

Original article

Development of a Hybrid CBME Model through identifying structural gaps in CBME and implementing Mitigation Strategies

¹Pooja Reddy, ²Dr. Vedprakash Mishra

¹Professor & Head, Department of Clinical Pharmacology, Sri Aurobindo Medical College & Postgraduate Institute, Madhya Pradesh, Indore

²Chancellor, Krishna Institute of Medical Sciences (Deemed University), Karad

Pro-Chancellor, Datta Meghe Institute of Medical Sciences (Deemed University), Nagpur

Honorary Director, Centre for Health Sciences Education Policy and Planning, DMIMS(DU), Nagpur

Corresponding Author: Dr. Pooja Reddy



Abstract

Background- Competency-Based Medical Education (CBME) was introduced in India to transform undergraduate medical education by emphasizing clearly defined competencies, learner-centered training, and outcome-based education. Although the existing CBME curriculum provides a structured framework for competency acquisition, concerns remain regarding its structural organization, longitudinal integration, progressive competency development, interdisciplinary orientation, and alignment with the objectives and desired attributes of the Indian Medical Graduate.

Objectives- To critically review the CBME curriculum document for its structural alignment with the intended objectives and graduate attributes, identify existing structural gaps, propose suitable mitigation strategies, and develop a Hybrid CBME Model that addresses these deficiencies.

Methods- A qualitative document-based study was conducted using the Competency-Based Undergraduate Curriculum and the Graduate Medical Education Regulations as the primary source documents. The structural organization of the curriculum was systematically analyzed to determine its alignment with the intended graduate roles, competencies, and educational objectives. Identified structural deficiencies were examined, appropriate mitigation strategies were proposed, and these strategies were integrated to develop a comprehensive Hybrid CBME Model.

Results- The analysis demonstrated that the present CBME curriculum is strongly oriented toward developing the role of a competent clinician. However, comparatively limited emphasis was observed on nurturing higher-order competencies such as critical thinking, research aptitude, leadership, health system orientation, and lifelong learning. Likewise, the objectives related to compassion, professionalism, confidence, interdisciplinary collaboration, and progressive learner autonomy were found to be inadequately represented because of insufficient longitudinal integration, fragmented competency progression across phases, and limited opportunities for authentic workplace-based learning. Targeted mitigation strategies, including enhanced longitudinal integration, progressive competency mapping, interdisciplinary learning experiences, structured research exposure, leadership development, and graduated clinical responsibility, were incorporated to formulate a Hybrid CBME Model with improved structural alignment.

Conclusion- The review identified several important structural limitations within the current CBME framework. The proposed Hybrid CBME Model, developed through systematic incorporation of evidence-informed mitigation strategies, offers a more integrated, competency-oriented, and learner-centered curriculum that better aligns with the intended graduate attributes and evolving healthcare needs of society. Further multicentric implementation studies are required to evaluate its feasibility, effectiveness, and adaptability across diverse educational and sociocultural settings.

Keywords: Competency-Based Medical Education (CBME), Undergraduate Medical Education, Hybrid CBME Model, Curriculum Reform, Graduate Attributes, Structural Gaps, Longitudinal Integration, Medical Education.

Introduction

Over a period of time, Competency-Based Medical Education has evolved in its focus from the previous "Time based learning" to an "Outcome oriented" structure. Through the various listed competencies, the CBME makes sure that the IMG acquires knowledge, skills, attitude and a professional behaviour- thereby making him an effective clinical practitioner (1,2). Year 2019, saw the introduction of various naïve but pertinent and hallmark concepts of structured competencies, skill based training, early clinical exposure and an assessment system based on acquiring competencies. CBME could imbibe all these components

well weaved within the inclusions (3). Medical education systems have continuously evolved over time; in this context, it was considered valuable to undertake a structured and reflective analysis of the current CBME framework with respect to its structural inclusions and overall organization. While CBME incorporates several progressive components, its overall architecture reflects few inadequacies in integration, continuity, and alignment across domains. Educational effectiveness depends not only on the presence of components but also on how coherently they are organized and interconnected (4).

The objectives of undergraduate medical education - Competence, Confidence, Concern, and Compassion serve as foundational pillars for developing a well-rounded graduate. Similarly, the attributes of the Indian Medical Graduate (IMG), including clinician, communicator, leader, professional, lifelong learner, critical thinker, and researcher, define expected outcomes (3). However, existing literature suggests that while clinical competence is strongly represented, higher-order competencies and non-clinical attributes remain inconsistently integrated (5,6). These observations bring out the presence of structural gaps within the CBME framework, particularly related to fragmentation, lack of longitudinal integration, and limited linkage to real-world settings. Addressing these gaps requires structural refinement rather than randomly spread modifications.

As such, the present study undertakes a systematic, comprehensive structural analysis of CBME to identify structural gaps in relation to its objectives and attributes as against curricular contents incorporated therein. Based on this analysis, targeted mitigation strategies are proposed, culminating in the development of a Hybrid CBME Model designed to enhance integration, continuity, and functional alignment as a part of abridgment of the identified structural gaps.

Methodology

Study Design

This qualitative analytical study employed a document-based approach to examine the structural organization of the CBME framework (7). A design-based methodology was used, involving structural appraisal, gap identification, mitigation strategies and model development.

Data Sources

Primary sources included the CBME curriculum and GMER documents notified by the National Medical Commission, New Delhi. Secondary sources included peer-reviewed literature and global frameworks on medical education.

Study Procedure

The study was conducted in four sequential analytical phases:

1. Structural appraisal of CBME
2. Identification of structural gaps
3. Proposing mitigation strategies
4. Development of Hybrid CBME Model

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee and the Doctoral Research Committee. As the study involved analysis of publicly available documents, no human participants were included. (Ref.No. DMIMD(DU)/IEC/2021/328)

Results

Structural Alignment with respect to Objectives of CBME (Table 1)

The structural alignment of inclusions of CBME with the listed objectives of Competence, confidence, concern and compassion showed variability across the inclusions. Of the four objectives, *Competence* had the strongest alignment by getting represented by competencies, assessment system, skill training and early clinical exposure. Still there was a limitation towards longitudinal integration and higher order competencies.

Confidence also seemed aligned with the competencies, albeit partially. Even though, there were elements suggesting skill acquisition learning but a structured route towards autonomy was lacking. *Concern* and *Compassion* were only scantily represented through the inclusion of AETCOM and foundation course, but

again there was a major absence of longitudinal integration and repetitive reinforcement – making the CBME document inconsistently aligned towards the objectives.

TABLE 1: Structural Adequacy of CBME with its Objectives

Objective	Structural Observation	Observations
Competence	Adequate	Demonstrates comprehensive structural representation
Confidence	Partial	Lacks explicit structural pathways for progressive autonomy
Concern	Limited	Lacks longitudinal incorporation and explicit linkage with competency progression.
Compassion	Limited	Lacks longitudinal incorporation and explicit linkage with competency progression.

Structural Alignment with respect to Attributes of CBME (Table 2)

Of all the attributes, the attribute of clinician demonstrated the strongest alignment with the inclusions of CBME. Through modules of various clinical competencies, structured clinical postings, diagnostic and integrated management training, the attribute of clinician reflected consistently well across various inclusions. The attribute of communicator and professional demonstrated only partial alignment though the AETCOM module but felt limited due to lack of vertical integration and recurrent reinforcements.

The rest of the attributes viz. Leader, lifelong learner, critical thinker and researcher had only limited integration due to a lack of a structured framework and an absence of integration strategy across longitudes.

Table 2: Structural Adequacy of CBME with its Attributes

Attribute	Structural Observation	Observations
Clinician	Adequate	Demonstrates strong structural representation through well-defined clinical competencies, structured clinical postings, and integrated diagnostic and management training
Communicator	Partial	Structured communication training present through AETCOM; however, lacks uniform integration and reinforcement across phases and disciplines
Leader	Limited	Leadership competencies, team dynamics, and health system coordination are not explicitly structured, with only implicit or minimal representation
Professional	Partial	Ethics and professional behaviour are included, but lack explicit linkage with competency progression and longitudinal reinforcement
Lifelong learner	Limited	Self-directed learning is included, but absence of structured reflective practice and longitudinal learning framework limits development
Critical thinker	Limited	Problem-based elements exist but lack a formal analytical and decision-making framework for structured development of critical thinking
Researcher	Limited	Research exposure is minimal, with absence of structured research methodology training and longitudinal integration within curriculum

Synthesis of Structural Gaps and Mitigation Strategies in Relation to Objectives of CBME (Table 3)

An attempt was made to identify the structural gaps within the CBME document in relation to attainment of the objectives of the CBME. Later related mitigation strategies were also identified to fill in these gaps. As previously suggested, *competence* was strongly represented through the inclusions of competencies, skill training, assessment based on competencies and early clinical exposure. However, there was a limitation towards higher order learning and cohesiveness. This structural gap can be mitigated by including higher order analytical competencies in the current competency structure.

The objective of *Confidence* was marked by lack of progression towards the learners' autonomy which can be mitigated through a structure targeting learners' autonomy with a defined levels of responsibilities- thereby leading to confidence building.

The deficits in the objective of *Concern* and *Compassion* were also likewise mitigated through community and public health engagements across all phases and implementing the principles of AETCOM cohesively and persistently across the phases of learning. These mitigation strategies would ensure a more holistic attainment of objectives of the CBME.

Table 3: Identification of structural gaps in CBME and probable mitigation strategies towards attainment of Objectives of CBME

Domain	CBME Inclusions	Identified Structural Gap	Structural Mitigation Strategy	Expected Structural Outcome
Competence	Competencies, Skill Training, CBA, ECE, Integration	Limited higher-order and cohesive learning	Introduction of competency framework integrating higher order analytical competencies	Continuous and holistic competency development
Confidence	ECE, Skill Training, Formative Assessment	Absence of structured progression towards learners' autonomy	Development of staged competency progression with defined levels of responsibility and learners' autonomy	Gradual and consistent confidence building
Concern	Foundation Course, ECE, Electives	Episodic and fragmented community exposure	Integration of longitudinal community and public health engagement across phases	Sustained development of social accountability
Compassion	AETCOM	Standalone module with limited reinforcement	Embedding AETCOM principles across clinical training and assessment systems	Continuous reinforcement of empathy and ethics

Structural Gaps and Mitigation Strategies in Relation to Attributes of CBME (Table 4)

The gaps in the CBME in context to the attainment of its attributes were also identified. Further mitigation strategies were identified to align the inclusions with the listed attributes. For the attribute of the *clinician*, a broader clinical perspective was sought through incorporating system based practice and introducing inter disciplinary competencies. The inclusions would be more aligned towards attribute of *communicator* and *leader* on introduction of communication training and structured modules towards leadership and team roles, across various phases of learning.

Table 4 illustrates the structural gaps in CBME with respect to the attributes of the Indian Medical Graduate and outlines targeted mitigation strategies. While the clinician attribute is well supported through clinical competencies and training, it remains predominantly focused on individual patient care, with limited incorporation of system-based and interdisciplinary perspectives. Communication and professionalism are addressed through AETCOM and clinical exposure but lack longitudinal reinforcement. Leadership, critical thinking, and research demonstrate significant structural deficiencies due to the absence of explicit frameworks. Lifelong learning, though supported through self-directed learning, lacks structured progression. The proposed strategies emphasize integration of these competencies into the core curriculum through structured frameworks, longitudinal reinforcement, and alignment with clinical practice, ensuring balanced development across all attributes.

Table 4: Structural Gaps and Mitigation Strategies in CBME with Reference to Attributes of CBME

Domain	CBME Inclusions	Identified Structural Gap	Structural Mitigation Strategy	Expected Structural Outcome
Clinician	Skill Training, ECE, CBA, Integration	Limited system and interdisciplinary orientation	Incorporation of system-based practice and interdisciplinary competencies	Broader clinical perspective
Communicator	AETCOM	Lack of contextual and reflective practices	Integration of communication training across clinical postings and assessments	Context-specific communication skills
Leader	No explicit inclusion	Absence of leadership development framework	Introduction of structured leadership modules and team-based roles	Development of leadership competencies
Professional	AETCOM, Clinical Exposure	Implicit learning without structured reinforcement	Explicit incorporation of professionalism within curriculum and assessments	Consistent professional behaviour
Lifelong Learner	Logbook, SDL	Lack of structured progression	Development of longitudinal self-directed learning framework with reflection and feedback	Sustained learning orientation
Critical Thinker	Implicit (case discussions)	Absence of analytical competency	Integration of structured analytical and	Enhanced reasoning and problem-solving

		framework	decision-making competencies	
Researcher	Electives	Not part of core curriculum	Inclusion of structured research training within core curriculum	Development of research oriented curriculum

Table 5: Structural Transformation of CBME into a Hybrid CBME Model: Proposed Framework

Dimension	Existing CBME Structure	Hybrid CBME Model
Competence (including higher-order competencies)	Phase-based, fragmented	Establish a longitudinal competency framework integrating core clinical and higher-order competencies, supported by phased milestones, case-based learning, and continuous workplace-based assessment.
Confidence	Implicit	Implement staged progression of learner autonomy using defined levels of responsibility (e.g., supervised → assisted → independent tasks), supported by formative feedback and entrustment-based assessments.
Concern (Community Orientation)	Episodic	Introduce longitudinal community engagement programs with repeated field exposure, integration with clinical subjects, and assessment linked to public health competencies and social accountability.
Compassion (AETCOM)	Standalone	Integrate AETCOM principles into routine clinical teaching, case discussions, and assessments, with reflective exercises, patient narratives, and evaluation of empathy and ethical decision-making in real scenarios.
Clinical Training	Individual-focused	Incorporate system-based practice by linking clinical learning with healthcare delivery systems, multidisciplinary team exposure, referral pathways, and resource management training.
Leadership	Absent	Introduce structured leadership modules including team-based activities, student-led clinical responsibilities, decision-making exercises, and participation in healthcare management tasks.
Communication	Module-based	Reinforce communication skills across all clinical postings using context-specific scenarios, simulated patient interactions, and continuous assessment through structured tools such as OSCEs.
Professionalism	Implicit	Establish explicit teaching and assessment of professionalism through defined competencies, regular feedback, reflective portfolios, and inclusion in workplace-based assessments.
Lifelong Learning	Limited structure	Develop a structured self-directed learning (SDL) pathway with defined learning goals, guided reflection, mentor feedback, and periodic evaluation of learning strategies and outcomes.
Critical Thinking	Implicit	Integrate structured analytical frameworks through case-based discussions, clinical reasoning exercises, and

		decision-making algorithms, with assessment of reasoning processes rather than only outcomes.
Research	Elective-based	Incorporate mandatory research training within the core curriculum, including research methodology teaching, supervised projects, mentorship, and evaluation of research output or participation.

Development of Hybrid CBME Model (Table 5)

The proposed framework of Hybrid CBME Model and its structural difference from the existing CBME is depicted in Table 5. The change represents a transition from phase-based structure to a framework having higher order competencies, learner autonomy as a progressive competency integrated across all phases.

Instead, then being limited to discrete modules, domains like communication, professionalism, and compassion are integrated throughout clinical training. The model also explicitly integrates leadership and research as fundamental curriculum components and includes system-based clinical training. Together, these changes seek to improve the curriculum's coherence, integration, and functional alignment in a free-flowing, structured way.

Discussion

Till date, Competency Based Medical Education (CBME) has been the most evolved medical education model that our country has adopted. The same came into existence after years of research and contemplation. It certainly incorporates many of the latest concepts of medical education such as AETCOM, early clinical exposure, Competency based learning and assessment techniques based on competencies. However, as evolution is an unending phenomenon, through this study an effort was made to assess the commensuration of the CBME modules with its listed objectives and attributes, to identify the critical structural gaps, possible mitigation strategies and thereby the final outcomes.

While CBME provided a basis for a competency-based approach, there are limitations in terms of its basic structural organization – limiting systematized vertical integration, higher order competencies and system based interdisciplinary learning, etc. The review of the alignment of various competencies with the listed objectives and attributes, suggested that there was a significant priority entrusted to the clinician competence while other objectives and attributes were assigned either limited or partially

The overemphasis on clinical competency was expected as the foundational principles of CBME are focused on outcomes that are well defined, observable and measurable (1,2). However an exclusive or over emphasis on the competency based approach would make the whole approach redundant with respect to higher order competencies, vertical integration, structural cohesiveness, system based practice and interdisciplinary learning (6). Our study resonates with the mentioned literature where these higher order competencies are either addressed in silos or are insufficiently represented in the structural framework.

Harden et al. in his outcome-based education framework has suggested the criticalness of the continuity of learning across phases through a vertical integration. This would ensure a more systematized progressive learning experience (4). In absence of this approach the competencies will be learned in silos and will lack the final outcome of a consolidated learning of knowledge, attitudes and skills. The same deficit was observed in our study where the structural framework lacked vertical integration and continuity across various curricular elements.

An ideal medical education model aims to produce a clinician who is capable of independent practice with able entrustment and responsibilities – qualities which make the clinician ready for the real world clinical settings. Ten Cate also voiced a similar concept though mention of Entrustable Professional Activities (EPAs) where in competency has to walk along the entrustment and responsibility (2). CBME although focuses well on the objective of confidence through competency based learning and assessment, the longitudinal structural integration towards graded autonomy and ability to take clinical responsibility seems to be lacking.

Like in the domains of confidence, the domains of concern and compassion also experience limited alignment with the inclusions of the CBME. The foundational course and AETCOM, to some extents do suffice the alignment, but in absence of the longitudinal continuity, these modules mostly exist in supplementary compartments rather than being an integral part of the curriculum all through (6,7).

Dr. Ved Prakash Mishra has consistently voiced his concerns towards the extension of the current focus of CBME on procedural competencies towards more analytical, ethical and system oriented capabilities to make the current framework integrative and contextually relevant to the societal needs (8). In its current form, the CBME was found to be lacking in these aspects of leadership, research and critical thinking – the qualities which make the IMG adept with the evolving healthcare systems.

In an attempt to fill in the current gaps, the authors propose a Hybrid CBME model – a model which is more structurally advanced by aiming at longitudinal integration, cohesion and continuity, incorporation of Entrustable Professional Activities and with the aims to make the IMG a confident practitioner while being a part of the bigger system. Rather than mere addition of components, the new Hybrid CBME model aims at a comprehensive reorganization of the current CBME aiming to be more aligned with the listed objectives and attributes.

The Hybrid CBME model emphasizes on the acquisition of the competencies in a more structured progressive manner with competencies reinforced continuously across phases. This will lead to a better transition from supervised learning environment to an independent clinical practitioner with acquisition of responsibility and autonomy in a graded manner. The model also emphasizes on the needs of communication, professionalism, compassion across various phases consistently. While the marginalized attributes of leadership, research and critical thinking were highlighted, focus was on developing an medical education model with the essence of system based learning and interdisciplinary competencies as an effort to suffice the evolving real world health care system. By implementing these elements, the Hybrid CBME model builds on the strengths of the existing CBME model and seems to be better aligned with the listed objectives and attributes – thereby providing a more contextually relevant structural framework able to satisfy the current needs of the evolving medical practice.

Conclusion

This study identifies significant structural shortcomings in the CBME model, especially with respect to longitudinal integration, continuity and the incorporation of higher-order competencies. Although the current structure is appropriate for clinical competency, there are few core domains such as critical thinking, system-based practice, leadership and research that are not well incorporated into the curriculum structure.

To address this, the study proposes a Hybrid CBME Model as an improved structural model that reconfigures present elements for greater coherence, continuity and functional alignment. The model provides a new, holistic framework for the advancement of undergraduate medical education that incorporates longitudinal competency development, the structured progression of learner autonomy, and the integration of affective and higher-order domains across clinical training.

The Hybrid CBME Model provides a practical and contextually appropriate way for curricular improvements in the current regulatory environment. Its timely implementation has the potential to enhance the overall effectiveness of CBME by ensuring a judicious balance of competency development that is aligned with real-world healthcare needs. The model is recommended to be empirically validated in different institutional settings.

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