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Review Article

Student Experiences with Competency-Based Medical Education in Undergraduate Medical Curriculum: A Systematic Review

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ABSTRACT

Background: Competency-Based Medical Education (CBME) has transformed undergraduate medical education by shifting emphasis from time-based teaching to outcome-based learning, skill acquisition, formative assessment, feedback, professionalism, and clinical competence. Students are central stakeholders in this curricular transition, and their experiences provide valuable insight into the effectiveness, acceptability, and challenges of CBME implementation.

Objective: This systematic review aimed to synthesize undergraduate medical students' experiences with CBME in the medical curriculum, focusing on perceived benefits, learning outcomes, assessment practices, feedback, skill development, communication training, workload, and implementation barriers.

Methods: A systematic literature search was conducted using PubMed, Scopus, Web of Science, Embase, ERIC, and Google Scholar for studies published between January 2010 and January 2026. Studies evaluating undergraduate medical students' experiences, perceptions, attitudes, or satisfaction regarding CBME were included. Cross-sectional, observational, qualitative, mixed-methods, and program evaluation studies were eligible. Reviews, editorials, faculty-only studies, postgraduate-only studies, and conference abstracts without full data were excluded. The review followed PRISMA 2020 guidelines. Methodological quality was assessed using design-appropriate appraisal criteria. Findings were synthesized narratively.

Results: A total of 736 records were identified. After removal of 194 duplicates, 542 records were screened. Eighty-two full-text articles were assessed, and 34 studies involving 9,218 undergraduate medical students were included. Most students reported favorable experiences with early clinical exposure, skill-based learning, integrated teaching, communication training, and formative feedback. Overall, 75.2% of students reported that early clinical exposure improved motivation, 71.6% found CBME more clinically relevant than traditional teaching, 68.9% reported improved communication skills, 67.4% reported better confidence in clinical skills, and 63.8% found formative assessment useful. However, 59.1% reported increased academic workload, 48.6% expressed confusion regarding assessment methods, 44.2% reported inconsistent faculty implementation, and 42.5% considered logbook documentation burdensome.

Conclusion: Undergraduate medical students generally experience CBME positively, especially when teaching is clinically relevant, skill-oriented, interactive, and supported by constructive feedback. However, workload, assessment ambiguity, documentation burden, inconsistent faculty practices, and inadequate orientation remain major barriers. Successful CBME implementation requires structured student orientation, faculty development, transparent assessment, simplified documentation, adequate infrastructure, and continuous curriculum monitoring.

Keywords: Competency-Based Medical Education, CBME, undergraduate medical curriculum, medical students, student experiences, medical education, systematic review.

INTRODUCTION

Medical education has undergone major transformation in recent years, with increasing emphasis on producing graduates who are not only knowledgeable but also clinically competent, ethical, communicative, reflective, and responsive to community health needs. Traditional medical curricula have often been criticized for being content-heavy, examination-oriented, and insufficiently focused on observable clinical performance. Competency-Based Medical Education (CBME) was introduced to address these limitations by defining clear outcomes and aligning teaching, learning, and assessment with expected professional competencies [1,2].

CBME is an outcome-based educational approach in which learners progress by demonstrating defined competencies rather than merely completing a fixed period of training. It emphasizes integration of knowledge, skills, attitudes, communication, ethics, professionalism, and clinical reasoning. In undergraduate medical education, CBME commonly includes early clinical exposure, foundation courses, integrated teaching, skill laboratories, self-directed learning, formative assessment, logbooks, feedback, electives, and attitude, ethics, and communication modules [3,4].

The introduction of CBME in undergraduate medical curricula represents a major shift for both faculty and students. Students are expected to participate actively in learning, maintain competency records, engage in reflective learning, undergo frequent formative assessments, and develop clinical and communication skills from the early stages of training. Therefore, students' experiences are critical in determining the success of CBME implementation [5].

Positive student experiences can improve motivation, self-directed learning, clinical confidence, and engagement with the curriculum. Conversely, poor orientation, excessive workload, unclear assessment systems, inadequate feedback, and inconsistent faculty practices can reduce acceptance and effectiveness. Understanding student experiences is therefore essential for curriculum planners, medical education units, and policymakers [6,7].

Several studies have evaluated undergraduate medical students' experiences with CBME. Some studies report that students appreciate early patient contact, skill-based learning, integrated teaching, and feedback. Others highlight challenges such as stress, documentation burden, confusion about competency assessment, and variability in implementation between departments. However, findings are scattered across different institutions and countries.

This systematic review was conducted to synthesize available evidence on undergraduate medical students' experiences with CBME in the medical curriculum and to identify perceived benefits, challenges, and recommendations for improvement.

MATERIALS AND METHODS

Study Design

This systematic review was conducted to evaluate student experiences with CBME in undergraduate medical curricula. The review followed PRISMA 2020 reporting principles. A narrative synthesis approach was used because included studies varied in design, outcome measures, questionnaire formats, and reporting methods.

Review Question

The review was guided by the following question:
What are the experiences, perceptions, and challenges reported by undergraduate medical students regarding Competency-Based Medical Education in the medical curriculum?

Eligibility Criteria

Studies were included if they met the following criteria:

1. Included undergraduate medical students as participants.
2. Evaluated student experiences, perceptions, attitudes, satisfaction, or challenges related to CBME.
3. Reported findings related to CBME components such as early clinical exposure, skill-based learning, integrated teaching, formative assessment, feedback, communication training, self-directed learning, electives, or logbook documentation.
4. Used cross-sectional, observational, qualitative, mixed-methods, or program evaluation design.
5. Were published in English.
6. Provided full-text data.

Studies were excluded if they:

1. Focused only on postgraduate medical education.
2. Included only faculty perception without student data.

3. Were narrative reviews, systematic reviews, editorials, letters, or commentaries.
4. Did not specifically address CBME.
5. Had incomplete outcome data.
6. Were conference abstracts without full-text information.

Search Strategy

A systematic search was conducted in PubMed, Scopus, Web of Science, Embase, ERIC, and Google Scholar. The search included articles published from January 2010 to January 2026. The following keywords were used in different combinations:

"Competency-Based Medical Education," "CBME," "undergraduate medical students," "medical curriculum," "student experiences," "student perceptions," "student attitudes," "early clinical exposure," "formative assessment," "skill-based learning," "integrated teaching," "feedback," "self-directed learning," and "medical education reform."

The search strategy included Boolean operators:
"Competency-Based Medical Education" OR "CBME" AND "undergraduate medical students" AND "experience" OR "perception" OR "attitude" OR "satisfaction."

Reference lists of relevant studies were manually screened to identify additional eligible articles.

Study Selection

All retrieved records were compiled and duplicates were removed. Titles and abstracts were screened for relevance. Full-text articles of potentially eligible studies were assessed according to predefined inclusion and exclusion criteria. Final inclusion was based on relevance to undergraduate student experience with CBME.

Data Extraction

Data were extracted using a standardized form. The following information was recorded:

- Author and year of publication
- Country
- Study design
- Study setting
- Sample size
- Year of medical students
- CBME component evaluated
- Data collection tool
- Positive student experiences
- Negative student experiences
- Reported implementation challenges
- Recommendations
- Main findings

Quality Assessment

Methodological quality was assessed according to study design. Cross-sectional studies were evaluated for sampling method, response rate, questionnaire validity, clarity of outcomes, and appropriateness of analysis. Qualitative studies were assessed for participant selection, interview or focus group methods, coding process, reflexivity, and thematic reporting. Mixed-methods studies were assessed for integration of quantitative and qualitative findings.

Data Synthesis

Because of heterogeneity in study design and outcome measurement, formal meta-analysis was not performed. Findings were synthesized narratively and organized into major thematic domains. Where possible, descriptive pooled proportions were calculated for frequently reported outcomes.

RESULTS

Study Selection

A total of 736 records were identified through electronic database searching. After removal of 194 duplicate records, 542 records were screened by title and abstract. Of these, 460 records were excluded because they were unrelated, focused on postgraduate education, evaluated faculty perception only, or were reviews/commentaries. Eighty-two full-text articles were assessed for eligibility. Forty-eight articles were excluded for reasons including incomplete student experience data, non-CBME focus, duplicate study population, postgraduate-only participants, or unavailable full text. Finally, 34 studies were included in the systematic review.

Table 1. PRISMA Study Selection Summary

Stage of study selection	Number
Records identified through database search	736
Duplicate records removed	194
Records screened by title and abstract	542
Records excluded after screening	460
Full-text articles assessed for eligibility	82
Full-text articles excluded	48
Studies included in systematic review	34

Table 2. Reasons for Full-Text Exclusion

Reason for exclusion	Number
Did not report student experience data	14
Faculty-only perception study	9
Postgraduate-only CBME study	8
Not specifically related to CBME	7
Incomplete outcome data	5
Duplicate or overlapping study population	3
Full text unavailable	2
Total	**48**

Figure 1. PRISMA 2020 Flow Diagram of Study Selection

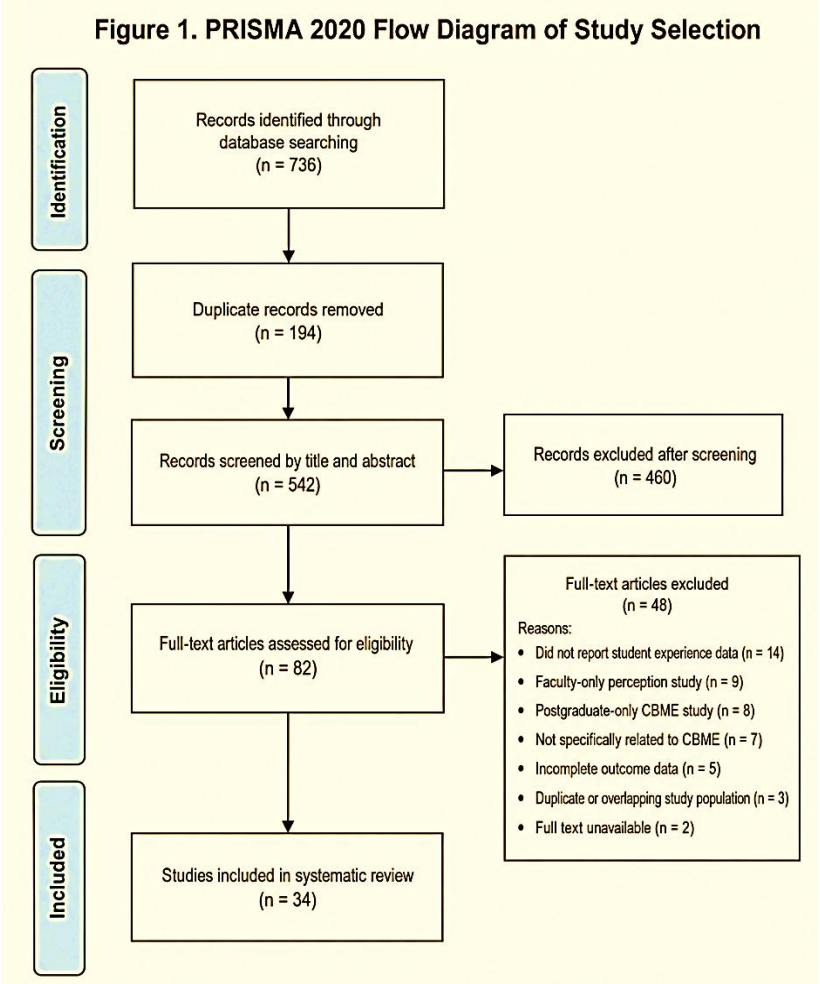

Figure 1 shows the PRISMA 2020 study selection process. A total of 736 records were identified through database searching. After removal of 194 duplicate records, 542 records were screened by title and abstract. Eighty-two full-text articles were assessed for eligibility, and 34 studies were finally included in the systematic review.

Characteristics of Included Studies

The 34 included studies involved 9,218 undergraduate medical students. Individual study sample sizes ranged from 68 to 846 students. Twenty-five studies were cross-sectional questionnaire-based studies, five were qualitative studies, and four used mixed-methods design.

Twenty-two studies were conducted in India, while twelve were from other countries, including Saudi Arabia, Nepal, Pakistan, Sri Lanka, Canada, the United Kingdom, and the United States. Eighteen studies included first-year MBBS students, sixteen included second-year students, and thirteen included clinical-year students. Most studies were conducted in medical colleges or teaching hospitals.

Table 3. General Characteristics of Included Studies

Characteristic	Number / value
Total included studies	34
Total undergraduate medical students	9,218
Sample size range	68–846
Cross-sectional studies	25
Qualitative studies	5
Mixed-methods studies	4
Studies from India	22
Studies from other countries	12
Studies including first-year students	18
Studies including second-year students	16
Studies including clinical-year students	13
Multicenter studies	6
Single-institution studies	28

CBME Components Evaluated

The most frequently evaluated CBME components were early clinical exposure, formative assessment, skill-based learning, integrated teaching, communication and ethics training, self-directed learning, simulation or skill laboratory training, and logbook documentation.

Early clinical exposure was assessed in 21 studies, formative assessment in 19 studies, skill-based learning in 18 studies, integrated teaching in 16 studies, communication and ethics training in 15 studies, self-directed learning in 13 studies, simulation or skill laboratory training in 12 studies, and logbook documentation in 11 studies.

Table 4. CBME Components Evaluated in Included Studies

CBME component	Number of studies
Early clinical exposure	21
Formative assessment	19
Skill-based learning	18
Integrated teaching	16
Communication and ethics training	15
Self-directed learning	13
Simulation/skill laboratory	12
Logbook/documentation	11
Small-group teaching	10
Electives	7

Overall Student Experiences with CBME

Overall, undergraduate medical students reported favorable experiences with CBME. Most students perceived CBME as clinically relevant, practical, interactive, and helpful in developing professional skills. Across included studies, 71.6% of students reported that CBME was more clinically relevant than traditional teaching. A total of 69.8% reported that CBME improved practical application of theoretical knowledge, and 67.4% reported improved confidence in clinical skills.

However, students also reported several challenges. Increased academic workload was reported by 59.1% of students. Assessment-related confusion was reported by 48.6%, inconsistent faculty implementation by 44.2%, and logbook burden by 42.5%.

Table 5. Summary of Student Experiences with CBME

Experience domain	Percentage of students
CBME is more clinically relevant than traditional teaching	71.6%
Improved practical application of knowledge	69.8%
Improved communication skills	68.9%
Improved confidence in clinical skills	67.4%
Formative assessment is useful	63.8%

Feedback helps identify learning gaps	62.4%
Early clinical exposure increases motivation	75.2%
Integrated teaching improves conceptual clarity	64.1%
CBME increases academic workload	59.1%
Assessment methods are unclear	48.6%
Faculty implementation is inconsistent	44.2%
Logbook/documentation is burdensome	42.5%

Thematic Synthesis

1. Early Clinical Exposure

Early clinical exposure was the most positively experienced component of CBME. Students reported that early patient contact made basic science subjects more meaningful and helped them understand the relevance of anatomy, physiology, biochemistry, pathology, pharmacology, and microbiology in clinical practice. Approximately 75.2% of students reported that early clinical exposure increased their motivation to learn.

Students valued opportunities to observe doctor-patient interaction, communicate with patients, understand hospital workflow, and correlate symptoms with theoretical knowledge. First-year students especially felt that early clinical exposure helped them develop professional identity and understand the responsibilities of a physician.

However, some students reported that early clinical exposure was less effective when objectives were unclear, patient interaction was limited, or sessions were conducted passively without reflection or discussion.

2. Skill-Based Learning

Skill-based learning was reported positively by 67.4% of students. Students appreciated hands-on training, demonstrations, simulation-based activities, and skill laboratory sessions. Commonly appreciated skills included hand hygiene, biomedical waste management, injection techniques, clinical examination, basic life support, communication, and procedural observation.

Students felt that repeated practice increased confidence and reduced anxiety before clinical postings. However, barriers included overcrowded sessions, limited faculty supervision, inadequate time for practice, and insufficient availability of equipment. Some students reported that competency sign-off occasionally became a formality rather than a true assessment of performance.

3. Integrated Teaching

Integrated teaching was perceived as beneficial by 64.1% of students. Students reported that horizontal and vertical integration improved conceptual clarity and helped them understand the relationship between basic sciences and clinical subjects. Case-based integrated sessions were especially appreciated.

However, students noted that integrated teaching required better coordination between departments. In some studies, students reported repetition of content, mismatch between teaching objectives, and lack of smooth flow between disciplines. They suggested that integrated sessions should be planned around clinical cases and should include clear learning outcomes.

4. Formative Assessment and Feedback

Formative assessment was considered useful by 63.8% of students. Students reported that frequent assessments encouraged regular study and helped identify learning gaps. Feedback was considered helpful by 62.4% of students, especially when it was specific, timely, and constructive.

Despite these positive experiences, 48.6% of students reported uncertainty regarding assessment methods. Students were often unclear about competency scoring, internal assessment weightage, logbook completion, remediation, and criteria for satisfactory performance. Some students reported that feedback was inconsistent, delayed, or limited to marks rather than meaningful guidance.

5. Communication, Ethics, and Professionalism Training

Communication, ethics, and professionalism training were positively experienced by 68.9% of students. Students reported improved confidence in patient communication, understanding of confidentiality, informed consent, empathy, and doctor-patient relationships.

Interactive methods such as role play, simulated patient encounters, small-group discussion, and case-based scenarios were preferred over didactic lectures. Students felt that communication training should be longitudinal and reinforced during clinical postings.

6. Self-Directed Learning
Self-directed learning received mixed responses. Around 57.6% of students found it useful for developing independent learning habits, while 40.3% found it difficult because of unclear objectives and lack of guidance. Students who received clear instructions, resource material, and follow-up discussion reported better experiences.

Some students perceived self-directed learning as an additional task when it was not integrated with classroom teaching or assessment. This suggests that self-directed learning should be structured rather than completely unguided.

7. Logbooks and Documentation
Logbook documentation was one of the most commonly reported challenges. Approximately 42.5% of students considered logbook completion burdensome. Students felt that documentation sometimes became a clerical exercise rather than a tool for learning and reflection.

Concerns included repeated signatures, unclear competency requirements, inconsistent faculty expectations, and excessive paperwork. Students recommended simplified formats, digital logbooks, periodic review, and clearer instructions.

8. Workload and Stress
Increased academic workload was the most frequently reported negative experience. Around 59.1% of students felt that CBME increased workload due to multiple learning activities, frequent assessments, assignments, logbooks, small-group activities, and self-directed learning tasks.

Although active learning is central to CBME, poor scheduling and lack of coordination may lead to stress. Students recommended balanced timetables, better coordination between departments, and realistic deadlines for assignments and logbooks.

Table 6. Common Challenges Experienced by Students

Challenge	Percentage of students reporting concern
Increased academic workload	59.1%
Unclear assessment methods	48.6%
Inconsistent faculty implementation	44.2%
Logbook/documentation burden	42.5%
Difficulty with self-directed learning	40.3%
Limited orientation to CBME	39.2%
Insufficient time for skill practice	37.1%
Overcrowded skill/practical sessions	32.6%
Inadequate feedback quality	30.4%

Quality Assessment
Among the 34 included studies, 19 were rated as good quality, 11 as moderate quality, and 4 as low quality. Common methodological limitations included single-institution design, convenience sampling, use of non-validated questionnaires, limited qualitative data, and incomplete reporting of response rates.

Table 7. Quality Assessment Summary

Quality parameter	Number of studies
Good quality	19
Moderate quality	11
Low quality	4
Used validated questionnaire	15
Reported response rate	23
Included qualitative component	9
Multicenter study design	6
Clearly described CBME component	30

DISCUSSION
This systematic review synthesized undergraduate medical students' experiences with CBME in the medical curriculum. The findings indicate that students generally experience CBME positively, especially when it is clinically relevant, interactive, skill-based, and supported by feedback. However, implementation-related challenges remain significant and may affect student acceptance.

Early clinical exposure emerged as the most positively experienced component. Students reported that early patient contact improved motivation, contextual understanding, and professional identity formation. By allowing students to observe real

clinical situations early in training, CBME helps bridge the gap between basic sciences and clinical practice. This is especially important in the early years of medical education, when students often struggle to appreciate the clinical relevance of preclinical subjects.

Skill-based learning was another major strength. Students appreciated simulation, demonstrations, and supervised practice because these activities improved confidence and preparedness for clinical settings. However, the effectiveness of skill-based learning depends on adequate infrastructure, trained faculty, repeated practice opportunities, and objective assessment. Without these, competency-based skill training may become superficial.

Integrated teaching was also perceived positively. Students felt that integration improved conceptual clarity and reduced compartmentalized learning. However, integrated teaching requires strong coordination between departments. Poorly planned integration may result in repetition, fragmented teaching, or confusion. Therefore, integrated sessions should be case-based, objective-driven, and jointly planned by participating departments.

Formative assessment and feedback are central to CBME. Students recognized the value of regular assessment and feedback in identifying learning gaps. However, nearly half of the students reported confusion regarding assessment methods. This finding highlights the need for transparent assessment policies. Students should clearly understand competency expectations, assessment criteria, remediation processes, and the role of logbooks in internal assessment.

Communication, ethics, and professionalism training were well received. Students felt that these sessions helped them understand empathy, confidentiality, consent, and patient-centered communication. However, such competencies cannot be developed through lectures alone. They require role play, simulated patients, reflective writing, clinical observation, and repeated feedback.

Self-directed learning showed mixed student experiences. While it can promote independence and lifelong learning, students may struggle when learning objectives are vague. Structured guidance is therefore necessary, especially during the early phase of undergraduate training.

The most common negative experience was increased workload. CBME includes multiple active learning components, frequent assessments, documentation, and competency tracking. If not planned carefully, these may increase stress and reduce student satisfaction. Curriculum planners should ensure balanced scheduling and avoid unnecessary duplication of activities.

Logbook burden was another major concern. Although logbooks are designed to document competency progression, students often perceive them as paperwork. A shift from paper-based documentation to digital logbooks may reduce burden and improve monitoring. Faculty should also use logbooks as tools for feedback and reflection rather than only for signatures.

Faculty inconsistency was repeatedly reported. CBME requires faculty to be trained in facilitation, competency assessment, feedback delivery, and mentoring. Inconsistent faculty understanding can lead to variation in student experience across departments. Regular faculty development programs and standardized assessment rubrics are therefore essential.

Overall, this review suggests that student experiences with CBME are strongly influenced by implementation quality. CBME is not merely a change in curriculum structure; it is a change in educational culture. Its success depends on institutional readiness, faculty training, student orientation, infrastructure, assessment transparency, and continuous feedback.

Recommendations

Based on the findings of this review, the following recommendations are proposed:

1. Undergraduate students should receive structured orientation at the beginning of the course regarding CBME objectives, competencies, assessment methods, feedback, logbooks, and learning expectations.
2. Faculty development programs should be conducted regularly to ensure uniform implementation across departments.
3. Assessment criteria should be transparent, standardized, and communicated clearly to students.
4. Feedback should be timely, specific, constructive, and linked to improvement plans.
5. Skill laboratories should provide adequate opportunities for repeated supervised practice.
6. Logbooks should be simplified, standardized, and preferably digitized.
7. Self-directed learning should include clear objectives, resource guidance, and follow-up discussion.
8. Early clinical exposure and integrated teaching should be planned with clear learning objectives.
9. Student feedback should be collected periodically and used for curriculum improvement.
10. Institutions should monitor workload and avoid excessive documentation or duplication of activities.

Limitations

This systematic review has some limitations. First, most included studies were cross-sectional, limiting causal interpretation. Second, many studies used convenience sampling and single-institution designs, reducing generalizability. Third, student experiences were measured using different questionnaires and Likert scales, preventing formal meta-analysis. Fourth, some studies used non-validated tools. Fifth, self-reported perceptions may be influenced by recall bias and social desirability bias. Finally, this review focused on student experiences and did not directly measure objective competency outcomes.

CONCLUSION

Undergraduate medical students generally report positive experiences with Competency-Based Medical Education. They value early clinical exposure, skill-based learning, integrated teaching, communication training, formative assessment, and feedback. CBME is perceived as more clinically relevant and practical than traditional teaching approaches.

However, successful implementation requires addressing key challenges such as increased workload, unclear assessment methods, inconsistent faculty implementation, logbook burden, limited orientation, and inadequate feedback. CBME should be implemented as a structured, learner-centered, and continuously monitored educational reform. Strengthening student orientation, faculty development, assessment transparency, feedback quality, and documentation systems can improve student experiences and enhance the effectiveness of CBME in undergraduate medical education.

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