly in resource-constrained government-run teaching institutions, raises ethical and practical concerns. These advanced simulators, while beneficial in specialised fields, are often costly, difficult to maintain, and impractical for institutions with large student populations. The pressure exerted by vendors and the desire for institutional prestige can lead to misguided procurement decisions that prioritise expensive technology over more effective, low-cost alternatives. A balanced approach that integrates low-cost simulators into the curriculum offers a more practical solution, ensuring hands-on training for all students. This review calls for ethical decision-making in simulator acquisition, emphasising the need to focus on student learning outcomes rather than institutional status symbols. Transparent procurement processes and resource allocation are crucial for maximising educational value while maintaining integrity in medical training.

Keywords: Simulation, High-fidelity, Low-fidelity, Medicine, Teaching, Students

Introduction

In the ever-evolving landscape of medical education, simulation-based learning has emerged as a cornerstone for training future healthcare professionals. The integration of simulation-based learning in medical education has become increasingly prominent, offering a controlled environment where students can develop and hone their clinical skills without posing any risk to patients. However, the burgeoning interest in high-fidelity simulation equipment, particularly in resource-constrained settings

and newly established teaching institutes, raises significant ethical and practical concerns. The aggressive promotion of these expensive simulators by vendors, coupled with the administration's inclination to invest in such technology, necessitates a critical examination of their utility and the potential ethical implications.

The Allure of High-Fidelity Simulation

High-fidelity simulators are designed to replicate complex clinical scenarios with remarkable realism, offering advanced features like physiological responses, real-time

feedback, and immersive environments that can greatly enhance the learning experience.¹ In specialised areas such as anaesthesia, critical care or emergency medicine, these simulators are undoubtedly valuable tools especially for conducting workshop and conferences. However, in medical colleges with large student populations, the practical utility of these simulators is often limited by their high cost, extensive maintenance requirements, and the time constraints associated with their use.

In educational institutions with yearly medical student intake ranging from 150 to 250 students, providing each student with sufficient hands-on time with a single high-fidelity simulator under expert faculty supervision is practically impossible. The logistical challenges make it difficult to justify the significant financial investment required for these simulators, which can cost several crore rupees. Furthermore, these high-end high fidelity simulators are very sensitive electronic equipment's which tends malfunction frequently and the ongoing maintenance of such equipment incurs substantial additional costs, placing further strain on already limited educational budgets.

Status symbol Vs Practical Utility

In many healthcare institutions, particularly in competitive and resource-constrained environments, the acquisition of high-fidelity simulators is sometimes driven by the desire to showcase technological advancement, institutional prestige and to fulfill requirements from the National Medical Commission. Possessing state-of-the-art simulators can signal positively to stakeholders—including prospective students, faculty, and funding bodies—that the institution is modern and forward-thinking. This symbolic value can overshadow the actual functional benefits that these simulators are meant to provide. As a result, institutions may prioritize purchasing the latest and most sophisticated simulators to enhance their reputation rather than assessing whether these tools meet the specific educational needs of their programmes.

While high-fidelity simulators are capable of providing immersive and realistic training experiences, their effectiveness is contingent upon proper integration into the curriculum and the availability of trained personnel to operate them. If the institution does not simultaneously develop a comprehensive simulation-based curriculum, train faculty to effectively use the simulators, and integrate simulation exercises into regular training modules, the simulators may remain underused or only employed for superficial demonstrations. Without these critical components, the simulators remain underutilised or are used sporadically, failing to contribute meaningfully to the educational objectives. This gap between acquisition and application diminishes the return on investment and can

lead to frustration among both educators and students who expect tangible improvements in their training experience.

Viewing high-fidelity simulators as mere status symbols can have significant implications for resource allocation within medical institutions. Funds that could be invested in foundational areas such as patient-care services, infrastructure, and basic training resources may instead be diverted towards acquiring expensive simulators that offer limited practical benefits under these circumstances. This misallocation can exacerbate existing resource constraints, particularly in countries like India where government-run healthcare institutions already face challenges in meeting the demands of large student populations and patient care needs. This comparison highlights that the mere presence of advanced equipment does not automatically translate into enhanced learning experiences.

Vendors and sales representatives of high-fidelity simulators may tend to exert considerable pressure on administrative staff and department heads in a medical institution to procure their costly equipment. They employ persuasive marketing strategies, emphasizing the advanced features of their simulators and presenting them as essential for modern medical training. In some cases, they may offer incentives or suggest potential financial and non financial benefits to the institution, such as prestige or research collaborations, making the decision seem more attractive. This pressure can lead to procurement decisions that prioritise expensive technology over more practical, cost-effective solutions, which may better serve the educational needs of the entire student body.

Strategies to Enhance Practical Utility of High-fidelity simulators

To ensure that high-fidelity simulators fulfill their intended educational roles, medical institutions should adopt a strategic approach to their acquisition and implementation:

- **Needs Assessment:** Conduct thorough assessments to determine the specific training needs of students and identify how simulators can address these gaps effectively.
- **Curriculum Integration:** Develop and integrate simulation-based training modules into the existing curriculum, ensuring that simulators are used consistently and purposefully.
- **Faculty Training:** Invest in comprehensive training programs for faculty members to operate simulators proficiently and to design effective simulation scenarios that mirror real-world clinical situations.
- **Maintenance and Support:** Establish robust maintenance schedules and technical support systems to ensure that simulators remain functional and up-to-date.

- Evaluation and Feedback: Implement mechanisms to regularly evaluate the impact of simulation training on educational outcomes and gather feedback from students and educators to make continuous improvements.
- **Balanced Investment:** Allocate resources judiciously, balancing investments in high-fidelity simulators with other critical areas such as patient-care services, infrastructure, and basic training tools.

Low-Cost Simulators: A Pragmatic Alternative

In contrast, low-cost simulators and mannequins present a more feasible and pragmatic solution. Although these basic tools may lack the advanced features of high-fidelity models, they offer ample opportunities for students to practice essential clinical skills. The primary goal of simulation-based education is to facilitate active learning through hands-on experience. By acquiring multiple low-cost simulators, institutions can ensure that every student has access to these tools during their clinical rotations, thereby maximizing the educational impact within the constraints of the available budget. Moreover, conducting hands-on workshops for a group of trainees becomes feasible due to the possibility of procuring multiple low-cost simulators.

The benefits of low-cost simulators go beyond their affordability. These tools are easier to maintain, require minimal technical support, and can be employed in a wide range of teaching scenarios. For example, basic mannequins can be effectively used to teach fundamental procedures such as cardiopulmonary resuscitation (CPR), intravenous cannulation, and basic surgical skills. By incorporating these tools into the curriculum, institutions can provide students with repeated practice opportunities, reinforcing their learning and boosting their confidence in performing these skills in real clinical settings. Moreover, providing 'hands-on' training for multiple students simultaneously under expert faculty guidance is possible, making this an ideal choice for medical colleges with a large intake of students. Studies have shown that low-fidelity simulators can be equally effective or even superior to high-fidelity ones.^{2,3}

The Ethical Quandary

The decision to prioritise high-fidelity simulators over more practical alternatives is not merely an educational philosophy; it also raises significant ethical questions. The potential for financial incentives or kickbacks associated with the procurement of expensive equipment cannot be overlooked. When educational administrators prioritise the acquisition of costly technology, possibly influenced by these unethical practices, it undermines the integrity of the educational process. Sometimes, the procurement of these single high-fidelity pieces of equipment is aggressively

pushed even before establishing basic patient care services, manpower, infrastructure, and space requirements. The focus shifts from the best interests of students, patients and the institution to the financial gains of a select few, which not only jeopardises the quality of education but also erodes public trust in the educational system.

Moreover, the allocation of substantial funds to high-fidelity simulators at the expense of more cost-effective solutions raises questions about the responsible use of public resources. In a country like India, where government-run healthcare institutions are often stretched thin due to resource constraints, it is imperative to prioritise investments that yield the greatest benefit for the largest number of students and patients. The pursuit of high-fidelity simulators, despite their limited applicability in large-scale educational settings, represents a misalignment of priorities that warrants urgent reconsideration.

Conclusion

As educators and administrators, our primary responsibility is to ensure that students receive the highest quality training possible within the available resources. While high-fidelity simulators have their place in medical education, they should not be viewed as a one-size-fits-all solution. In resource-limited settings, a more balanced approach that includes the strategic use of low-cost simulators is not only more practical but also more ethical.

It is imperative to resist the allure of expensive technology when more effective and equitable alternatives are available. The emphasis should be on enhancing the learning experience for all students, rather than investing in equipment that, while impressive on the surface, offers limited value in the broader context of medical education. Advocacy for transparency and accountability in the procurement process is crucial to ensure that decisions are guided by the best interests of students and the ethical principles that underpin the medical profession.

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