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Faculty perceptions of the efficacy, benefits and challenges of simulation-based early clinical exposure for medical students in India: A qualitative study

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ABSTRACT

Objectives: Medical education in India has shifted to a learner-centric approach, with early clinical exposure (ECE) mandated for 1st-year medical students. Implementing ECE in a clinical setting is challenging, leading to the adoption of simulation-based ECE (SB-ECE). However, faculty perceptions of integrating simulation with ECE, especially for 1st-year undergraduates, remain understudied. This study aimed to explore faculty perceptions of the feasibility, advantages and challenges of using simulations in ECE, providing valuable insights for future studies.

Materials and Methods: We conducted a qualitative study with intentional sampling according to predefined criteria. We interviewed 12 faculty members at a medical teaching institution using a topic guide. Thematic analysis was then performed on the data collected from the 12 interviews to identify the key themes and patterns.

Results: Most of the faculty interviewed considered the use of simulation in ECE as an excellent adjunct to teaching in a clinical setting. However, the faculty also noted a few challenges, such as fidelity, time constraints and the ratio of students to faculty members, in implementing SB-ECE.

Conclusion: Faculty members recognised the integration of simulation into ECE as a highly effective tool for enhancing the learning of basic sciences and fostering attitudes, ethics and professionalism in medical education, with the main challenge being the logistical demand for implementing simulation-based sessions.

Keywords: Early clinical exposure, Simulation, Medical education, Basic sciences

INTRODUCTION

The growing complexity of medical knowledge, the need for critical thinking and problem-solving skills and the dynamic healthcare landscape have resulted in a shift from a teacher-centric to a learner-centric approach. The National Medical Commission of India introduced early clinical exposure (ECE) to enable 1st-year medical students to recognise the relevance of basic sciences in diagnosis, patient care and treatment, thus providing a context that will enhance basic science learning.[1]

ECE is typically implemented in three settings: classroom-based activities, guided observations in clinical settings, and community-based encounters.[1] While case-based discussions in classrooms may not reflect real-world clinical practice, ECE in actual clinical settings is challenging due to limited resources, safety concerns, and the need for emotional support for novice medical students.

Simulation-based ECE (SB-ECE) can effectively address these limitations and challenges. By utilising high-fidelity simulator technology, SB-ECE offers students the opportunity to engage in realistic clinical scenarios in a safe and controlled learning environment, thereby enhancing their knowledge, skills and confidence without compromising patient safety. Incorporating simulations into ECE can enhance tailored learning experiences while leading to improved learning outcomes.

The success of SB-ECE is influenced by the perceptions of faculty members responsible for designing, implementing and evaluating the curriculum. The available literature lacks faculty insight regarding the integration of simulations into ECE in India. Moreover, the existing literature focuses on the later stages of medical or nursing education,[2,3] leaving a gap in knowledge about the use of simulations for 1st-year medical undergraduate students.

Therefore, this study attempted to investigate faculty perceptions regarding the feasibility, advantages, and challenges of using simulation for ECE. The findings offer valuable insights into the integration of simulation into ECE and will drive further research in this area.

MATERIALS AND METHODS

Study design

A prospective qualitative study was conducted to explore faculty perceptions of SB-ECE among 1st-year undergraduate medical students.

Ethical consideration

This study was conducted following ethical clearance (IEC Reference Number299/2022) from the institution and in accordance with the Declaration of Helsinki and its amendments. Informed consent was obtained from all participants, and confidentiality was maintained.

Study setting

The study consisted of a simulation-based case scenario conducted at the institutional simulation centre, while in-depth interviews were conducted at the workplace at a time convenient for the participants.

Simulation-based session

The SB-ECE of a myocardial infarction (MI) case using high-fidelity simulation was planned after a didactic lecture. Learning objectives and materials were provided to the students in advance. The students were divided into groups of 20 for the simulation session, each group having two facilitators. The session consisted of a 15-minute briefing, a 15-minute immersive simulation experience and a 60-minute debriefing. The briefing covered ground rules, learning objectives, simulation scenarios and roles, whereas the debriefing allowed students to discuss, reflect and learn through feedback from facilitators and peers.

Sampling and recruitment

Twenty faculty members with at least 2 years of medical teaching experience and training in conducting simulation sessions were voluntarily recruited. These faculty members were then asked to observe the SB-ECE session on MI, following which data were collected.

Data collection

Key-informant interviews of the faculty were conducted in English within a week of the session, using a validated topic guide. The interviews were conducted at the workplace, in a private area. Consent was obtained before audio recording the interviews. Each interview lasted for 18–26 min, with one researcher conducting the interviews and the other researcher taking notes. Faculty were encouraged to express their opinions and discuss issues. Data collection was discontinued after the 12th interview due to saturation.

Data analysis

The interviews were transcribed verbatim into Microsoft Word. The coding process was iterative, and codes were generated based on the content of the interviews. Two researchers who had not been directly involved in data collection reviewed and coded the transcribed text independently. Thematic analysis was used, and final themes were developed following discussions among the researchers. These themes were used to summarise the findings and draw conclusions from the collected data.

RESULTS

Twelve faculty members from various departments of a medical college participated in the study. Four faculties each were from the Departments of Physiology, Biochemistry, and Medicine. Seven interviewees were female, and five were male; their ages ranged from 29 to 50 years.

The identified themes include the clinical relevance of basic sciences, instructional design of SB-ECE, learners' engagement and support in SB-ECE and fidelity of SB-ECE [Table 1].

Clinical relevance of basic sciences

Faculty unanimously agreed that SB-ECE met ECE's objectives by helping learners recognise the significance of basic sciences and motivating further learning.

Table 1: Emerging themes from thematic analysis.

Clinical relevance of basic sciences	Instructional design of SB-ECE	Learners' engagement and support	Fidelity
Recognition of relevance of basic sciences in diagnosis, patient care and treatment Enhance basic science learning and motivation for further learning. Safe learning environment	Strengths Planning and organisation Relevance of topic chosen Horizontal integration Faculty training Technical support Challenges Faculty-Learner ratio Time and cost constraints Recommendations Integration with anatomy	Strengths Learners' preparedness Active participation	Emotional connect Sense of emergency

SB-ECE: Simulation-based early clinical exposure

> '*Simulation scenario provided students with an opportunity to understand the underlying pathophysiology of the condition, such as the role of biochemistry and physiology in the development and management of MI, interpreting ECG changes and understanding coronary circulation…Now the students know that their basics have to be strong to manage any clinical case*' (Faculty-1; Biochemistry).
>
> '*…. practical application knowledge is gained rather than regular theoretical understanding and memorising the topic. Here, they get to experience real-life-like situations {sic}. That made basic science topics more interesting for them and thus has motivated them for further learning*' (Faculty-9; Physiology).

Most of the faculty believed that SB-ECE offered a dual advantage by allowing learners to relate to patient experiences while providing a safe learning environment that encouraged mistake-based learning. Faculty also noted that SB-ECE promoted learning and enabled assessment in cognitive, psychomotor and affective domains.

> '*We are allowing a novice to learn in almost real-life scenarios without exposing the patient to risk. The student here can learn from their mistakes, which is the best way to engage the student in active learning……it provides a safe learning environment*' (Faculty-12; Physician).
>
> '*I believe that SB-ECE for MI cases is an excellent topic for 1st-year MBBS students. It enables students to acquire hands-on experience and build their clinical skills in a secure and controlled environment, which may not be feasible and possible in a real-life clinical setting*' (Faculty-8; Physician).

Instructional design of SB-ECE

The faculty highlighted that the choice of topic was important and that horizontal integration of the topic between physiology and biochemistry added value to the session. A few faculty members suggested integrating anatomy along with physiology and biochemistry for a better understanding of coronary circulation and MI.

> '*Instead of approaching the case of MI separately in terms of physiology and biochemistry, this session took an integrated approach to the topic. Students were able to develop a more comprehensive understanding of the pathophysiology of MI and the interconnectedness of various aspects, such as laboratory investigations like cardiac markers*'. (Faculty 4; Biochemistry) '*….integrating the concepts of anatomy, especially the coronary circulation and ECG changes in different leads of MI, would have added significant value to the session*' (Faculty-8).

When asked about the factors that facilitated the session, few faculty believed that the faculty and simulation technical support facilitated the session effectively.

> '*…… staff was very confident, and they were very comfortable and well-trained in running the sessions, especially the debriefing part. Another factor would be the fact that it was conducted in the well-equipped simulation centre with great technical support….*' (Faculty-5; Physiology).

However, few faculties expressed concerns regarding the time and financial constraints associated with implementing this type of session.

> '*…….the time factor, making 10–15 small groups and scheduling a 2-h session for each group is really time-consuming…*'. (Faculty-10; Physiology)
>
> '*….and also because the high-fidelity equipment is quite expensive, so this facility may not be available in all the medical colleges*' (Faculty-2).

In addition, faculty members expressed concerns that the number of learners per group was higher, which could have

hindered the effectiveness of the session. The lack of human resources was also identified as a barrier to the effective implementation of SB-ECE.

> '*The simulation-based ECE session would have been more effective if the number of students was reduced, allowing for smaller group sizes*'. (Faculty-3; Biochemistry)

Learner engagement and support during SB-ECE

The faculty felt that the learners were well prepared for the session because they had been given the learning objectives in advance and had attended the necessary theory classes. This allowed them to apply their knowledge to the clinical scenario and effectively manage the case.

> '*The students had come prepared in certain preparatory materials, so that really went well*' (Faculty-6; Physiology).
> '*The students' enthusiasm to participate and learn was too good. They appeared excited and motivated to take part in the simulation and learn from the experience*' (Faculty-8).
> '*Each student's point of view was considered, not even a single person was left, and the batch was divided so that everyone gets an opportunity*' (Faculty-7; Biochemistry).

The fidelity with respect to SB-ECE

The faculty had mixed responses regarding the fidelity of the scenario. Some felt that it was very realistic, whereas others felt that it was relaxed and lacked a sense of urgency. Few faculty members expressed concern that the simulation-based scenario did not allow for the development of emotional connection or empathy among the learners. It was recommended that scenarios authentically replicate real-life patient encounters and elicit emotional responses from learners.

> '*Students actually considered it to be a real-life scenario. They were panicking, which is quite common for a 1st-year student. During debriefing, most of the students realised what could have been improved, and they wanted to know more about MI management*' (Faculty 7).
> '*I (faculty) think that the need for them (students) to realise the urgency of the matter is important.…the entire scenario was a bit relaxed when compared to real-life events*'. (Faculty 11; Physician)
> '*I (faculty) think the emotional aspect is the one thing that they may not be able to connect so much. Empathy and emotional aspects were not up to the expectations…I would recommend incorporating more realistic and emotionally engaging scenarios*' (Faculty 12).

DISCUSSION

This study contributes to Indian medical education by investigating faculty perceptions of SB-ECE to gather rich and detailed data, enabling a deeper and more contextual understanding of this teaching-learning method.

This study revealed that SB-ECE successfully met the objectives of ECE for 1st-year medical learners. The objectives included enabling learners to recognise the relevance of basic sciences in patient care, providing a contextual framework that enhances the learning of basic sciences, and relating to the experiences of patients as a motivation to learn.[1] This research revealed a unanimous agreement that SB-ECE effectively helped learners recognise the significance of the basic sciences in diagnosis, patient care and treatment. This contextualised learning experience enhances motivation-driven learning and bridges the gap between theoretical knowledge and its practical application. The recognition that SB-ECE enables mistake-based learning and offers a safe environment for learners aligns with the core principles of experiential learning.[4] Our findings suggest that SB-ECE helps to build confidence in a controlled setting before transitioning to real-life clinical practice. This study highlights SB-ECE's ability to promote comprehensive learning and assessment across cognitive, psychomotor and affective domains. The purpose of SB-ECE is not to replace traditional clinical teaching but rather to enhance the understanding of basic sciences by providing a clinical context.

The participants identified several facilitating factors and a few challenges associated with the implementation of SB-ECE. Facilitating factors included the relevance of the chosen topic, horizontal integration with basic sciences, faculty training, simulation technical support and learner preparedness. The selection of a relevant topic for SB-ECE played a crucial role in its successful implementation. Topics relevant to learners' careers are more likely to motivate and engage in the learning process.[5] The study incorporated a simulation scenario that bridged the disciplines of physiology and biochemistry, with codebriefing sessions conducted by facilitators from both departments. Codebriefing provided a larger pool of expertise and helped to integrate the concepts of biochemistry and physiology and their clinical applications. Similar to the findings of previous studies,[5,6] this study showed that faculty training and simulation technical support positively impact SB-ECE implementation. In addition, learner preparation, by providing learning objectives in advance and ensuring completion of necessary theory classes, was also essential for the success of SB-ECE. This emphasises the importance of pre-session preparation and theoretical grounding for knowledge and skill transfer in simulated clinical situations.

The challenges associated with SB-ECE were regarding the number of learners per group, time and financial constraints. Research suggests that an optimal facilitator-to-learner ratio for debriefing is 1:6–10.[7] However, in this study, the learner-to-faculty ratio was higher than the recommended range.

Strategies such as smaller group sizes, increased facilitator numbers, leveraging technology and exploring cost-effective solutions can be employed to address these challenges without compromising effectiveness.

A notable finding that emerged from this study was the lack of emotional connection and empathy in SB-ECE scenarios. This finding contradicts the perception that SB-ECE fosters the development of clinical and interpersonal skills.[8,9] In this study, the lack of emotional connection in the scenario may be attributed to the fidelity of the simulation. The faculty of basic sciences felt that the scenario was realistic, whereas the clinical faculty felt the scenario was relaxed and lacked the sense of urgency of a real-life situation. Scenario fidelity would have potentially influenced learners' ability to establish the components of the affective domain. In this session, the scenario fidelity might have been compromised as the emphasis was placed on history taking, clinical examination and case management while maintaining a relatively relaxed environment. This approach was intentional, considering that the learners were 1st-year medical students, and the primary objective was one of sensitisation to the clinical settings rather than focusing on emergency care.

However, this study primarily explored faculty perceptions and did not capture perspectives from other stakeholders, such as students or patients. The study focused on a single simulation-based scenario and did not assess the impact of SB-ECE on student learning outcomes. Despite these limitations, the study provides valuable insights into the feasibility of implementing SB-ECE in medical education.

Involving a larger and more diverse sample will provide a broader perspective and comprehensive understanding of SB-ECE. To overcome cost constraints, future research can consider using standardised patients in lieu of high-fidelity mannequins. In conclusion, this study highlights the benefits, feasibility and challenges of using SB-ECE for 1st-year undergraduate medical students.

CONCLUSION

SB-ECE is a valuable supplement to traditional teaching approaches, emphasising the importance of basic sciences in patient care and fostering early clinical awareness. Despite challenges, with horizontal and vertical integration, SB-ECE can be harnessed as a valuable teaching-learning method in medical education.

Ethical approval

The research/study was approved by the Institutional Review Board at Father Muller Medical College, number 299/2022, dated 01th June 2022.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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