



Implementation and Evaluation of Competency-based Medical Education in Phase I of Undergraduate Medical Curriculum

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Abstract

Introduction: Adaptation to the “Competency-based Medical Education” (CBME) is a major challenge faced by medical colleges all over India. Hence, the present study aimed to evaluate the mechanisms adopted in the process of implementation of CBME in Phase I at our institution.

Methods: In this qualitative study, 12 faculty members including professors, associate professors, assistant professors, and tutors from preclinical departments of the first professional year participated as the study participants. Focus Group Discussion were conducted with the participants regarding the strategies adopted and the challenges faced in implementation of CBME. Gap analysis was done based on the guidelines from CBME modules. In depth interview was conducted with the heads of the pre-clinical departments to propose appropriate action plans. The interviews were audio-recorded and thematic analysis of the transcripts was done.

Results: The crucial areas identified were the implementation of early clinical exposure, AETCOM, integrated, and skill modules during the COVID pandemic. The faculty expressed lack of clarity in designing the sessions for “Self-Directed Learning”. Tapering the content relevant to basic sciences was a major challenge faced in the integrated sessions. The faculty members requested sensitization to different student centric instructional methods for small group teaching and guidelines for valid assessment strategies.

Conclusions: Acquisition of competencies is enhanced by appropriate instructional methods and effective assessment strategies. Frequent and constant hands-on training on the CBME modules through “Faculty Development Programs” plays a crucial role in the successful implementation of CBME.

Keywords: Curriculum, Education, Medical, Undergraduate

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Introduction

With the intention to rise the standards of Indian Medical Graduate and attain the goal of “Health for all”, Medical Council of India (MCI), now known as National Medical Commission (NMC), took a major initiative

in introducing the Competency-based Medical Education (CBME) for the Undergraduate Medical Curriculum in India (1). NMC clearly enunciated the competencies to be attained by an undergraduate medical student to become a globally competent “Indian Medical Graduate”.

CBME is an “Outcome-based Approach”, with emphasis on shared responsibility with learners, adopting student-centric teaching learning methods and inculcating formative assessment as an integral component of the learning process (2). The regulatory body had made appreciable efforts in designing the curriculum with the team of experts and also planning “Training of Trainers” of the faculty from medical colleges all over India, through the “Curriculum Implementation Support Program 1 & 2” (CISPI & II), organized by Nodal/Regional Centers in India.

With this foundation laid by the NMC/MCI, the responsibilities were laid over the medical colleges to successfully implement and run the CBME program. Curricular change is always associated with challenges. Owing to the complexity of CBME, many studies in the past decade brought insights into the foreseen challenges with the implementation of CBME (3-5). However, literature on the process evaluation of the contextualized CBME remains minimal.

Program evaluation plays a major role in enhancing the quality of the services provided and facilitates the attainment of outcomes (6). Literature search has revealed studies that recommend that those involved in health education should systematically evaluate and publish their CBME activities, including assessment-related content and evaluations. The highlighted themes may offer insights into ways in which current CBME assessment practices might be improved to align with efforts to improve health care (7). Planning of evaluation framework through surveys and focus group discussions well in advance with implementation may favour an effective evaluation (4). Process evaluation with the introduction of a curricular reform yields valuable information on the fidelity of the implementation (8, 9). Hence, the present study aimed to evaluate the mechanisms adopted in the process of implementation of CBME in Phase I (First Professional Year) at our institution.

Methods

Study setting: The study was carried out by the Medical Education Unit (MEU) of Sri Manakula Vinayagar Medical College and Hospital, Puducherry. Our institute is a fifteen-year-old institute, affiliated to Puducherry University offering quality medical education to the medical undergraduates and postgraduates.

Study Design: We did a qualitative study with a mixed method of data collection including Focus group discussion (FGD), In-depth interviews (IDI), and Checklist- based evaluation.

Inclusion Criteria: All the preclinical

faculty involved in teaching in the first professional year.

Exclusion Criteria: MEU members, Curriculum committee members.

Hence, twelve Phase I faculty (Faculty of the preclinical departments, excluding the principal investigator) were selected as the study participants.

Sampling: Purposive sampling method was used for recruiting the participants. The faculty members recruited from the preclinical departments were directly involved in the implementation of the curriculum.

Data Collection Methods: Interview guide with probing was used for conducting focus group discussion and in-depth interview. A checklist was designed based on the guidelines of the regulatory body released on the implementation of CBME modules (Framing of objectives for competencies, Active learning strategies, Foundation Course, Attitude, Ethics, Communication Skills Module [AETCOM], Skills Module, Assessment Module, Early Clinical Exposure, Alignment and Integration, Self-directed learning). The checklist was used for gap analysis of the extracted data. The following measures were taken for the quality of data; debriefing was done after each, and IDI and transcripts were analyzed independently by two of the co-authors.

The evaluation plan was presented by the principal investigator to the members of Medical Education Unit (MEU) and Curriculum Committee. It was revised after the suggestions from the members. The final approval was obtained from the Dean. The study was carried out in 5 steps.

Step 1:

Three Focus Group Discussion with 3-5 members in each group were performed with the faculty of all three preclinical departments (Anatomy, Physiology and Biochemistry) regarding the strategies adopted and the challenges faced in the implementation of CBME. Each FGD lasted for 45-60 minutes and was conducted in MEU meeting hall which was convenient for the participants. The discussion was conducted in English by the faculty (the 3rd and 4th author) trained in Qualitative research. FGD was audio-recorded and the transcripts were prepared. The manual content analysis was done, and report was provided by three of the co-investigators trained in qualitative research.

Step 2:

After the FGD, gap analysis was done with

the same participants to evaluate the level of implementation of CBME using the checklist.

Step 3:

The data obtained from the FGD and Gap analysis was triangulated to prepare the evaluation report.

Step 4:

The evaluation report was shared with the heads of the departments in advance, and three IDI were conducted with the heads of the three pre-clinical departments respectively to propose appropriate action plan for the identified gaps in the evaluation report, relevant to their discipline. The evaluation report and proposed action plan was disseminated with all the preclinical faculty.

Step 5:

An action plan review meeting was conducted with the Dean, curriculum committee members, and phase I faculty. The consensus on the final plan of action and the strategies to implement the action plan was reached.

Data Analysis: The manual content analysis was done for the Focus Group Discussion and IDI. The Focus Group Discussions were audio-recorded, and thematic analysis of the transcripts was done. The data were transcribed in English, manually coded, and analysed. The transcript was read multiple times to assimilate the meaning conveyed, identifying similar statements and organizing these statements into themes. This was compared and discussed with the team members and consensus on the theme was finalized. The statements related to challenges faced were categorized into 9 themes. The themes were derived from the components of CBME. Similarly, the statements related to strategies adopted were categorized into 2 themes.

The statements obtained from the checklist were grouped manually by coauthors, and the

duplicates were removed. The statements were finalized after discussion with the team members. They were categorized into 8 gaps grouped under 5 extracted themes.

Similarly, the action plans obtained from IDI was manually analyzed and categorized. The 10 action plans finalized after manual content analysis were grouped under proposed action plans.

Ethical Consideration: Ethical principles such as obtaining consent from the respondents and ensuring confidentiality were considered throughout the study. Ethical approval was obtained from the Institute Ethics Committee (Ref No:EC/102/2021).

Inform Consent: Informed consent was obtained from all the study participants.

Results

Table 1 represents the qualitative data of the study participants.

Table 2 represents the strategies adopted by the institute and the departments in the implementation of CBME. The institute and the departments took measures to comply with the guidelines incorporated by the NMC.

Table 3 represents the challenges faced by the faculty during the implementation of the different components of CBME. COVID Pandemic was an unanticipated challenge faced by the faculty.

Table 4 represents the strategies adopted by the institute and the departments for online teaching, during the COVID pandemic. The institute took measures to provide necessary technical support for the smooth running of online classes for the students. Innovative TL methods and the assessment methods were adopted by the faculty to enhance student engagement even during the lockdown period.

Table 5 represents the gaps identified with implementation of CBME compared with the guidelines of NMC. The gaps were identified for 5 themes obtained from the content analysis. It also

Table 1: Qualitative (FGD and IDI) data

<i>Sample size for data collection</i>	
Tutors	1
Assistant Professor	5
Associate Professor	3
Professor	3
<i>Criteria for selection of study participants</i>	
Place of work	First year faculty, SMVMCH
Experience in teaching	14 - 20 years
Gender	Male (4) and Female (8)
<i>Others</i>	
Venue	MEU Hall
Duration	45 – 60 minutes

FGD: Focus group discussion, IDI: In-depth interviews, SMVMCH: Sri Manakula Vinayagar Medical College and Hospital, MEU: Medical Education Unit.

Table 2: Strategies adopted by the institute and the departments of Phase I in the implementation of Competency-based Medical Education (CBME)

At the level of Institute
<ul style="list-style-type: none"> - Training of faculty with CISP I under the guidance of regional center. - Sharing of resources like CBME modules released by NMC, GMER (Graduate Medical Education Regulations), Articles on Competency Based Medical Education with the in-house faculty. - Allotment of Phase wise & Department wise CBME Coordinators, Alignment and Integration (AIT) teams. - Formation of Curriculum subcommittee. - In-house Faculty development programs (FDP) on various components of CBME like Time table preparation, Integration, Assessment in CBME, Mapping Modules for measuring competency attainment, Integrating E-Learning in Teaching Learning process. - Periodical review meeting with Phase I faculty to update on the progress of CBME implementation.
At the level of the departments
<ul style="list-style-type: none"> - Motivation and encouragement of participation of the Phase I Faculty in CISP I and other in-house FDP. - Framing of objectives for the competencies in their respective discipline. - Preparation of academic calendar with yearly schedule before the commencement of the academic year, incorporating competency number and appropriate Teaching Learning (TL) Methods, adhering to the hours allotted by NMC. - Lesson plan for the TL sessions. - Adoption of student-centric methods like Case Based Learning, Peer teaching, Model/Poster preparation by students, Concept Mapping, DOAP for skill sessions. - Training with MCQs in assessments, regular blueprinting and answer key preparation for sharing with the students. - Conduct of OSPE/OSCE for certifiable skill modules. - Measuring competency attainment through a "Mapping Module". - Foundation Course was implemented covering all the Modules suggested by NMC. - System Based Modular Teaching with Alignment & Integration. - Early Clinical Exposure in both classroom & Hospital settings with observation guide. - Implementation of the AETCOM modules suggested by the NMC. - Maintenance of Logbook incorporating all the elements of CBME.

CISP: Curriculum Implementation Support Program, NMC: National Medical Commission, DOAP: Demonstrate Observe Assist Perform, OSPE/OSCE: Objective Structured Practical Examination/Objective Structured Clinical Examination, AETCOM: Attitude Ethics and Communication.

highlights the appropriate action plan proposed for bridging the identified gaps and successfully implementing the CBME for the upcoming batches.

Discussion

The results of the present study have highlighted all the strategies adopted by the institute in liaison with the guidelines of the regulatory body and the regional centre of NMC. Awareness of the stakeholders regarding the curricular change plays a crucial role in the successful implementation of the CBME (10). This was the prime step carried out by the institute and the departments for the implementation of CBME. All the departments prepared a yearly schedule; the core competencies to be covered, choice of appropriate instructional methods, and assessment strategies were done well in advance before the implementation of the CBME. This form of curriculum mapping ensures the constructive alignment within a curriculum (11).

Implementation of a curricular change is not free of challenges. Sensitization of stakeholders and motivation and training of faculty are some of the challenges quoted in the literature (12). Bringing a major transition in the teaching learning process and assessment strategies has

been identified as a major challenging task in our study. The arrangement of strategies for the successful implementation of these changes demands high coordination among the faculty members and financial support from the administration. Shrivastava has reported that coordination with other departments, sustained support from administration, faculty shortage, lack of direction, etc. are bound to impact the successful implementation of CBME with respective diseases planned for the session (4).

Non-availability of patients with respective diseases planned for the session in the stipulated time and lack of cooperation of patients during addressal by several small group of students are some practical difficulties faced in the implementation of the sessions of Early Clinical Exposure in our study. This could be managed with recorded conversations between the physician and patient or replaced with paper-based scenarios. However, these alternatives do lack the real time feeling obtained from the patient's interaction (13).

Lack of interdisciplinary coordination, allotment of appropriate Weightage to the topics for integration, allocation of an appropriate fit in the timetable, emphasis on formative

Table 3: Challenges faced by the faculty during the implementation of different components of Competency-based Medical Education (CBME)

Themes	Challenges faced
Framing objectives and yearly schedule	<ul style="list-style-type: none"> - Adapting to the curricular change. - Framing of objectives to the numerous competencies. - Necessitated refresher sensitization sessions for CBME. - Fitting the traditional schedule into the CBME trend was time consuming and needed coordination from all the faculty.
Active Learning with Student Centric Methods	<ul style="list-style-type: none"> - Engaging students with variety of instructional methods demands intrinsic motivation of faculty. - Preparation of materials for the active learning strategies.
Foundation Course	<ul style="list-style-type: none"> - Both students and faculty were novel to the course. - Planning interactive sessions and arrangements with necessary requirements were challenging.
Early Clinical Exposure	<ul style="list-style-type: none"> - Demands coordination with clinical faculty. - Patient availability in the planned time slot. - Engaging students in small groups during hospital visits demanded extensive ground planning and time management. - Preparation of observation guide, organizing assessments, analysis of reflection by students were time consuming. - Unable to carry out during COVID Pandemic.
Alignment and Integration	<ul style="list-style-type: none"> - Difficulty in alignment of curriculum with Biochemistry. - Extensive time consumption and preparing the lesson plan for individual Integration sessions. - Motivation of faculty was needed for creating essential resources. - Lack of attainment of objectives at the first professional year level. - Planning of assessment for Integration.
Attitude Ethics and Communication (AETCOM)	<ul style="list-style-type: none"> - Preparation of observation guide, organizing assessments, analysis of reflection by students were time consuming. - Unable to carry out during COVID Pandemic.
Skill Modules	<ul style="list-style-type: none"> - Planning of the certification of skill competencies. - Unable to conduct during the COVID Pandemic.
Assessment	<ul style="list-style-type: none"> - Introduction of MCQs was more challenging in the assessment, as it demanded more ground work from the faculty. - Lack of awareness of different formative assessment tools that could be adopted for lectures/small group discussions among the faculty. - A structured format for attitudinal assessment was difficult to implement.
Self- Directed Learning (SDL)	<ul style="list-style-type: none"> - Lack of clarity in planning the sessions for Self-Directed learning and allotment of stipulated hours for the same.

Table 4: Strategies adopted by the institute and the departments for online teaching during the COVID Pandemic

At the institute level
<ul style="list-style-type: none"> - Periodic online and offline review meeting with the faculty, students and parents. - Provision of necessary technological support through virtual platforms in conducting online classes. - Appropriate and timely communication to the students regarding the classes and assessments. - Offering mental support to the students through "Student Support System", both offline and online.
At the departmental level
<ul style="list-style-type: none"> - Motivation of the faculty to sensitize themselves to online teaching through various e-courses. - Participation of faculty in webinars and online workshops organized with relevance to CBME. - Adoption of student centric methods through online tools like Peardeck, Nearpod and other virtual platforms. - Enhancing student engagement through use of breakout rooms, interactive white boards and small group discussions. - Organizing online competitions for students in video preparation, e-poster preparation. - Periodic conduct of assignments and assessments through google forms, Google classrooms and institutional LMS. - Sharing of the recording of video lectures, power point presentations, e-textbooks and e-notes in pdf format to the students.

CBME: Competency-based Medical Education, LMS: Learning Management System.

assessment, SDL, and time consumption with resource preparation were some of the anticipated challenges quoted by Patel in his review (14). Similar results were observed in our study. In addition, we faced extreme difficulty in tapering the integrated content relevant to basic sciences.

Assessment, as a component of CBME, itself

is associated with intrinsic challenges. An article by Lockyer emphasizes the importance of multiple assessments with multiple assessors in CBME to ensure that assessment for learning is taken care of (15). However, it requires motivated, trained faculty, and adequate time for its implementation. Lack of awareness of different formative assessment

Table 5: Gaps identified with the implementation of CBME and the proposed action plan

Themes	Gaps Identified	Proposed Action Plan
Active Learning with Student Centric Methods	<ul style="list-style-type: none"> - In small group teaching more of reinforcement of content covered in lecture was done. - Effective planning of active learning strategies, as a part of the curriculum. 	<ul style="list-style-type: none"> - Topics may be planned for exclusive coverage under small group teaching at the beginning of academic year. - Workshops to be planned by MEU to incorporate time-tested active learning strategies by the faculty.
Alignment & Integration	<ul style="list-style-type: none"> - Not time-bound, exceeding time limits. - The objectives of the session were not met, despite sharing them well in advance. - Unstructured session for incorporating SDL and assessment in Integration sessions. 	<ul style="list-style-type: none"> - Workshops to be planned, Guidelines to be strictly adopted. - AIT coordinator should take care of the practical constraints. - Reinforcement of the objectives and lesson plan to be shared in advance. - Inhouse FDP to be planned in planning a structured integrated session with assessment.
Early Clinical Exposure	<ul style="list-style-type: none"> - Lack of patients with respective diseases in the allotted time. 	<ul style="list-style-type: none"> - Usage of other resources, like videotaped patient doctor conversation of important cases. - Recommended faculty allotment of ECE in charge from clinical side.
Assessment	<ul style="list-style-type: none"> - Lack of awareness on the tools used for formative assessment. 	<ul style="list-style-type: none"> - Recommended workshops from MEU regarding sensitization to formative assessment and feedback.
Self-Directed Learning (SDL)	<ul style="list-style-type: none"> - Lack of guidelines for SDL. 	<ul style="list-style-type: none"> - Recommended workshops from MEU.

MEU: Medical Education Unit, AIT: Alignment and Integration, FDP: Faculty development programs, ECE: Early Clinical Exposure.

tools was a major challenge addressed in our study. Further, NMC recommends at least one of the assessments as attitudinal assessment, which is a tough task in framing and implementation.

Self-directed Learning is one of the essential components of CBME. While literature search reveals multiple methods for self-directed learning, there are no specific guidelines for its implementation. This was again a major challenge with respect to SDL in our study. A systematic review by Buch reported similar results (16).

COVID pandemic was an unanticipated challenge in the process of implementation of CBME. Online tools were utilized for teaching, learning and assessing to maintain the academic flow during the pandemic crisis. However, face-face interaction with patients and implementation of skill modules were major constraints, similar to observation by other studies. Yet, this has led to effective incorporation of blended learning (17, 18).

The challenges faced during the implementation were in the same line with the gaps identified with the analysis. Though many action plan strategies have been suggested for the successful implementation of CBME for the upcoming batches, Faculty development plays a crucial role in the success of the curricular change. Owing to its complexity, CBME demands multiple reinforcement sessions as FDPs for the capacity building of the faculty (19).

Pairing evaluation with implementation

may yield invaluable information regarding the progress of the program (20). Hence, it is ideal to plan the evaluation process along with the program implementation and incorporating changes obtained with review process. CBME evaluation can support the improvement of current processes and guide future implementation by shedding light on the gaps identified and supporting effective and efficient use of resources; it can also help to devise appropriate action plan to overcome the challenges.

Strengths and Limitations of the study

Most of the studies have highlighted the perceptions of the faculty before implementation of CBME. The current study is one among the very few studies that attempted to do the process evaluation of CBME, particularly in a qualitative mode. However, our study is not free of limitations. COVID pandemic has masked the actual challenges involved in the implementation of CBME. Prospective studies in the future may reflect the real scenario of the barriers involved in the implementation of CBME.

Conclusion

Attainment of curricular changes demands positive momentum with all the stakeholders, at various stages of the implementation of the program. Evaluation provides critical insights into the successes and challenges of operationalizing

CBME. CBME is not mere introduction of competencies. Acquisition of competencies is enhanced by appropriate instructional methods and effective assessment strategies. Frequent and constant hands-on training on the CBME modules through “Faculty Development Programs” plays a crucial role in successful implementation of CBME.

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Authors' contribution

All Authors Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work, Drafting the work or revising it critically for important intellectual content, Final approval of the version to be published, Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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