SHORT COMMUNICATION

Barriers to implementing simulation-based surgical training for improving quality and safety in developing countries: A short communication

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Abstract

Simulation-based surgical training has the potential to significantly improve surgical outcomes in developing countries. However, its implementation faces numerous challenges, including financial constraints, infrastructural limitations, cultural barriers, and a lack of trained personnel. High costs, limited access to technology, and resistance to innovative teaching methods hinder the adoption of simulation-based surgical training. To overcome these obstacles, strategic approaches are needed, such as leveraging low-fidelity simulators, building strong partnerships, and investing in faculty development. By addressing these challenges, developing countries can harness the power of simulation-based surgical training to enhance surgical education and improve patient care.

Keywords: Simulation training, Surgical procedures, Developing countries, Healthcare quality, Patient safety.

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Introduction

About five billion people globally, majority of whom in developing countries, do not have access to safe and affordable surgical care[1]. The significance of enhancing surgical training in developing countries for improved patient outcomes cannot be overestimated. Surgeons with rigorous training are adequately equipped with the abilities needed to reduce patient safety hazards. Advances in surgical education, such as simulation-based surgical training (SBST), aim at increasing patient safety by improving the competence level of surgeons.[2]

In SBST, real-world surgical events are replicated using a variety of instructional resources, including task trainers, models, virtual reality (VR), and augmented reality (AR). These techniques give students a secure setting to hone their abilities and prepare for the real world without worrying about the repercussions, lowering the possibility of suboptimal patient outcomes in clinical practice.[2] By enabling learners to engage in repetitive practice — sometimes impossible in clinical settings due to time and patient constraints — SBST has been demonstrated to enhance surgical results.[2] Additionally, simulation offers debriefing opportunities, which enables students to reflect on their performance for improved learning. Therefore, SBST has the potential to greatly improve surgical safety, particularly in countries where a lack of proper training resources exacerbates patient safety issues.

However, the implementation of SBST in developing countries faces several challenges.[3] The current short report was planned to discuss them and find ways to implement successful SBST.

Materials and Methods

The different challenges and barriers for successful SBST implementation in developing countries are discussed along with the possible solutions which can be implemented. Barriers included are: Finances, Infrastructural and technological barriers, Cultural and institutional barriers, Lack of trained personnel and expertise and Geographical and logistical barriers

Financial barriers: The high cost of implementation is still one of the primary obstacles to SBST in developing countries, even after simulation was recognised as essential to medical education, and its use increased. The cost of purchasing, maintaining and using medium- or high-fidelity simulators, VR platforms, and other cutting-edge technologies is significant.[4-6.] The need for specialised personnel to handle several simulators contributes to overall financial limitations.[7] Another financial burden is the expense of teaching faculty members how to utilise these technologies efficiently. SBST is frequently comparatively deprioritised as a result of the allocation of limited resources. Laparoscopic simulation, for instance, has recently been mentioned as a contentious issue with regard to surgery-based educational improvement programmes in a developing country. This is because of concerns that more crucial

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clinical areas should be given priority because they improve patient outcomes more.[8] As a result, the local hospital, the ministry of health, or foreign partners frequently need to make a significant expenditure in order to build an SBST programme.[9] According to one study, the majority of laparoscopic simulation training programmes in underdeveloped countries depended on equipment contributions from foreign parties.[9]

Infrastructural and technological barriers: In many underdeveloped nations, the infrastructure required to facilitate SBST is lacking. SBST is severely limited, for instance, by the lack of adequate simulation facilities, dependable electricity, and a steady internet connection.[4] Lack of proper space and/or mannequins to accomplish the necessary realism, access to acceptable situations, and technological know-how are among the other shortcomings.[10] In addition to discouraging the use of simulation, infrastructural barriers run the risk of causing equipment connected to simulation to malfunction or shut down suddenly.[7] The two most frequent obstacles to incorporating SBST into resident teaching were found to be upkeep of facilities, and a lack of appropriate equipment and models.[5].

Cultural and institutional barriers: Another major obstacle is institutional and cultural opposition to innovative teaching strategies. In many developing countries, where practical experience on actual patients is regarded as the gold standard, traditional surgical training methods are ingrained in the educational system. It might be challenging for simulation educators to persuade their management personnel, who may be doubtful of the value of simulation (some stakeholders may view it as less useful than clinical experience) and who are looking for quick, observable returns on their investment.[10] Due to a more hierarchical training system and observant apprenticeship, there might be cultural barriers to receiving feedback.[8] The simulation sessions may become difficult if hierarchical boundaries become problematic during debriefing.[10] Occasionally, the student may hold a higher position than the teacher in the clinical hierarchy. Language interpretations, gender implications, feedback that deviates from established local institutional practices, and different trainer-trainee relationships are other possible obstacles.[8]

Lack of trained personnel and expertise: Implementation of SBST is also difficult owing to lack of qualified faculty members who can instruct and use simulation technologies. It is challenging for surgeons to find time in their hectic schedules to get involved in SBST at their workplaces.[10] Another obstacle mentioned by trainees is a lack of faculty participation and allotted time.[6] Lack of time is a barrier for training sessions, facilitators, support personnel and students.[10] Organising SBST is challenging for facilitators already overburdened with duties and obligations beyond their job descriptions.[10] It takes time and effort to learn how to operate complex simulators for teaching sessions, and faculty members may themselves need several practice sessions to feel at ease with the technology.[8] SBST development is crucial, but it necessitates extra resources that are frequently unavailable in environments with limited resources. It is challenging to successfully develop and maintain these programmes due to a shortage of faculty members with SBST experience.

Geographical and logistical barriers: There are difficulties in terms of gathering learners for centralised simulation training because of the frequent geographical dispersion of healthcare professionals in developing countries. If distance simulation is chosen as a modality to overcome this obstacle, time differences between the two different geographical locations still remain an issue. Administrative staff's inability to effectively coordinate simulation sessions between facilitators and students is a recurring resource issue.[8] Another significant obstacle to overcome is a lack of collaboration among user groups.[8]

In the light of the difficulties identified in the existing literature [4-10], it is essential to find solutions to overcome thee barriers. Based on the experience of leading a simulation centre in a developing country, the current study recommends solutions that are broadly applicable across many developing contexts, particularly where similar resource constraints and cultural dynamics are present. The use of task trainers and low- and medium-fidelity models is advocated wherever possible over high-fidelity models, as the relative drop in fidelity is greatly overshadowed by the saving of fiscal resources. Proactive engagement of all stakeholders and leveraging partnerships with faculty and institutional leadership can play a vital role in overcoming cultural and institutional barriers. Regular offering of courses aimed at capacity-building can ensure an adequate number of faculty trained in simulation education. Digital solutions, including virtual or distance simulation platforms, can help bridge the gap by offering remote learning opportunities for healthcare professionals in underserved areas.

It is not merely enough to encourage the uptake of simulation, but rather policy measures at the institutional level should be implemented to facilitate simulation educators for sustained excellence. Examples of such measures include adequate financial remuneration, factoring in contributions to simulation education at the time of promotion, and protected time for both educators and students for simulation activities. With medical education shifting towards competence-based curricula, it is high time SBST was integrated into formal surgical training.

This current report has limitations as it is based on a narrative synthesis of available literature and personal experience, which may have introduced selection bias. While studies from multiple low- and middle-income countries(LMICs) were explored, barriers and solutions may vary significantly across regions, depending on local infrastructure, cultural norms and healthcare systems' maturity. Additionally, the study does not include empirical data, and future studies should aim at evaluating the effectiveness of proposed strategies through longitudinal and comparative studies.

Conclusion

In developing countries, governments, academic institutions and international healthcare organisations must collaborate to remove obstacles in the way of SBST. Developing context-specific solutions and continued investment in SBST are crucial for enhancing surgical safety and quality in these areas. Further research into effective models of implementation, as well as ongoing collaboration between stakeholders, will be crucial in overcoming these challenges.

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