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Original Article

Exploring Faculty Perspectives on Implementing Simulation-Based Learning in Pharmacology: A Qualitative Focus Group Study

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Abstract

Background: Simulation-based learning (SBL) has emerged as an effective pedagogical approach in medical education, offering opportunities to integrate theoretical knowledge with clinical application. This study explores faculty perceptions regarding the implementation of SBL in Pharmacology curriculum. ***Methods:*** A focus group discussion (FGD) was conducted via Zoom platform with six Pharmacology faculty members from PSG Institute of Medical Sciences and Research. The 60-minute session explored current simulation practices, perceived benefits, implementation challenges, and strategies for successful integration of SBL in the Pharmacology curriculum. The discussion was recorded, transcribed, and analyzed using thematic analysis. ***Results:*** Faculty identified multiple benefits of SBL including integration of cognitive, psychomotor, and affective learning domains; enhanced clinical relevance; and improved student engagement. Key challenges included managing large student batches (250 students), limited practical time slots, faculty training needs, and logistical constraints. Participants proposed a phased implementation approach with hybrid learning models, integration with existing assessment frameworks, and comprehensive faculty development programs. ***Conclusions:*** Faculty demonstrated positive attitudes toward SBL implementation while recognizing practical challenges. Successful integration requires systematic planning, adequate resource allocation, comprehensive faculty training, and institutional support. The proposed hybrid model balancing traditional and simulation-based approaches offers a feasible pathway for Pharmacology curriculum enhancement.

Keywords: ***Simulation-based learning, Pharmacology education, medical education, Faculty perceptions, Focus group discussion, Curriculum development.***

Introduction

Medical education has undergone significant transformation with the introduction of competency-based medical education (CBME) frameworks that emphasize the integration of knowledge, skills, and attitudes. Traditional lecture-based teaching methods, while foundational, often fail to provide students with opportunities to apply theoretical concepts in realistic clinical contexts. Simulation-based learning (SBL) has emerged as a powerful pedagogical tool that addresses this gap by providing safe, controlled environments where students can practice clinical skills, develop critical thinking abilities, and enhance patient care competencies without risk to actual patients [1].

The use of high-fidelity mannequins such as SimMan3G allows students to experience realistic clinical scenarios that integrate pharmacological principles with patient management [2]. These simulations can replicate complex physiological responses to medications, adverse drug reactions, and emergency situations, providing invaluable learning experiences that bridge the gap between classroom knowledge and clinical practice. Furthermore, SBL aligns well with the affective domain of learning, enabling students to develop professional communication skills, ethical decision-making abilities, and empathetic patient interactions in realistic yet risk-free settings.

This study aims to explore faculty perceptions regarding the implementation of SBL in Pharmacology curriculum at a tertiary care medical institution. Understanding faculty perspectives is crucial as they are the primary stakeholders responsible for curriculum design, delivery, and evaluation. Their insights regarding the benefits, challenges, and practical implementation strategies can inform evidence-based approaches to integrating SBL into Pharmacology education.

Methods

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A qualitative study using focus group discussion methodology was conducted to explore faculty perceptions regarding the implementation of simulation-based learning in the Pharmacology curriculum after Institutional ethics committee approval. This approach was selected as it facilitates dynamic group interaction, allowing participants to build upon each other's ideas and perspectives, thereby generating rich, contextualized data that reflects the collective experience and expertise of the faculty group.

Six faculty members from the Department of Pharmacology at PSG Institute of Medical Sciences and Research participated in this study. The participants included the Head of Department, senior faculty members with varying levels of simulation-based learning exposure, junior faculty members, and teaching staff directly involved in second-year MBBS education. This diverse composition ensured representation of different perspectives based on teaching experience, administrative responsibilities, and prior exposure to simulation methodologies.

A 60-minute focus group discussion was conducted via Zoom platform with clearly defined objectives to assess current simulation usage in the Pharmacology curriculum, explore faculty perceptions regarding SBL benefits and challenges, identify implementation strategies for routine integration of simulation activities, and discuss feasibility and sustainability considerations for long-term adoption. The discussion was facilitated by an experienced moderator who employed semi-structured questioning techniques to encourage open dialogue while ensuring coverage of all key topics. The session was video-recorded with explicit participant consent, and a detailed transcript was prepared for subsequent analysis.

The recorded focus group discussion was transcribed verbatim, preserving the natural flow of conversation. The transcript was analyzed using thematic analysis, a systematic qualitative research method that identifies, analyzes, and reports patterns within data. Key themes were identified through careful reading and re-reading of the transcript, followed by coding of relevant text segments, grouping of codes into potential themes, and refinement of themes to ensure they accurately reflected the data. This iterative process enabled the research team to develop a comprehensive understanding of faculty perceptions regarding various aspects of simulation-based learning implementation (**Figure 1**).

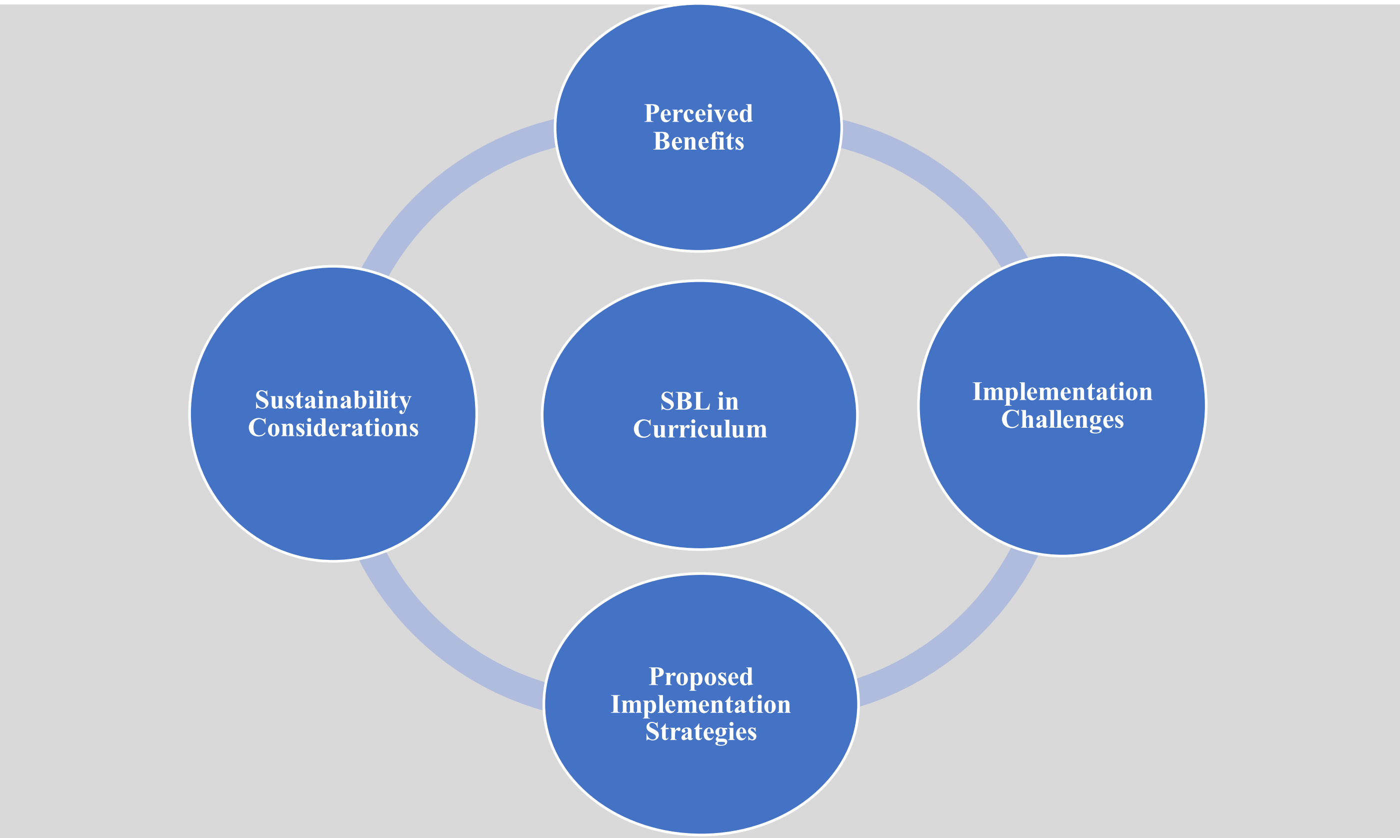

Figure 1: Illustration of the Themes that emerged in FGD

Results

Faculty participants identified several existing simulation applications within their Pharmacology curriculum, primarily focused on teaching routes of drug administration using mannequin models, implementing computer-aided learning (CAL) modules as alternatives to animal experiments, and developing basic psychomotor skills in students. These current practices predominantly address cognitive and psychomotor learning domains but show limited integration of affective domain competencies such as communication skills, ethical reasoning, and professional behavior. This recognition of current limitations served as a foundation for discussing expanded applications of simulation-based learning.

Perceived Benefits of Simulation-Based Learning: Faculty recognized the significant potential of simulation-based learning to simultaneously address all three fundamental learning domains. In the cognitive domain, SBL facilitates the application of pharmacological concepts to authentic clinical scenarios, moving beyond rote memorization to meaningful understanding and clinical reasoning. The psychomotor domain benefits are evident through opportunities for students to practice drug selection, master administration techniques, and develop proficiency in clinical procedures. Perhaps most importantly, faculty emphasized SBL's unique capacity to develop affective domain competencies including professional communication skills, appropriate patient interaction, and ethical decision-making in realistic contexts.

Participants strongly emphasized that simulation-based learning effectively bridges the gap between theoretical pharmacological knowledge and clinical application. Through SBL, students can experience realistic patient scenarios that mirror actual clinical practice, practice decision-making in safe environments where errors become learning opportunities rather than sources of patient harm, develop sophisticated therapeutic reasoning skills through iterative practice and reflection, and understand drug effects through immediate visual and physiological feedback from high-fidelity simulation systems. This enhanced clinical relevance was viewed as particularly promoting student motivation and active participation through engagement. These factors collectively contribute to more effective learning and better retention of both knowledge and skills.

Implementation Challenges: Faculty identified significant logistical constraints as primary barriers to effective simulation-based learning implementation. With 250 students per batch, participants expressed concerns about scheduling all students within reasonable timeframes while maintaining educationally sound small group sizes for effective learning experiences. The challenge of coordinating simulation sessions with existing practical schedules without disrupting other essential curriculum components was also highlighted. Additionally, time allocation emerged as a critical concern, given the limited practical session hours currently available (2-4 PM daily), competing demands from the regular curriculum, constraints on faculty availability for extended or additional teaching sessions, and potential scheduling conflicts with students' clinical rotations in other departments.

Comprehensive faculty development emerged as a crucial requirement for successful simulation-based learning implementation. Participants emphasized the need for systematic training on high-fidelity simulation techniques and facilitation-based approaches that characterize effective simulation education, development of technical competency with sophisticated simulation equipment including troubleshooting and access to continuous professional development opportunities in simulation-based learning methodologies to keep pace with evolving best practices. These training needs reflect the recognition that effective simulation teaching requires specialized pedagogical skills beyond traditional teaching competencies.

Infrastructure considerations presented additional challenges for simulation-based learning integration. The physical distance between the simulation laboratory and the Pharmacology department creates logistical difficulties for both faculty and students. Concerns about equipment availability, regular maintenance requirements, and access to prompt technical support were raised as potential barriers to consistent simulation utilization.

Assessment alignment represented another significant concern among faculty participants. The current limitation whereby simulation-based learning activities are not incorporated into formal university examinations creates potential challenges for student motivation and curricular validation. Faculty discussed the need for thoughtful integration of SBL activities with existing internal assessment frameworks, development of appropriate evaluation criteria that capture the unique learning outcomes facilitated by simulation, and formal recognition of simulation as a core component of the Pharmacology curriculum rather than an optional or supplementary activity.

Proposed Implementation Strategies: Faculty recommended implementing simulation-based learning during the first three months of the academic year, before summative internal assessments. This phased introduction approach offers several advantages including gradual introduction of new teaching methods that allows students and faculty to adapt systematically, early identification and resolution of implementation challenges, in addition to progressive development of faculty experience and confidence with simulation methodologies. This timing strategy aims to minimize disruption while maximizing the potential for successful integration.

Participants proposed a hybrid learning model that thoughtfully combines traditional and simulation-based approaches to optimize educational outcomes while addressing practical constraints. This model would maintain essential university-mandated practical exercises to ensure curricular compliance, introduce carefully sized groups of approximately 20 students per session to the simulation laboratory to ensure meaningful engagement, provide supplementary online learning resources for students who miss regular practical sessions due to simulation participation, and implement flexible scheduling arrangements that accommodate both student preferences and faculty availability. This balanced approach recognizes that simulation should complement rather than completely replace traditional teaching methods.

Proposed evaluation strategies included allocating appropriate marks within the existing Simulation and Virtual Laboratory (SVL) component of the curriculum, developing comprehensive competency-based assessment criteria that capture the multidimensional learning outcomes of simulation, incorporating meaningful participation and engagement metrics that recognize the process of learning through simulation, and providing regular formative feedback opportunities that support student development. These assessment integration strategies aim to position simulation as a valued and validated component of Pharmacology education.

Participants identified several important support mechanisms necessary for successful and sustainable simulation-based learning implementation. Technology integration recommendations included utilizing the institutional Learning Management System for distributing pre-reading materials and preparatory resources, creating high-quality demonstration videos to facilitate student preparation and maximize productive simulation time, implementing systematic online feedback collection systems to enable continuous program improvement, and developing comprehensive digital resource repositories that support both student learning and faculty development. Faculty development strategies emphasized mandatory training programs for all participating faculty to ensure baseline competency, establishment of peer mentoring systems where more experienced simulation educators support colleagues new to the methodology, regular faculty meetings dedicated to sharing experiences and collaborative problem-solving, and ongoing access to continuous professional development opportunities in simulation-based education.

Sustainability Considerations: Faculty emphasized the critical importance of student motivation and genuine buy-in for long-term simulation program success. Key strategies identified included clear, evidence-based communication about the concrete benefits of simulation-based learning for clinical preparation and professional competence, initial reliance on voluntary student participation to build positive momentum, leveraging positive peer influence and systematic demonstration of tangible learning outcome improvements through assessment data and student feedback. These approaches recognize that sustained student engagement depends on perceived value and demonstrated benefits.

Sustaining faculty engagement over time was recognized as essential for program longevity and effectiveness. Key factors for maintaining faculty involvement included ensuring manageable workload distribution that prevents burnout and maintains enthusiasm, providing meaningful recognition of the additional effort required for simulation teaching, offering ongoing professional development opportunities that maintain faculty interest and competence, and ensuring collaborative planning and shared decision-making processes that give faculty ownership of the program. Long-term institutional support emerged as a fundamental requirement for sustainable simulation-based learning implementation. Essential elements included strong administrative support to innovative teaching approaches, adequate and reliable resource allocation for equipment acquisition, maintenance, and periodic upgrades, flexibility in scheduling and timetabling to accommodate simulation activities, and explicit integration of simulation-based learning with broader institutional strategic goals for educational excellence.

Discussion

The focus group discussion revealed generally positive faculty attitudes toward implementing simulation-based learning in Pharmacology education, coupled with realistic recognition of practical challenges and thoughtful consideration of implementation strategies. This balanced perspective reflects the faculty's genuine commitment to educational innovation while maintaining awareness of the potential constraints. The findings provide valuable insights for institutions considering similar curricular enhancements and contribute to the growing evidence base regarding faculty perspectives on simulation in medical education [3].

Faculty recognition of simulation-based learning's capacity to integrate multiple learning domains aligns with contemporary educational frameworks emphasizing competency-based medical education. The ability to simultaneously develop cognitive knowledge application, psychomotor skill proficiency, and affective domain competencies such as communication and professionalism represents a significant pedagogical advantage over traditional single-domain focused teaching methods [4]. This integrated approach reflects current understanding of how medical professionals actually practice, where clinical decisions require simultaneous integration of knowledge, technical skills, and professional behaviors. The faculty's appreciation of this multidimensional learning potential suggests strong conceptual alignment between simulation-based learning and modern medical education principles.

The challenges identified by faculty reflect common concerns in medical education reform initiatives and demonstrate a sophisticated understanding of implementation complexities. Large student batch sizes, limited time resources, faculty development needs, and infrastructure constraints are recurring themes in the literature on simulation implementation [5]. Faculty's recognition of these challenges represents a realistic appraisal rather than resistance to innovation. Importantly, the proposed solutions—phased implementation, hybrid models, and comprehensive support systems—demonstrate problem-solving orientation and commitment to overcoming barriers. This proactive approach suggests a high likelihood of successful implementation if adequate institutional support is provided.

The emphasis on comprehensive faculty training reflects the understanding that successful simulation-based learning implementation requires more than simply acquiring equipment and creating scenarios. Effective simulation education demands facilitation skills that differ substantially from traditional didactic teaching, including the ability to guide experiential learning, provide constructive debriefing, manage group dynamics, and foster reflective practice [6,7]. The recognition that faculty need structured training and ongoing development opportunities demonstrates a realistic assessment of professional development needs. This awareness positions the institution well for creating effective faculty development programs that will support sustainable simulation implementation.

The comprehensive nature of these recommendations implies confidence in potential implementation success.

Limitations

The single-institution perspective may limit the generalizability of findings to other contexts with different resources, student populations, or institutional cultures. The small sample size of six faculty members, while appropriate for focus group methodology, may not capture the full range of perspectives within the broader Pharmacology faculty community. There exists potential bias toward positive perceptions due to participants' previous exposure to simulation-based learning, which may have influenced their attitudes. The study's limited exploration of cost-effectiveness considerations represents a gap, as financial sustainability is crucial for long-term program success. Finally, the absence of student perspectives in this faculty-focused discussion means that important end-user viewpoints are not represented, which should be addressed in future research.

Conclusions and Recommendations

Faculty demonstrated positive attitudes toward implementing simulation-based learning in Pharmacology education while maintaining realistic awareness of practical challenges. The study identified clear benefits, acknowledged significant implementation barriers, and proposed thoughtful strategies for successful integration.

Future research should explore student perspectives on simulation experiences, conduct rigorous cost-effectiveness analyses comparing simulation to traditional methods, evaluate long-term learning outcomes and clinical skill retention, investigate optimal group sizes and session frequencies, and examine assessment validity and reliability in simulation contexts. These research directions will strengthen the evidence base for simulation in Pharmacology education and guide continuous improvement of implementation approaches.

Declarations

Ethical Approval

Approval of the Institutional Ethics Committee obtained with approval number: 24/022

Study centre

Department of Pharmacology at PSG Institute of Medical Sciences and Research, Peelamedu, Coimbatore, Tamilnadu, India.

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Conflicts of Interest

The authors have no conflicts of interest to declare.

Authors contributions

The first author was involved in concept, design, data collection, interpretation, data analysis, drafting and approval of article

The second author was involved in design, data collection, interpretation, data analysis, drafting and approval of article

The fourth author was involved in design, data analysis, drafting and approval of article

Author's consent

*The manuscript has been read and approved by all the authors.
**We affirm that the manuscript has not been previously published or submitted to any other journal for consideration for publication

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