

Original Research Article

A MIXED-METHODS ASSESSMENT OF EARLY CLINICAL EXPOSURE UNDER COMPETENCY-BASED MEDICAL EDUCATION IN A GOVERNMENT MEDICAL COLLEGE IN GUJARAT

Susan Yohannan¹, Vijay Sooraj A.², Hansa N. Parikh³

¹Assistant Professor, Department of Physiology, G.M.E.R.S. Medical College, Gotri, The Maharaja Sayajirao University of Baroda, Gujarat, India

²Senior Resident, Department of Community Medicine, Medical College Baroda, The Maharaja Sayajirao University of Baroda, Gujarat, India

³Assistant Professor, Department of Physiology, Medical College Baroda, The Maharaja Sayajirao University of Baroda, Gujarat, India

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Corresponding Author:

Dr. Susan Yohannan,
Assistant Professor, Department of
Physiology, G.M.E.R.S. Medical
College, Gotri, The Maharaja Sayajirao
University of Baroda, Vadodara,
Gujarat, India
Email: susanyohannan7941@gmail.com

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ABSTRACT

Background: Early Clinical Exposure (ECE), a key component of Competency-Based Medical Education (CBME), aims to integrate basic sciences with clinical practice, but its value depends on implementation quality. This study assessed ECE implementation, student perceptions, benefits, challenges and suggestions in a government medical college in Gujarat.

Materials and Methods: This mixed-methods study combined a cross-sectional survey and Key Informant Interviews (KIIs) among 193 purposively selected MBBS students who had undergone ECE under CBME. Data were collected using a pre-tested, CBME-based semi-structured Google Forms questionnaire; satisfaction was rated on a five-point Likert scale. Five KIIs with batch representatives were conducted until thematic saturation. Descriptive statistics (Jamovi 2.3.28) and manual thematic analysis were used.

Results: Participants were 64.2% male; 54.9%, 28.0% and 17.1% were in second, third and final year, respectively. Familiarity with ECE guidelines was 49% (familiar) and 15% (very familiar). ECE was useful for 71.5% and interesting for 33.7%. Common modalities were case scenario discussions (81.9%), lectures (76.2%) and hospital visits (61.1%). Clinical correlation with basic sciences was the most perceived benefit (63.7%); 52.3% applied ECE learning during clinical rotations. Overall, 65.8% were satisfied and 15.5% very satisfied. Qualitative themes revealed student-, faculty- and system-related challenges: conceptual gaps, passive learning, mentorship gaps, limited clinical exposure, documentation burden and time pressure.

Conclusion: ECE was perceived positively, particularly for linking basic sciences with clinical practice, but variable clinical exposure, passive teaching, mentorship gaps and system constraints may limit its potential. Strengthening interactive teaching, faculty development, clinical integration and institutional support may improve implementation.

Keywords: Early Clinical Exposure; Competency-Based Medical Education; Medical Students; Undergraduate Medical Education; Clinical Correlation.

INTRODUCTION

Traditional undergraduate medical education has frequently separated foundational basic science education from subsequent clinical training. This separation can make it difficult for students to appreciate the relevance of subjects such as physiology and anatomy to patient care. Early

Clinical Exposure (ECE) was introduced to address this divide by providing clinically relevant experiences during the early phase of medical education.

In India, ECE forms part of the Competency-Based Medical Education (CBME) introduced by the National Medical Commission (NMC). The NMC curriculum specifically provides an ECE module and

describes clinical exposure as a means of contextualising knowledge, skills, communication and professional development.^[1] The framework was intended to move undergraduate medical education towards competency-based learning and greater integration of basic and clinical sciences.^[1]

ECE does not necessarily imply unrestricted exposure of early medical students to patients. Rather, it encompasses structured educational experiences involving clinical scenarios, patients, healthcare settings, observation, case discussions, simulation and other approaches that allow learners to relate foundational concepts to clinical practice. Previous Indian studies have reported favourable student perceptions of ECE, including improved understanding, motivation, attention, retention and appreciation of the clinical relevance of basic sciences.^[2-4]

For example, Gupta et al. reported that students perceived an ECE intervention as satisfactory and useful for improving understanding of the relevance of biochemistry to clinical practice.^[2] Studies involving physiology and anatomy have similarly demonstrated that structured clinical exposure can facilitate correlation of theoretical knowledge with clinical situations.^[3,4] A study involving a vertical integration programme in physiology reported favourable student perceptions of bedside clinical exposure that emphasized applied physiological concepts.^[5]

However, successful implementation of ECE depends on more than simply scheduling clinical visits. Faculty preparedness, teaching-learning methods, availability of patients, institutional infrastructure, curricular scheduling and student workload may influence the quality of implementation.^[6] Reviews of ECE have highlighted opportunities for improving clinical understanding and professional development while also identifying practical challenges in implementation.^[2]

The introduction of CBME has also created additional curricular and administrative requirements for undergraduate medical education.^[7] Studies of CBME implementation in India have identified issues related to faculty preparedness, workload, documentation and institutional variability.^[8,9] These factors may be particularly relevant in large government medical colleges where substantial student numbers coexist with high clinical service requirements.

Therefore, institutional evaluation of ECE is important to determine whether curricular intentions are reflected in students' actual educational experiences.

The present study aimed to assess the implementation and perceived educational impact of ECE among undergraduate MBBS students at a Government Medical College in Gujarat, and to explore challenges and student suggestions for improving ECE implementation under CBME.

MATERIALS AND METHODS

Study design and reporting framework: A mixed-methods study comprising a cross-sectional quantitative component and a qualitative Key Informant Interview (KII) component was conducted. The quantitative component was reported with reference to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cross-sectional studies.^[10] The qualitative component was reported with reference to the Consolidated Criteria for Reporting Qualitative Research (COREQ).^[11]

Study setting: The study was conducted from February 2023 to April 2023 at a Government Medical College in Gujarat, among undergraduate MBBS students undergoing the CBME curriculum introduced by the NMC.

Study participants: Students who had undergone ECE activities and provided informed consent were eligible for inclusion. Students who had not attended ECE sessions and those unwilling to participate were excluded.

A total of 193 students were included using purposive sampling.

Because the survey was administered after completion of ECE, no first-year students were included in the final quantitative sample. The participants were therefore students who had subsequently progressed to the second, third or final year of MBBS.

Operational definition: ECE was operationally defined as structured exposure of first-year MBBS students to clinically relevant scenarios, patients or healthcare settings with the objective of correlating basic science concepts with clinical practice.^[1]

Quantitative data collection: A pre-tested semi-structured questionnaire developed from CBME guidelines was administered electronically through Google Forms. The questionnaire collected information regarding participant characteristics, familiarity with ECE guidelines, ECE implementation and students' perceptions of ECE.

Students rated their satisfaction with the quality of ECE using a five-point Likert scale ranging from "Very Dissatisfied" to "Very Satisfied."

Qualitative data collection: Qualitative data were collected through semi-structured KIIs with batch representatives.

Five KIIs were conducted: two batch representatives each from Second Professional and Third Professional Part I MBBS and one batch representative from Third Professional Part II MBBS. Verbal consent and permission for audio recording were obtained. Interviews were conducted in Hindi or English and audio-recorded using a mobile phone. Key notes were taken. Audio recordings were transcribed in the original language and translated into English on the same day. Each interview lasted approximately 30–45 minutes, until saturation of themes.

Data analysis: Quantitative data were entered into Microsoft Excel version 2408 and analysed using Jamovi version 2.3.28. Categorical data were expressed as frequencies and percentages. Quantitative variables, where applicable, were expressed as mean $\pm$ standard deviation. Descriptive statistics were used.

Qualitative responses were analysed manually using thematic analysis. Emerging themes, subthemes and codes were identified and reported.

The quantitative and qualitative findings were subsequently interpreted together to provide an institutional assessment of ECE implementation.

Ethical considerations: Permission to conduct the study was obtained from the Institutional Ethics Committee for Human Research (IECHR). Informed consent was obtained from participating students

after explanation of the study purpose, and anonymity was assured.

RESULTS

Participant characteristics: A total of 193 undergraduate MBBS students participated in the study.

Among the participants, 124 (64.2%) were male and 69 (35.8%) were female. The largest proportion of participants were from the second year of MBBS (106; 54.9%), followed by third year (54; 28.0%) and final year (33; 17.1%).

No first-year students were included because the survey was conducted after completion of ECE.

Table 1: Demographic and academic characteristics of participants (n=193)

Variable	Category	n	%
Gender	Male	124	64.2
	Female	69	35.8
Current year of study	First year	0	0
	Second year	106	54.9
	Third year	54	28.0
	Final year	33	17.1

Familiarity with NMC ECE guidelines: Most students reported at least some familiarity with NMC ECE guidelines. Nearly half (49%) described

themselves as familiar, 15% as very familiar and 28% as somewhat familiar. Only 4% each reported being unfamiliar or very unfamiliar.

Table 2: Familiarity of participants with NMC guidelines for ECE (n=193)

Level of familiarity	%
Very unfamiliar	4
Unfamiliar	4
Somewhat familiar	28
Familiar	49
Very familiar	15

Thus, 92% of participants reported at least some familiarity with the ECE guidelines.

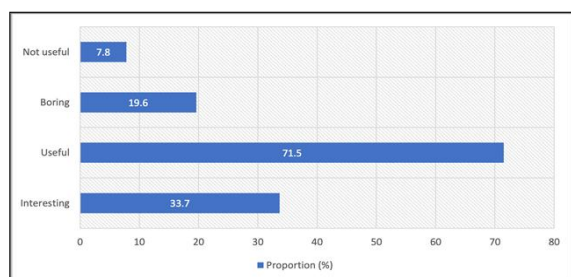


Figure1: Student perceptions regarding ECE sessions (n=193)

Student perceptions of ECE sessions: ECE was considered useful by 71.5% of participants and

interesting by 33.7%. However, 19.6% described the sessions as boring and 7.8% considered them not useful.

Modes of ECE implementation: Multiple ECE teaching-learning modalities were reported. Case scenario discussion was the most frequently reported modality (158/193; 81.9%), followed by lectures (147/193; 76.2%) and hospital visits (118/193; 61.1%). Actual patient exposure was reported by 57 students (29.5%), while 63 (32.6%) reported observing residents or qualified faculty members interviewing patients and demonstrating doctor-patient communication. Use of videos as a teaching aid was reported by 58 students (30.1%), whereas simulated patient exposure was reported by 24 students (12.4%).

Table 3: Teaching-learning modalities used for ECE (n=193)

ECE modality	n	%
Case scenario discussion	158	81.9
Lecture	147	76.2
Hospital visit	118	61.1
Observed residents/faculty interviewing patients or doctor-patient communication	63	32.6
Videos	58	30.1
Actual patient exposure	57	29.5
Simulated patient	24	12.4

Written question-answer activity	1	0.5
Lectures sometimes not undertaken	1	0.5
None of the above	0	0

Because students could report more than one modality, percentages are not expected to total 100%.

Perceived educational benefits: Clinical correlation of basic sciences such as physiology and anatomy was the most frequently reported benefit, identified by 123 students (63.7%). Improved understanding of

concepts was reported by 104 students. Communication skills were reported to improve by 79 students (40.9%), while 74 (38.3%) reported improved practical skills. Sixty-two students reported increased confidence, while 66 (34.2%) reported that ECE motivated them to learn basic sciences.

Table 4: Perceived benefits of ECE (n=193)

Perceived benefit	n	%
Clinical correlation with basic sciences	123	63.7
Improved understanding of concepts	104	53.9
Improved communication skills	79	40.9
Enhanced practical skills	74	38.3
Motivation to learn basic sciences	66	34.2
Increased confidence	62	32.1
Increased interest in particular topic/subject	1	0.5
Not much help	1	0.5

Application of ECE learning during clinical rotations: A total of 101 students (52.3%) reported that they were able to apply knowledge and skills gained through ECE during clinical postings. Twenty-five students (13.0%) reported that they were unable to apply their ECE learning, while 67 (34.7%) were uncertain.

Satisfaction with ECE quality: More than half of the participants (65.8%) were satisfied with the quality of ECE, while 15.5% were very satisfied. A further 12.4% reported neutral satisfaction. Only a small proportion were dissatisfied (4.7%) and very dissatisfied (1.6%).

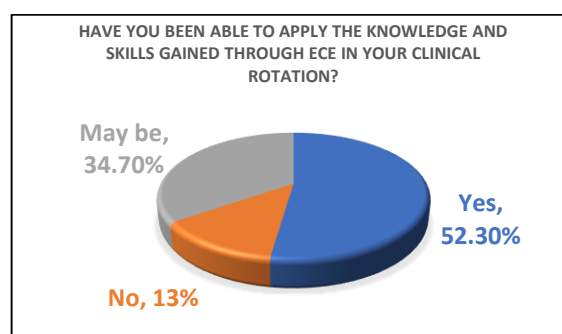


Figure 2: Application of ECE-acquired learning during clinical rotations (n=193).

Table 5: Satisfaction with quality of ECE (n=193)

Satisfaction category	%
Very satisfied	15.5
Satisfied	65.8
Neutral	12.4
Dissatisfied	4.7
Very dissatisfied	1.6

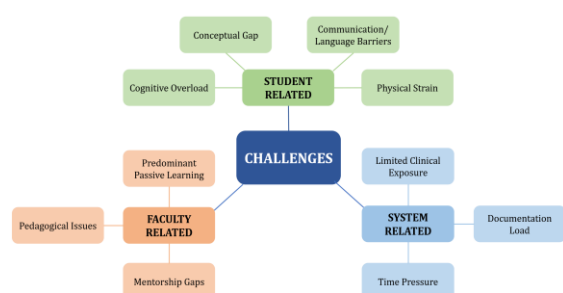


Figure 3: Challenges experienced by the students after implementation of ECE

Qualitative findings: Thematic analysis of five KIIs identified three broad domains of challenges: student-related, faculty-related and system-related factors. Corresponding suggestions for improvement were also grouped into these domains.

Student-related challenges included conceptual gaps in integrating basic sciences with clinical learning, cognitive overload due to increased academic demands, communication and language barriers during patient interaction, and physical strain associated with prolonged clinical sessions. Faculty-related challenges primarily comprised the predominance of passive learning approaches, pedagogical issues related to teaching methods and session organization, and mentorship gaps affecting effective guidance and student engagement. System-related challenges included limited clinical exposure opportunities, increased documentation and logbook burden, and time pressure arising from tight academic schedules and coordination difficulties. These findings highlight the multifactorial barriers influencing the effective implementation of ECE and emphasize the need for student-centered, faculty-supported, and system-strengthening strategies to improve its overall effectiveness.

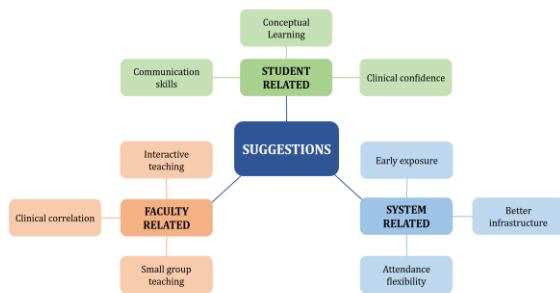


Figure 4: Suggestions given by the study participants in improving the ECE

Student-related suggestions emphasized strengthening conceptual learning rather than rote memorization, improving communication skills, and enhancing clinical confidence through better practical exposure. Faculty-related suggestions highlighted the need for more interactive teaching methods instead of predominantly passive PowerPoint-based lectures, greater faculty engagement and enthusiasm during teaching sessions, incorporation of clinical correlation while explaining theoretical concepts, and implementation of small-group teaching to improve interaction and individualized learning. System-related suggestions included improving institutional infrastructure such as lecture halls, libraries, and learning aids, and introducing flexibility in attendance policies to facilitate self-directed learning. Additional recommendations included reducing excessive documentation burden such as log books for each sessions, ensuring better curriculum planning, and developing structured academic schedules with adequate preparation time before examinations. These suggestions reflect the need for a more student-centered, clinically integrated, and interactive medical education system for effective ECE implementation.

DISCUSSION

This mixed-methods institutional assessment found that ECE was generally perceived positively by undergraduate medical students. Nearly three-fourths of students considered ECE useful, and the most frequently identified benefit was clinical correlation of basic science subjects. At the same time, the qualitative component identified important barriers related to passive learning, mentorship, limited authentic clinical exposure, cognitive load, documentation and scheduling.

The finding that 71.5% of students perceived ECE as useful is consistent with previous Indian studies reporting favourable student perceptions. Gupta et al. reported that students considered ECE enjoyable, satisfactory and effective and perceived benefits in knowledge, retention, attention and motivation.^[2] Similarly, studies involving clinical exposure in physiology and anatomy have reported favourable

student responses and improved appreciation of clinical relevance.^[3-5]

The present study provides additional information by examining ECE across students who had progressed beyond the first year. This allowed participants to reflect retrospectively on whether ECE learning remained relevant during subsequent clinical postings.

Clinical correlation with basic sciences was the most frequently reported benefit, identified by 63.7% of participants. This finding is consistent with the fundamental rationale of ECE. The NMC framework places ECE within CBME partly to facilitate contextualisation and integration of basic and clinical learning.^[1]

Importantly, the current findings suggest that students may value ECE not simply because it places them in a clinical environment but because it gives meaning to previously abstract theoretical concepts. This distinction is important for curriculum design. A hospital visit without structured learning objectives may provide exposure but may not necessarily result in meaningful integration.

The pattern of reported ECE modalities illustrates this issue. Case scenario discussions were reported by 81.9% of students and lectures by 76.2%, whereas actual patient exposure was reported by only 29.5% and simulated patient exposure by 12.4%. Thus, ECE at the study institution incorporated several clinically oriented activities, but a considerable proportion of the exposure remained classroom-based.

This does not imply that case discussions or lectures are inappropriate ECE modalities. Case-based teaching can effectively contextualize foundational knowledge and may be particularly feasible in large student cohorts. However, the relatively lower frequency of actual-patient and simulated-patient exposure suggests an opportunity to strengthen experiential components where resources and patient safety considerations permit.

Previous research has demonstrated that ECE can be implemented through different models. A physiology-based vertical integration programme, for example, used bedside clinics involving multiple clinical departments and emphasized applied physiological concepts.^[5] Other Indian studies have used structured clinical exposure alongside traditional teaching and reported favourable learning outcomes.^[3,4]

More than half of the students in the present study (52.3%) reported applying knowledge or skills gained through ECE during clinical rotations. This finding is encouraging because it suggests that at least some learning acquired through ECE may remain relevant when students enter subsequent clinical environments. However, 34.7% were uncertain whether they had applied ECE-related learning.

This uncertainty is important. Application of knowledge was assessed through student self-report rather than objective observation or competency assessment. Therefore, the present findings should

not be interpreted as evidence that ECE objectively improved clinical competence.

Objective educational outcomes would require measures such as pre- and post-intervention knowledge testing, structured clinical skills assessment, OSCE performance or longitudinal competency assessment. Previous intervention studies have used such approaches. For example, one Indian study comparing ECE with conventional teaching in respiratory physiology reported differences in academic performance between groups, while another study evaluating interactive clinical anatomy lectures demonstrated improved post-test performance.^[3,4] Such designs provide stronger evidence of educational effectiveness than perception-based surveys alone.

The satisfaction findings were generally favourable, with 81.3% reporting that they were either satisfied or very satisfied. Nevertheless, 12.4% were neutral. This relatively large neutral group is consistent with the qualitative findings suggesting that ECE experiences were not uniform.

The qualitative analysis identified three broad categories of challenges.

First, student-related challenges included conceptual gaps, cognitive overload, communication and language barriers and physical strain. Conceptual gaps are particularly relevant because students entering clinical environments may not yet possess sufficient foundational knowledge to interpret all clinical findings.^[12] ECE therefore requires appropriate scaffolding.

Second, faculty-related challenges included passive learning, pedagogical issues and mentorship gaps. This finding highlights the importance of faculty development. Faculty may understand the curricular requirement for ECE but still require support in translating the requirement into interactive and learner-centred sessions.

The finding of predominantly passive learning is also relevant to students' suggestion for interactive teaching and small-group learning. Recent discussions of CBME implementation in India similarly highlight the importance of faculty preparedness and institutional support.^[7,8]

Third, system-related challenges included limited clinical exposure, documentation burden and time pressure. These are particularly relevant in large government medical colleges, where undergraduate teaching occurs alongside substantial clinical service delivery.^[13]

The documentation burden identified by participants also deserves attention. CBME introduced several formal documentation and competency-tracking requirements.^[14] Documentation can be educationally useful when it promotes reflection and competency tracking, but excessive documentation may reduce time available for direct learning.

The recommendations emerging from this study therefore support a more structured and integrated approach to ECE rather than simply increasing the number of ECE sessions.

The first priority should be to ensure clear alignment between each ECE activity, the relevant basic science concept and the intended learning outcome. For example, a physiology-oriented patient encounter should identify the physiological principle being demonstrated, provide appropriate clinical context and allow students to discuss the relationship between the physiological mechanism and patient presentation.

Second, interactive approaches should complement conventional lectures. Case discussions, guided patient observation, small-group activities and simulation may increase active participation.^[15-18]

Third, faculty development should address not only awareness of CBME requirements but also practical teaching skills. Faculty should be supported in facilitating discussions, linking basic sciences to clinical cases, supervising patient interactions and providing feedback.

Fourth, authentic patient exposure should be strengthened where feasible. The relatively low proportion reporting actual patient exposure indicates that this is an area where further institutional planning may be beneficial.

Finally, ECE should be integrated with the broader academic timetable. Excessive curricular compression may result in ECE becoming an additional activity rather than an integrated learning strategy.^[19]

Overall, the findings support the interpretation that ECE is valued by students but that its implementation is heterogeneous. The educational potential of ECE appears to depend on the quality of integration, interaction and clinical authenticity rather than merely on the existence of an ECE programme.

Recommendations: Based on the quantitative and qualitative findings, the following institutional measures are recommended:

1. Strengthen clinical correlation: Explicitly link basic science concepts with clinical cases and patient presentations.
2. Increase authentic patient exposure: Where feasible and ethically appropriate, provide supervised opportunities for direct patient interaction and observation.
3. Promote interactive learning: Complement lectures with case discussions, small-group activities, simulation and guided clinical observation.
4. Strengthen faculty development: Provide faculty development focused on ECE pedagogy, facilitation, clinical correlation, feedback and mentorship.
5. Improve curricular integration: Align ECE activities with the relevant basic science learning objectives and subsequent clinical competencies.
6. Reduce unnecessary documentation: Streamline logbooks and documentation requirements so that they support rather than compete with learning.

7. Address communication barriers: Incorporate supervised opportunities to develop patient communication skills.
8. Improve institutional infrastructure: Ensure adequate teaching spaces, learning resources and coordination between basic science and clinical departments.
9. Improve scheduling: Avoid excessive clustering of ECE activities around examinations and provide adequate preparation time.
10. Conduct periodic evaluation: Continue collecting student and faculty feedback and consider longitudinal assessment of ECE outcomes.

Limitations: This study was conducted at a single government medical college, which may limit the generalisability of the findings. Purposive sampling may have introduced selection bias. The cross-sectional design does not permit causal inference or assessment of changes over time. Finally, the study was conducted after students had completed ECE, and therefore recall bias may have influenced responses.

CONCLUSION

ECE was generally perceived positively by undergraduate medical students at a government medical college in Gujarat, with clinical correlation of basic sciences emerging as its most frequently reported educational benefit. Case discussions, lectures and hospital visits were the predominant modes of implementation.

However, the relatively lower frequency of actual patient and simulated-patient exposure, together with qualitative findings of passive learning, mentorship gaps, conceptual difficulties, documentation burden and time pressure, indicates that implementation remains variable.

ECE may therefore be strengthened by moving beyond exposure alone towards structured, interactive and clinically integrated learning, supported by faculty development, authentic patient interaction, small-group teaching and appropriate institutional planning.

The findings provide an institutional baseline for future longitudinal studies evaluating whether strengthened ECE implementation produces measurable improvements in knowledge, clinical skills, communication and competency.

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