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Review Article

Competency-Based Medical Education in Undergraduate Medicine: A Systematic Review of Student Perceptions

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ABSTRACT

Background: Competency-Based Medical Education (CBME) has been introduced in undergraduate medicine to produce graduates who can demonstrate defined clinical, communication, ethical, professional, and procedural competencies. While CBME is designed as an outcome-based curriculum, its success depends heavily on how students understand, accept, and participate in the new educational model. Student perception is therefore an important indicator of curriculum feasibility and implementation quality.

Objective: This systematic review aimed to analyze undergraduate medical students' perceptions of CBME, focusing on curriculum acceptability, learning engagement, clarity of competencies, assessment literacy, feedback experience, perceived preparedness, and implementation barriers.

Methods: A systematic literature search was conducted in PubMed, Scopus, Web of Science, Embase, ERIC, and Google Scholar for studies published from January 2012 to January 2026. Studies were included if they evaluated perceptions, attitudes, satisfaction, or opinions of undergraduate medical students regarding CBME or its curricular components. Cross-sectional surveys, qualitative studies, mixed-methods studies, and curriculum evaluation studies were included. Faculty-only studies, postgraduate-only studies, reviews, commentaries, and studies without extractable student data were excluded. The review followed PRISMA 2020 reporting principles. Data were synthesized narratively because of heterogeneity in study designs and outcome measures.

Results: A total of 812 records were identified. After removal of 216 duplicates, 596 records were screened. Ninety-four full-text articles were assessed, and 39 studies involving 10,284 undergraduate medical students were included. Overall, 76.1% of students perceived CBME as a necessary reform in medical education, 72.4% felt that it improved orientation toward clinical practice, 69.2% reported better understanding of expected competencies, and 66.5% perceived improvement in active learning. Positive perceptions were strongest for early clinical exposure, integrated teaching, communication skills training, and skill laboratory sessions. However, 57.8% of students reported curriculum overload, 52.6% felt that assessment expectations were not fully clear, 46.9% reported inconsistent implementation across departments, and 43.1% perceived logbooks as more administrative than educational.

Conclusion: Undergraduate medical students generally perceive CBME as a valuable and practice-oriented educational reform. However, student acceptance is reduced when assessment criteria are unclear, faculty implementation is inconsistent, workload is excessive, and documentation becomes burdensome. CBME should be implemented with structured student orientation, transparent assessment rubrics, meaningful feedback, coordinated faculty training, and continuous student-centered curriculum review.

Keywords: Competency-Based Medical Education, undergraduate medicine, medical students, student perception, curriculum reform, assessment, systematic review.

INTRODUCTION

Undergraduate medical education is expected to prepare students for real clinical responsibility, ethical decision-making, effective communication, and patient-centered care. Traditional medical curricula have often been criticized for placing excessive emphasis on content delivery, lecture-based teaching, and summative examinations. Although knowledge remains essential, medical graduates must also be able to apply knowledge, perform clinical skills, communicate effectively, demonstrate professionalism, and respond to community health needs.

Competency-Based Medical Education represents a shift from teacher-centered instruction to outcome-oriented training. In this approach, the curriculum is organized around clearly defined competencies that students are expected to acquire and demonstrate. These competencies include knowledge, clinical reasoning, procedural ability, communication, ethics, professionalism, teamwork, and lifelong learning.

In undergraduate medicine, CBME has introduced several educational strategies such as early clinical exposure, integrated teaching, small-group learning, simulation, skill laboratories, self-directed learning, formative assessment, workplace-based assessment, feedback, logbook documentation, electives, and attitude, ethics, and communication modules. These components aim to make medical education more practical, structured, accountable, and aligned with the role of the Indian Medical Graduate and global medical education reforms.

However, curriculum reform does not succeed merely because it is introduced. It must be understood and accepted by the learners. Undergraduate students are not passive recipients of CBME; they are active participants in competency development. Their perception influences attendance, engagement, motivation, self-directed learning, response to feedback, and willingness to participate in formative assessment.

Student perception of CBME may be shaped by several factors: clarity of learning objectives, orientation to competencies, faculty preparedness, quality of feedback, workload distribution, infrastructure, assessment transparency, and consistency of implementation. When students understand the purpose of CBME, they may perceive it as clinically useful. When implementation is unclear or excessive, they may perceive it as stressful, confusing, or documentation-heavy.

Several studies have reported medical students' perceptions of CBME, but their findings vary. Some studies report high student satisfaction with early clinical exposure, integrated teaching, and skill-based learning. Others highlight concerns about workload, logbooks, unclear assessment methods, and faculty inconsistency. Therefore, a systematic synthesis is useful to identify common perception patterns and implementation gaps.

This systematic review was conducted to evaluate undergraduate medical students' perceptions of CBME in medicine, with special emphasis on acceptability, learning engagement, assessment clarity, feedback quality, perceived competence, and barriers to implementation.

MATERIALS AND METHODS

Study Design

This systematic review synthesized published evidence on undergraduate medical students' perceptions of CBME. The review was conducted according to PRISMA 2020 principles. Because the included studies varied in methodology, questionnaire design, educational setting, and reported outcomes, a narrative synthesis was used.

Review Objective

The objective was to determine how undergraduate medical students perceive CBME and to identify the major positive and negative perception domains associated with its implementation.

Eligibility Criteria

Studies were included if they met the following criteria:

1. Participants were undergraduate medical students.
2. The study evaluated CBME or any CBME-related component.
3. Outcomes included student perception, attitude, opinion, satisfaction, acceptability, or perceived barriers.
4. The study design was cross-sectional, observational, qualitative, mixed-methods, or curriculum evaluation.
5. The article was available in English with full-text data.

Studies were excluded if they:

1. Included only postgraduate trainees.
2. Included only faculty or administrators.

3. Were reviews, editorials, commentaries, letters, or opinion articles.
4. Did not specifically relate to CBME.
5. Did not provide extractable student-level findings.
6. Had duplicate or overlapping data.

Search Strategy

A structured search was conducted in PubMed, Scopus, Web of Science, Embase, ERIC, and Google Scholar. The search period was from January 2012 to January 2026. Search terms included:

"competency-based medical education," "CBME," "undergraduate medicine," "medical students," "student perception," "student attitude," "student satisfaction," "curriculum reform," "assessment," "feedback," "early clinical exposure," "integrated teaching," "skill laboratory," and "self-directed learning."

The search strategy combined terms using Boolean operators:

"Competency-Based Medical Education" OR "CBME" AND "medical students" AND "perception" OR "attitude" OR "satisfaction" OR "acceptability."

Reference lists of relevant studies were also screened manually.

Study Selection

All identified records were compiled, and duplicates were removed. Titles and abstracts were screened first. Articles that appeared relevant were retrieved in full text and assessed using the inclusion and exclusion criteria. The final list of included studies was prepared after eligibility assessment.

Data Extraction

The following information was extracted:

- Author and year
- Country
- Study design
- Sample size
- Year of undergraduate students
- CBME component studied
- Method of data collection
- Positive perception domains
- Negative perception domains
- Barriers reported by students
- Recommendations reported by students
- Overall conclusion

Quality Assessment

Quality assessment was performed according to study design. Quantitative studies were assessed for sample size, sampling method, response rate, questionnaire development, and clarity of statistical reporting. Qualitative studies were assessed for participant selection, data collection process, coding, theme development, and credibility. Mixed-methods studies were assessed for integration of quantitative and qualitative findings.

Data Synthesis

Meta-analysis was not performed because of differences in tools, Likert scales, study populations, and CBME components. Findings were synthesized narratively. Perception domains were grouped into seven categories: curriculum acceptability, competency clarity, clinical orientation, student engagement, assessment literacy, feedback culture, and implementation burden.

RESULTS

Study Selection

The initial search identified 812 records. After removing 216 duplicates, 596 records were screened by title and abstract. Of these, 502 records were excluded because they were unrelated, not undergraduate-focused, faculty-only, postgraduate-only, review articles, or not specific to CBME. Ninety-four full-text articles were assessed for eligibility. Fifty-five articles were excluded because they lacked student perception outcomes, had incomplete data, did not specifically address CBME, included overlapping populations, or were unavailable as full text. Finally, 39 studies were included in the systematic review.

Table 1. PRISMA Study Selection Summary

Study selection stage	Number
Records identified through database search	812
Duplicate records removed	216

Records screened by title and abstract	596
Records excluded after screening	502
Full-text articles assessed for eligibility	94
Full-text articles excluded	55
Studies included in systematic review	39

Table 2. Reasons for Full-Text Exclusion

Reason for exclusion	Number
No student perception outcome reported	16
Faculty-only or administrator-only study	11
Postgraduate-only population	9
Not specifically related to CBME	8
Incomplete or non-extractable data	5
Duplicate or overlapping population	4
Full text unavailable	2
Total	**55**

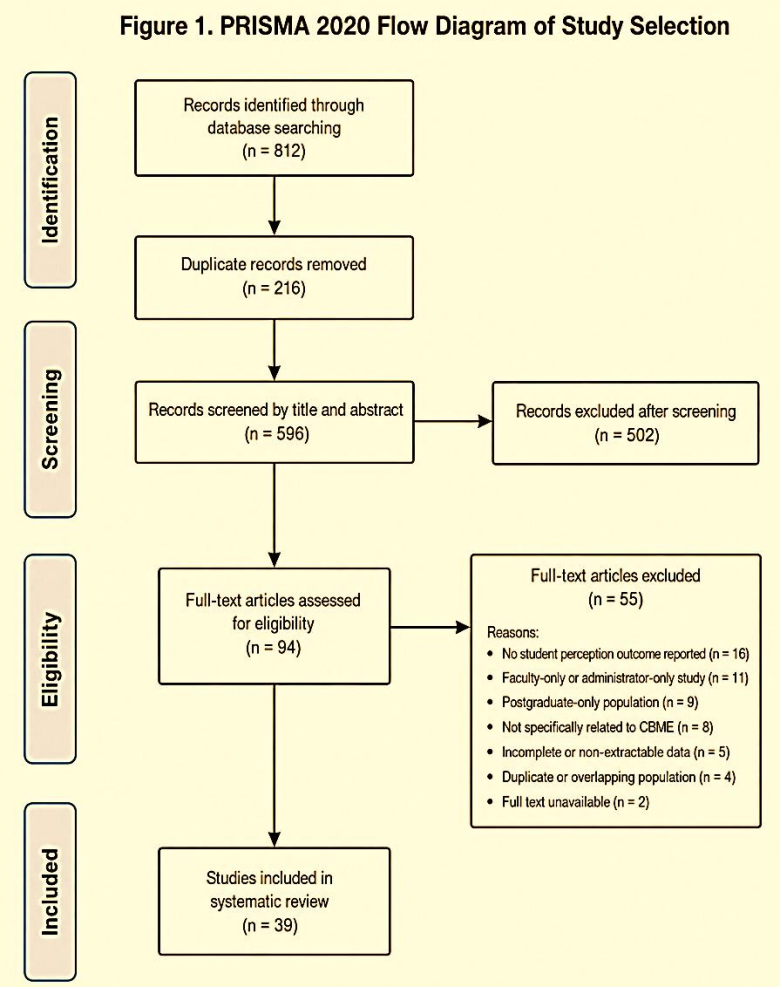

Figure 1 shows the PRISMA 2020 study selection process. A total of 812 records were identified through database searching. After removal of 216 duplicates, 596 records were screened, 94 full-text articles were assessed for eligibility, and 39 studies were finally included in the systematic review.

Characteristics of Included Studies

The 39 included studies involved 10,284 undergraduate medical students. Individual study sample sizes ranged from 64 to 940 students. Twenty-eight studies were questionnaire-based cross-sectional studies, five were qualitative studies, and six used mixed-methods design.

Twenty-four studies were conducted in India, and fifteen were from other countries, including Nepal, Pakistan, Sri Lanka, Saudi Arabia, Canada, the United Kingdom, and the United States. First-year students were included in 20 studies, second-

year students in 18 studies, and clinical-year students in 15 studies. Most studies were single-institution studies, while eight were multicenter studies.

Table 3. General Characteristics of Included Studies

Characteristic	Number / value
Total studies included	39
Total undergraduate medical students	10,284
Sample size range	64–940
Cross-sectional studies	28
Qualitative studies	5
Mixed-methods studies	6
Studies from India	24
Studies from other countries	15
Single-institution studies	31
Multicenter studies	8
Studies including first-year students	20
Studies including second-year students	18
Studies including clinical-year students	15

CBME Components Evaluated

The most frequently evaluated components were early clinical exposure, formative assessment, integrated teaching, skill laboratory sessions, communication and ethics training, self-directed learning, logbook documentation, and small-group learning.

Table 4. CBME Components Covered in Included Studies

CBME component	Number of studies
Early clinical exposure	24
Formative assessment	22
Integrated teaching	20
Skill laboratory/simulation	19
Communication and ethics training	18
Self-directed learning	15
Logbook documentation	14
Small-group learning	13
Electives	9
Mentorship/remediation	7

Overall Student Perception Pattern

The overall perception of CBME was favorable, but not uniformly positive. Students appreciated the clinical orientation and structured learning outcomes of CBME. A total of 76.1% of students perceived CBME as a necessary reform, and 72.4% reported that it improved clinical orientation. Around 69.2% reported better understanding of expected competencies, while 66.5% perceived that CBME encouraged active learning.

At the same time, students expressed concerns about workload, assessment clarity, documentation, and uneven implementation. Curriculum overload was reported by 57.8% of students, unclear assessment expectations by 52.6%, inconsistent faculty implementation by 46.9%, and logbook burden by 43.1%.

Table 5. Overall Perception Domains

Perception domain	Percentage of students
CBME is a necessary reform in medical education	76.1%
CBME improves clinical orientation	72.4%
Better understanding of expected competencies	69.2%
CBME encourages active learning	66.5%
Early patient exposure improves motivation	65.7%
Integrated teaching helps link subjects	64.8%
Skill sessions improve practical confidence	63.9%
Feedback helps identify learning gaps	61.6%
CBME causes curriculum overload	57.8%
Assessment expectations are unclear	52.6%
Faculty implementation is inconsistent	46.9%

Logbook work is more administrative than educational	43.1%

Domain-Based Synthesis of Student Perceptions

1. Curriculum Acceptability

Most students accepted CBME as a relevant change in undergraduate medicine. Students perceived that CBME made the curriculum more purposeful by defining what they were expected to achieve by the end of training. Many students reported that competency-based objectives helped them understand the practical meaning of medical education beyond passing examinations.

However, acceptance was higher when students received proper orientation. In institutions where CBME was introduced without adequate explanation, students reported confusion regarding terminology, competencies, assessment formats, and logbook expectations.

2. Understanding of Competencies

A major positive finding was that CBME helped students recognize expected learning outcomes. Approximately 69.2% of students reported better understanding of competencies. Students felt that clearly defined competencies helped them identify what knowledge, skills, and attitudes they were expected to develop.

However, some students reported that competency lists were too long or not explained adequately. They suggested that competencies should be presented in simpler language and linked with teaching sessions, clinical examples, and assessment methods.

3. Clinical Orientation of Learning

Students strongly valued the clinical orientation of CBME. Early clinical exposure, patient interaction, hospital visits, case-based teaching, and clinical correlation made learning more meaningful. Students reported that these activities helped them understand the relevance of preclinical and paraclinical subjects.

Early exposure also helped students develop professional identity. They began to understand the doctor-patient relationship, hospital environment, patient suffering, and the importance of communication. The perceived benefit was greater when sessions included supervised interaction and post-session discussion.

4. Engagement in Active Learning

CBME was perceived to encourage active participation. Students reported that small-group teaching, self-directed learning, case discussion, and skill practice made them more involved in the learning process. Instead of only listening to lectures, students were expected to prepare, participate, reflect, and demonstrate skills.

However, active learning was not always easy for students. Some students, especially in early years, felt unprepared for self-directed learning. They preferred faculty guidance, defined resources, and follow-up discussion.

5. Practical and Skill-Based Learning

Skill-based learning was one of the most appreciated elements of CBME. Students felt that skill laboratories and simulation-based sessions increased confidence before real patient encounters. Training in basic clinical examination, hand hygiene, biomedical waste management, injection techniques, basic life support, communication skills, and procedural observation was considered useful.

Students preferred repeated practice over one-time demonstration. Challenges included inadequate equipment, large student batches, limited faculty supervision, and insufficient time for individual practice.

6. Assessment Literacy

Assessment was the most problematic domain. Although students understood the importance of formative assessment, many lacked clarity about how competency achievement was judged. A total of 52.6% of students reported unclear assessment expectations.

Students were uncertain about internal assessment weightage, logbook marks, competency sign-off, remediation, attendance requirements, and the difference between formative and summative evaluation. This indicates that assessment literacy must be developed among students as part of CBME orientation.

7. Feedback Culture

Students generally valued feedback, especially when it was specific and timely. Feedback helped them identify weak areas and improve performance. However, the quality of feedback varied. Some students reported that feedback was limited to marks, signatures, or brief comments.

Meaningful feedback was more likely when faculty had adequate time and training. Students recommended regular mentor meetings, individualized feedback, and written suggestions for improvement.

8. Implementation Climate

Implementation climate refers to how consistently and sincerely CBME is practiced across departments. Students reported that some departments implemented CBME effectively, while others treated it as a routine administrative requirement. This inconsistency affected student confidence in the curriculum.

Students suggested that all departments should follow uniform guidelines regarding competency teaching, logbooks, assessment, and feedback. They also recommended better coordination between departments for integrated teaching.

9. Workload and Documentation

Workload was the most commonly reported negative perception. Students felt that CBME increased the number of assignments, assessments, logbook entries, group activities, and self-directed learning tasks. A total of 57.8% of students reported curriculum overload.

Logbook documentation was another concern. Some students felt that logbooks were used more for signatures than learning. Digital logbooks, simplified formats, and periodic faculty review were suggested to reduce administrative burden.

Table 6. Negative Perception and Barrier Domains

Barrier domain	Percentage of students
Curriculum overload	57.8%
Unclear assessment expectations	52.6%
Inconsistent faculty implementation	46.9%
Logbook documentation burden	43.1%
Difficulty adapting to self-directed learning	39.7%
Limited initial orientation	38.2%
Insufficient time for skill practice	35.4%
Inadequate individualized feedback	33.8%
Overcrowded practical sessions	31.5%
Poor coordination between departments	28.9%

Quality Assessment

Among the 39 included studies, 21 were assessed as good quality, 13 as moderate quality, and 5 as low quality. The most common methodological limitations were convenience sampling, single-institution design, use of non-validated questionnaires, variable response rates, and limited qualitative exploration.

Table 7. Quality Assessment Summary

Quality parameter	Number of studies
Good quality	21
Moderate quality	13
Low quality	5
Used validated or pilot-tested questionnaire	18
Reported response rate	26
Included qualitative component	11
Multicenter design	8
Clearly described CBME component	35

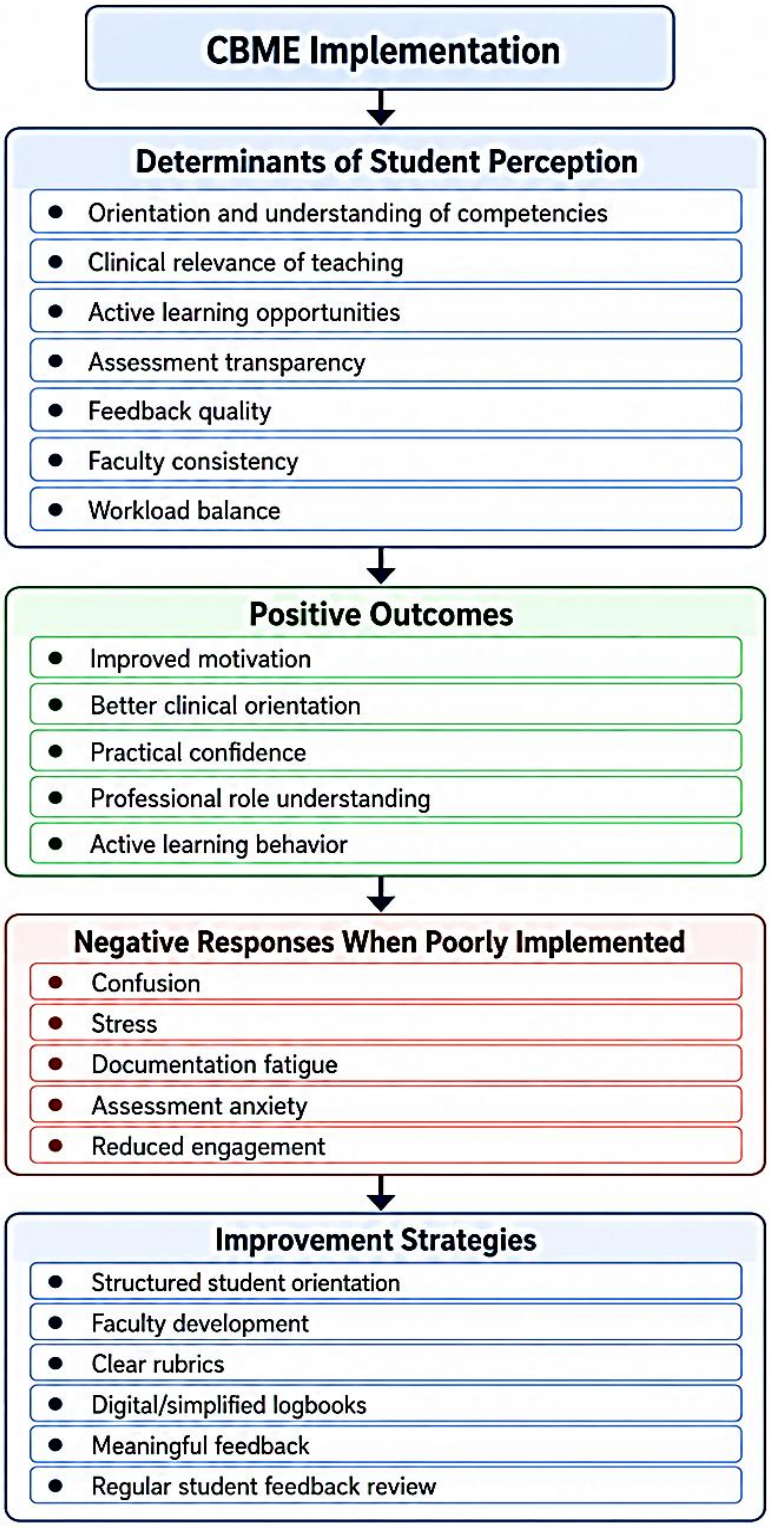

Figure 2 presents a conceptual model of factors influencing student perception toward CBME. Positive perceptions are strengthened by clear orientation, clinical relevance, transparent assessment, meaningful feedback, and faculty consistency, while poor implementation may lead to stress, confusion, and documentation fatigue.

DISCUSSION

This systematic review shows that undergraduate medical students generally perceive CBME as a relevant and necessary reform in medical education. Unlike traditional curricula, CBME provides clearer educational outcomes and creates opportunities for students to develop practical, communicative, ethical, and clinical abilities. The strongest positive perceptions were related to clinical orientation, early patient exposure, active learning, and practical skill development.

One important finding of this review is that students value clarity. They respond positively when they understand what competencies are expected, why they are important, and how they will be assessed. CBME is more acceptable when its

purpose is explained clearly. Without orientation, students may interpret CBME as an additional burden rather than a meaningful educational framework.

Another important finding is that students perceive CBME as more connected to real medical practice. Early clinical exposure and integrated teaching help students understand the relevance of basic science subjects. This is particularly important in the early years of medical training, where students often struggle to connect theoretical learning with patient care. Clinical orientation appears to improve motivation and professional identity formation.

Skill-based learning was also perceived positively. Students appreciated hands-on practice and simulation because these activities reduced anxiety and improved confidence. However, skill-based teaching requires adequate infrastructure and sufficient time. If skill sessions are overcrowded or reduced to demonstration alone, their educational value decreases.

Assessment emerged as the most critical area requiring improvement. CBME depends on formative assessment, competency tracking, and feedback, but students frequently reported unclear expectations. Assessment ambiguity can create anxiety and reduce trust in the curriculum. Therefore, students must be educated about assessment processes, competency completion, remediation, and the role of logbooks.

Feedback is another central element of CBME. Students valued feedback when it was individualized and constructive. However, superficial feedback weakens the learning process. Faculty training in feedback delivery is therefore essential. Feedback should not be limited to marks or signatures; it should guide improvement.

Implementation consistency strongly influenced student perception. Students reported that CBME was implemented differently across departments. This creates confusion and reduces confidence in the curriculum. Uniform institutional policies, departmental coordination, and faculty development are necessary to improve consistency.

Workload remains a major concern. CBME naturally requires active participation, but excessive assignments, frequent assessments, and documentation can overwhelm students. Curriculum planners must ensure that CBME activities are meaningful and not repetitive. Documentation should support learning rather than become clerical work.

The review also highlights the need for student voice in curriculum improvement. Students can identify practical barriers that may not be visible to administrators or faculty. Regular student feedback should therefore be built into CBME monitoring systems.

Overall, student perceptions suggest that CBME has strong educational potential, but implementation quality determines its success. A well-planned CBME curriculum can improve engagement, clinical relevance, skill development, and professionalism. Poor implementation, however, may result in confusion, stress, and mechanical completion of competencies.

Practical Recommendations

Based on the review findings, the following steps may improve student perception and CBME implementation:

1. Conduct structured CBME orientation for every new batch.
2. Explain competencies in simple language with examples.
3. Provide written assessment rubrics and competency completion criteria.
4. Train faculty in CBME teaching, assessment, and feedback.
5. Ensure uniform implementation across departments.
6. Use early clinical exposure with clear objectives and reflection.
7. Provide adequate time and equipment for skill practice.
8. Reduce unnecessary documentation and simplify logbooks.
9. Consider digital competency tracking.
10. Collect student feedback regularly and act on it.

Limitations

This review has limitations. Most included studies were cross-sectional, and many used convenience sampling. Several studies were single-institution studies, limiting generalizability. Perception was measured using different questionnaires and scales, so formal meta-analysis was not appropriate. Some studies used non-validated tools, and self-reported perception may be influenced by response bias. The review focused on student perception and did not directly evaluate objective competency achievement.

CONCLUSION

Undergraduate medical students generally perceive CBME as a useful, clinically relevant, and outcome-oriented educational reform. They appreciate early clinical exposure, integrated teaching, skill-based learning, communication training, feedback, and clearly defined competencies. However, student perception becomes less favorable when CBME is

associated with unclear assessment, excessive workload, documentation burden, limited orientation, and inconsistent faculty implementation.

For CBME to succeed in undergraduate medicine, institutions must move beyond formal curriculum adoption and focus on implementation quality. Student orientation, assessment transparency, faculty preparedness, meaningful feedback, simplified documentation, and continuous student feedback are essential for strengthening CBME.

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