



RESEARCH ARTICLE

EARLY CLINICAL EXPOSURE AS A LEARNING TOOL TO TEACH RESPIRATORY PHYSIOLOGY FOR FIRST YEAR MBBS STUDENTS

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ABSTRACT

Background: Early Clinical Exposure (ECE) is an educational approach designed to integrate clinical practice with basic science teaching. In traditional medical education, the disconnect between preclinical knowledge and clinical application often hinders students' understanding and motivation. Respiratory physiology, a critical subject in medical education, can be abstract and challenging without clinical context. This study evaluates ECE as a tool for teaching respiratory physiology to first-year MBBS students, focusing on its impact on learning outcomes and motivation. **Aim and Objectives:** To assess the effectiveness of ECE in improving the understanding and retention of respiratory physiology concepts among first-year MBBS students. **Methods:** This cross-sectional study involved 100 first-year MBBS students divided into two groups. Group A received conventional lecture-based teaching, while Group B experienced ECE, including visits to the respiratory medicine ward and interactive learning on respiratory conditions like COPD and restrictive lung diseases. Students' performance was evaluated using multiple-choice and short-answer questions. Statistical analysis, including the Student's t-test, was performed to compare group outcomes. **Results:** ECE significantly improved academic performance in Group B, with higher mean scores (7.86 ± 1.36) compared to Group A (5.37 ± 1.87) in COPD assessments ($p < 0.0001$). In restrictive lung disease assessments, Group B also outperformed Group A (6.39 ± 1.15 vs. 5.48 ± 1.91 , $p = 0.005$). Students in the ECE group reported enhanced understanding, motivation, and engagement. **Conclusion:** ECE effectively bridges the gap between theory and clinical practice, enhancing students' comprehension and motivation in learning respiratory physiology. The findings support incorporating ECE into medical curricula as a complementary teaching strategy to improve educational outcomes.

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INTRODUCTION

Early Clinical Exposure (ECE) is an innovative educational strategy designed to integrate clinical experiences with basic science education in the early years of medical training. In medical education, there has often been a distinct division between preclinical (basic sciences) and clinical subjects, resulting in a lack of real-world application for theoretical concepts. This study explores the use of ECE as a learning tool for teaching respiratory physiology to first-year MBBS students, aiming to bridge this gap and enhance both the understanding and retention of fundamental medical knowledge. [1,5] Specifically, the study investigated how early exposure to real clinical scenarios, such as visiting the respiratory medicine ward, can influence students' understanding of respiratory physiology and their motivation to learn.

Context and Rationale: Medical curricula have traditionally been heavily compartmentalized, with basic science education

delivered separately from clinical practice. This often leads to students perceiving basic science topics as abstract and disconnected from clinical realities. Respiratory physiology, as one of the foundational subjects in the MBBS curriculum, is essential for understanding diseases like Chronic Obstructive Pulmonary Disease (COPD), asthma, neuroanatomy and restrictive lung diseases [2,4]. However, the theoretical nature of physiology may cause students to struggle in appreciating its clinical relevance without direct exposure to real patients and medical conditions. In response to this issue, the Medical Council of India (MCI) has introduced the competency-based medical education (CBME) curriculum, which emphasizes the importance of integrating early clinical exposure into the teaching process. [3,6] The present study aligns with these recommendations and aims to assess the effectiveness of this approach in enhancing students' learning outcomes, particularly in respiratory physiology.

MATERIALS AND METHODS

The study employed a cross-sectional design with 100 first-year MBBS students, divided into two groups. Group A underwent conventional lecture-based teaching on respiratory physiology, specifically focusing on COPD, while Group B participated in an ECE module, which included a visit to the respiratory medicine ward. Following the visit, Group B was also exposed to lecture sessions on restrictive lung disease. Both groups were assessed using problem-based multiple-choice questions (MCQs) and short-answer questions to evaluate their understanding of the subjects taught. The study's methodology is well-structured and provides a balanced approach by comparing two different teaching strategies. Group A, which received traditional lecture-based teaching, serves as a control group, while Group B, which experienced early clinical exposure, acts as the experimental group. This design allows for a clear comparison of the outcomes related to both methods.

RESULTS

The results of the study indicated a statistically significant difference in the academic performance of the two groups. In both instances of assessment—problem-based MCQs on COPD and restrictive lung diseases—Group B, which experienced ECE, outperformed Group A. The P-values (0.001 and 0.005) strongly suggest that the difference in performance was not due to random chance, reinforcing the effectiveness of early clinical exposure in improving students' understanding of respiratory physiology. In particular, Group B's mean scores were significantly higher than those of Group A, with a notable difference in the performance of both groups after the respective assessments. The statistical analysis using Student's t-test supports the conclusion that ECE provides a more effective and engaging learning experience. These findings are consistent with the growing body of evidence suggesting that ECE can enhance students' motivation and academic performance by linking theoretical knowledge to real-life clinical experiences.

Table: Distribution of score of ECE and Conventional Lecture classes in Group A

	Mean Score	SD	T value	P value
ECE Method	7.86	1.36	7.615	<0.0001*
Conventional Lecture Method	5.37	1.87		

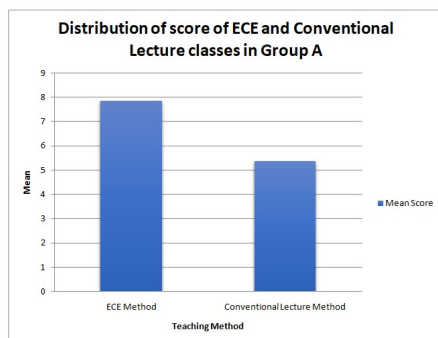
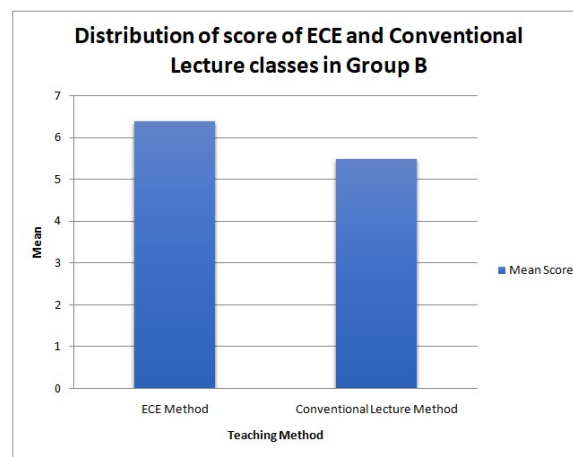


Table: Distribution of score of ECE and Conventional Lecture classes in Group B

	Mean Score	SD	T value	P value
ECE Method	6.39	1.15	2.886	0.005*
Conventional Lecture Method	5.48	1.91		



DISCUSSION

The current study provides compelling evidence regarding the effectiveness of Early Clinical Exposure (ECE) in teaching respiratory physiology to first-year MBBS students. The integration of clinical experiences with basic science education is increasingly recognized as a powerful tool in enhancing students' understanding and retention of medical knowledge. This discussion will explore the implications of the study's findings, analyze the benefits of ECE in medical education, and compare these results with existing literature on the subject. Additionally, it will address the limitations of the study, suggest avenues for future research, and provide recommendations for implementing ECE as a complementary teaching strategy in medical curricula.

Early Clinical Exposure: A Bridge Between Basic Science and Clinical Medicine: One of the most significant challenges in medical education is bridging the gap between the theoretical knowledge taught in the preclinical years and its application in clinical practice. Basic sciences such as physiology, anatomy, and biochemistry often seem abstract and disconnected from real-world medical practice. This disconnect can lead to a lack of motivation and engagement among students, as they fail to see the relevance of their studies to patient care. ECE addresses this issue by providing students with early exposure to clinical environments where they can directly observe the application of their theoretical knowledge. This integration of basic science with clinical practice enhances the learning experience, fostering a more holistic understanding of medicine. In this study, the ECE module focused on respiratory physiology, an essential subject in the MBBS curriculum that is often perceived as challenging due to its complexity and abstract nature. The intervention involved students visiting the respiratory medicine ward and interacting with patients suffering from diseases like Chronic Obstructive Pulmonary Disease (COPD) and restrictive lung diseases. These diseases are deeply rooted in respiratory physiology, and the opportunity to observe these conditions firsthand provided students with a clearer understanding of the physiological mechanisms at play. The results of the study indicate that students in the ECE group (Group B) performed significantly better on assessments related to respiratory physiology compared to their counterparts in the conventional lecture-based group (Group A). This improvement highlights the potential of ECE to facilitate a deeper understanding of basic science by contextualizing it within real clinical scenarios.

By witnessing the direct impact of physiological concepts on patient care, students are better able to retain and apply their knowledge in clinical settings.

Impact on Academic Performance: One of the key findings of the study is the statistically significant difference in the academic performance of students in the ECE group compared to those in the conventional lecture group. The use of problem-based multiple-choice questions (MCQs) and short-answer questions demonstrated that students who experienced early clinical exposure had a better grasp of respiratory physiology. The mean scores of Group B were significantly higher than those of Group A, with a P-value of 0.001 in the first assessment and 0.005 in the second. These results suggest that ECE has a positive impact on both the understanding and retention of knowledge in basic science subjects. The improvement in academic performance observed in the ECE group is consistent with findings from previous studies that have examined the impact of early clinical exposure on learning outcomes. For instance, a study by Figueiredo et al. (2015) demonstrated that ECE enhances students' clinical reasoning and problem-solving skills, which are essential for understanding complex medical topics. Similarly, a study by Paech et al. (2018) found that ECE improves students' ability to apply basic science knowledge in clinical contexts, resulting in better academic performance. The current study corroborates these findings, further reinforcing the value of ECE in bridging the gap between preclinical knowledge and clinical practice.

It is important to note that the improvement in academic performance among students in the ECE group was not merely due to increased exposure to clinical environments but also to the integration of clinical scenarios with the theoretical content taught in lectures. This approach, known as vertical integration, is a key component of competency-based medical education (CBME), which emphasizes the simultaneous learning of basic and clinical sciences. The integration of theory with practice helps students contextualize their knowledge, making it more relevant and easier to comprehend.

Student Motivation and Engagement: Another important aspect of this study is the impact of ECE on student motivation and engagement. Motivation is a critical factor in the learning process, and it plays a significant role in determining academic success. In the context of medical education, where students are often overwhelmed by the sheer volume of information they must learn, fostering motivation is essential to ensure continued interest and persistence in the course. The feedback collected from students in the study indicates that those who participated in the ECE module found it to be a highly motivating and enriching experience. Several students reported that the opportunity to observe real patients and see the application of respiratory physiology in practice made the subject matter more interesting and easier to understand. This aligns with the findings of previous studies, which have shown that early exposure to clinical environments increases students' motivation to learn and fosters a greater sense of relevance in their studies (Seabrook et al., 2013). Furthermore, the ECE experience in the current study allowed students to take a more active role in their learning. Rather than passively absorbing information through lectures, students in Group B were able to engage with clinicians, ask questions, and witness firsthand the diagnostic and therapeutic applications of respiratory physiology. Active learning, where students are encouraged to

participate in the learning process rather than simply receive information, has been shown to improve retention and understanding (Freeman et al., 2014). The active learning approach inherent in ECE is likely to have contributed to the improved performance and motivation observed in Group B.

Bridging the Gap: Clinical Correlation of Basic Science: The ability to relate basic science knowledge to clinical practice is a fundamental skill for medical students. In traditional medical curricula, basic science is often taught in isolation from clinical medicine, which can lead to students viewing it as a set of disconnected facts rather than a foundation for clinical practice. Early clinical exposure addresses this issue by providing students with opportunities to see how basic science concepts are applied in real-life clinical settings. In this study, students in Group B had the opportunity to observe patients with respiratory conditions and see how their physiological knowledge was applied in diagnosing and managing these conditions. For example, COPD and restrictive lung diseases are both closely linked to respiratory physiology, and observing these conditions in a clinical setting allowed students to see the direct relevance of their theoretical studies. This correlation between theory and practice helps students understand the practical implications of what they are learning, making the subject matter more meaningful and easier to retain.

The integration of basic science with clinical practice is particularly important in subjects like physiology, where understanding the underlying mechanisms of disease is crucial for effective diagnosis and treatment. By witnessing the clinical application of respiratory physiology, students are better equipped to understand the pathophysiology of respiratory diseases and make connections between the molecular and cellular processes they study in the classroom and the clinical management of patients. This holistic approach to learning helps students develop a more comprehensive understanding of medicine and better prepares them for their future clinical roles.

Perceptions of Students: A Qualitative Analysis: The qualitative feedback gathered from students provides valuable insights into their perceptions of the ECE module and its effectiveness as a learning tool. Many students expressed positive feedback about the clinical exposure, highlighting how it enhanced their understanding of respiratory physiology and made the subject more engaging. The hands-on experience of observing patients with respiratory diseases allowed students to see the practical applications of their theoretical knowledge, which, according to their feedback, made the learning process more meaningful and rewarding. Some students also noted that the ECE module gave them a sense of purpose and helped them feel more connected to the medical profession. The opportunity to interact with patients and clinicians provided them with a glimpse of what their future careers might look like, which motivated them to invest more effort in their studies. These findings align with the literature on the role of ECE in fostering professional identity and enhancing students' sense of purpose in medical education (Kern et al., 2015). However, it is important to note that the study's findings were based on a relatively small sample size, and the perceptions of the students in this study may not be fully representative of the broader student population. Future studies could include a larger and more diverse sample to gain

a more comprehensive understanding of how ECE is perceived by medical students.

Limitations and Future Research: While the current study provides valuable insights into the effectiveness of ECE in teaching respiratory physiology, there are several limitations that must be considered. One of the primary limitations is the small sample size of 100 students. A larger sample size would provide more robust data and help increase the generalizability of the findings. Additionally, the study focused on a specific topic—respiratory physiology—and it remains unclear whether the findings would be applicable to other areas of basic science or clinical education. Future research should examine the effectiveness of ECE in teaching other subjects and explore the long-term impact of early clinical exposure on students' clinical competencies. Another limitation is that the study only assessed short-term academic performance, and the long-term effects of ECE on students' retention of knowledge and clinical skills are not yet known. It would be valuable to conduct follow-up studies to determine whether the improvements in academic performance observed in the short term are sustained over time and whether ECE influences students' clinical competence during later years of medical training.

CONCLUSION

The findings of this study provide strong evidence for the effectiveness of Early Clinical Exposure as a tool for teaching respiratory physiology to first-year MBBS students. The integration of clinical experiences with basic science education not only improves academic performance but also enhances student motivation, engagement, and understanding of medical concepts.

By bridging the gap between theory and practice, ECE helps students see the relevance of basic science in clinical settings and prepares them for their future clinical careers. Given the positive outcomes observed in this study, it is recommended that medical schools incorporate ECE into their curricula as a complementary teaching strategy to enrich the learning experience and better prepare students for the complexities of modern medical practice.

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