Education Section

Implementation of Competency Based Medical Education Curriculum in Paediatrics for Phase 2 MBBS Undergraduates- A Descriptive Study

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ABSTRACT

Introduction: Adoption of Competency Based Medical Education-Undergraduate (CBME-UG) curriculum is made mandatory in medical colleges by National Medical Commission (NMC). CBME-UG curriculum enumerates the expected knowledge and skills in detail and it focuses more on observable outcomes that are important in day-to day medical practice. This curriculum holds the teacher as well as learner equally responsible in running the educational programme.

Aim: To put forth the approach adopted in implementation of CBME-UG curriculum for phase 2 MBBS students in paediatric subject.

Materials and Methods: This descriptive study describes the steps applied in transforming the traditional structured teaching method to the CBME method for undergraduate phase 2 MBBS students in the Department of Paediatrics at Dr. B.R. Ambedkar Medical College and Hospital, Bengaluru, Karnataka, India, during January 2021 to December 2021. The duration of one year was divided into preimplementation phase (three months) and implementation phase (nine months). The faculty of the department, a coordinator to overview the programme, the postgraduate residents, and the students of phase 2 MBBS were the stakeholders identified in order to run the CBME-UG educational programme.

Results: Preimplementation phase consisted of designing the department module and sensitisation of involved stakeholders. The contents of the module were curriculum planner for three years, time-table plan for phase 2 MBBS students, structuring of teaching sessions, designing the assessment method, and designing the feedback method. Implementation phase during clinical postings for the phase 2 MBBS students incorporated the strategies designed in preimplementation phase. The teaching sessions, assessment, the feedback sessions, and student-doctor programme were implemented with realistic and feasible planning.

Conclusion: The CBME curriculum was successfully implemented among undergraduate second year medical students in terms of student feedback and performance. It was noted that appropriate planning and sensitisation of students, as well as, the teachers, helped in running the programme smoothly.

INTRODUCTION

Medical education in India was centered more around time-bound learning approach, didactic lecture teaching methods and there was less of patient based learning [1]. Introduction of Competency Based Medical Education (CBME) in India will in contrast increase the focus of medical education on patient outcome, de-emphasise time based learning and emphasise on being learner centered. The CBME curriculum enumerates the expected knowledge and skills in detail and it focuses more on observable outcomes that are important in day to day medical practice. This curriculum holds the teacher, as well as, learner equally responsible in running the educational programme [1].

Adoption of Competency Based Medical Education Undergraduate (CBME-UG) curriculum is made mandatory in medical colleges by National Medical Commission (NMC). An Entrustable Professional Activity (EPA) is a unit of professional work that the Indian medical graduate should be able to execute unsupervised [2]. Competencies designed by the NMC (for CBME-UG subject-wise) comprise of components such as knowledge, skills and attitudes which are necessary to ensure that every Indian medical graduate has completed the expected EPA's. In view of increasing violence and medico-legal allegations against doctors it is important to work on these aspects of ensuring quality of medical education. Several Indian articles have emphasised on importance of transformation to CBME and possible hurdles that will be encountered during this transformation [2,3]. Need for this change was foreseen even a decade ago by Singh T et al., as stated in a study conducted by them to identify as to which pedagogic themes should be incorporated under faculty development programmes in India [4]. Also, few studies have stressed on need for a module to successfully implement CBME programme in an Institute [5-7].

This article highlights the on-field application of the instructions provided by Medical Council of India (MCI) for implementation of CBME-UG curriculum [8]. It discusses how department learning module can be developed to implement the CBME-UG curriculum in each department and importance of identification of stakeholders involved in this educational programme along with early sensitisation of these stakeholders about their responsibilities in this transformation. It also lays emphasis on sequencing the milestones over three years in form of curriculum planner for the learner to achieve the expected competencies. Hence, present study aimed to describe the steps applied in transforming the traditional structured teaching method to the CBME method for undergraduate phase 2 MBBS students in the Department of Paediatrics.

MATERIALS AND METHODS

This descriptive study was conducted to describe the steps applied in transforming the traditional structured teaching method to the CBME method for UG phase 2 MBBS students in the Department

of Paediatrics, Dr. B.R. Ambedkar Medical College and Hospital, Bengaluru, Karnataka, India, during January 2021 to December 2021. No ethical issues involved in this educational programme.

The methodology was framed adopting the recommendations provided in one of the articles describing the design and implementation of the competency based medical education training programme for medical oncology residents in Canada [9]. Incorporating the recommendations, the duration of one year, January 2021 to December 2021 was divided with pre implementation of phase three months and implementation phase of nine months.

Preimplementation phase: It focused on recognisation and early engagement of the stakeholders to run this educational programme. Stakeholders being faculty of Department of Paediatrics (eight), a Department Co-ordinator to overview the programme, postgraduate residence in the Department (five) and the students of phase 2 MBBS (n=91). Selection of competencies and categorisation of them under different phases was important part of framing learning module. Developing teaching, assessment and feedback systems that is realistic and practical was also important focus of Preimplementation phase.

Implementation phase: It was during the period when the students were posted in batches for clinical postings: duration of postings was two weeks for each batch.

RESULTS

I) Preimplementation Phase

This consisted of developing department module and sensitisation of the stakeholders.

A. Developing department module

Following are contents incorporated in the module:

a) **Curriculum planner for three years:** As per Rajiv Gandhi University of Health Sciences (the study Institute is affiliated to this University) timetable [10], the students attend the clinical postings of two weeks in MBBS 2nd year (phase 2), three weeks in MBBS 3rd year (phase 3 part 1) and eight weeks in MBBS final year (phase 3 part 2). The lectures (40 hours), and small group discussion sessions (64 hours i.e 32 hours sessions) are divided among the phase 3 part 1 and phase 3 part 2 academic years. [Table/Fig-1-3] shows the curriculum planner developed in the department module for the three years based on allotted hours of clinical posting and theory for the subject of Paediatrics.

S. No.	Topic	Phase 2 MBBS	Phase 3 MBBS Part-1	Phase 3 MBBS Part-2
A.	Growth in children	Normal growth pattern in children and adolescents; To perform various anthropometric measurements; Plotting on standardised growth charts.	Interpretation of growth charts with clinical relevance. Identify deviations in growth.	Short stature-approach and management.
B.	Developmental Paediatrics and behavioural problems	Laws of development; Demonstrate developmental milestones; Calculate developmental quotient.	Knows to use trivandram development screening chart to identify deviations. Behavioural problems-SLO's Paediatrics 5.1 to 5.11.	Developmental delay and cerebral palsy-History Elicitation (HE) and Case presentation and Attention deficient hyperactivity disorder autism, scholastic backwardness
C.	Complementary feeding and breastfeeding	All SLO's in PE 8.1 to 8.5 and 7.1 to 7.11		
D.	Nutrition	Nutritional status-assessment and classification; Document dietary history, identify gap in calorie and protein; interpret with clinical relevance; Recommended Dietary Allowance (RDA) and dietary sources of micronutrients.	Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM) Integrated Management of Newborn and Childhood Illness (IMNCI) Criteria; Clinical features and management; Clinical features and management of deficiency of micronutrients; National programmes related to micronutrient deficiencies.	Failure to thrive-approach and management. SAM and MAM-management. Obesity-approach and management.
E.	Immunisation	Universal Immunisation Programme (UIP) schedule; Vaccine preventable disease covered under UIP, vaccines under UIP; Safe injection practices; Cold chain maintenance; adverse events following immunisation; Counselling skills	Vaccination for special situations optional vaccines; Indian Academy of Paediatrics (IAP) recommended immunisation schedule; Assess patient for immunisation and prescribe appropriate schedule	

[Table/Fig-1]: Sequencing of Specifc Learning Objectives (SLOs) over three years-Section 1.

Topic	Phase 2 MBBS	Phase 3 MBBS Part-1	Phase 3 MBBS Part-2
Vital signs	Record vital signs and interpret age appropriately		
Adolescent health		All SLO's in PE6.1 to 6.13	
Newborn (NB)	Terminologies in newborn; care of normal newborn; counselling skills; Neonatal resuscitation protocol (NRP)-upto bag and mask ventilation steps.	Integrated Management of Newborn and Childhood Illness (IMNCI) stratification for sick NB; NRP-remaining portion All diseases of newborn period	All diseases of newborn period Examination of newborn and elicit history; newborn case presentation
Emergency paediatrics		Approach and management: Cardiorespiratory arrest, Unconscious child, status epilepticus, respiratory distress. >> Assessment and management (skill bases): Airway and breathing convulsion, shock dehydration	
Diarrhoeal diseases and Fluid and electrolyte balance		Acute diarrhoeal disease and dyssentry Chronic and persistent diarrhoeal disease IMNCI classification and management.	History elicitation, General physical examination, systemic examination, Case presentation appropriate fluid and electrolyte management and perform relevant investigations
Endocrine			All SLO's in PE 33.1 to 33.11
Chromosomal abnormalities			All SLO's in PE 32.1 to 32.13
Rheumatology			All SLO's PE 22.1 to 22.3

[Table/Fig-2]: Sequencing of SLO's over three years-Section 2.
*IMNCI: An introduction to the integrated management of newborn and childhood illness

S. No.	Core topic	Phase 2	Phase 3 Part 1	Phase 3 Part 2
A.	Respiratory system (RS)		Upper respiratory tract infection, Lower respiratory tract infection, Foreign body inhalation; Stridor in children; IMNCI classification and management-croup and pneumonia; Chest X-ray in RS.	Asthma in children history elicitation, general physical examination, systemic examination, case presentation; counselling skills
B.	Cardiovascular system (CVS)		Congenital heart disease;Cardiac failure; Infective endocarditis; Acute Rheumatic fever; Cardiac surgeries.	History elicitation, general physical examination, systemic examination, case presentation; chest X-ray in CVS; Paediatric ECG; counselling skills
C.	Infectious diseases		Tuberculosis; Vector borne disease; parasitic infestations; enteirc fever; rickettsial diseases; Diphtheria Pertusis Tetanus; exanthematous illness.	History elicitation, General physical examination, Systemic examination and Case presentation; Counselling skills
D.	Liver diseases		Acute hepatitis; fulminant hepatic failure	Chronic liver disease; portal hypertension; History elicitation, General physical examination, Systemic examination and Case presentation; Clinical skills-liver biopsy; Counselling skills
E.	Central nervous system		Febrile seizures; meningitis in children	Microcephaly; neural tube defects; epilepsy; infantile hemiplegia; floppy infant; Duchenne muscular dystrophy ; headache in children; History elicitation, general physical examination, Systemic examination and Case presentation; Clinical skills-lumbar puncture; Counselling skills
F.	Haematology and oncology		Iron deficiency anaemia; vitamin B12 and folate deficiency anaemia	Haemolytic anaemia; Immune thrombocytopaenia; haemophilia; leukaemia; lymphoma; History elicitation, General physical examination, Systemic examination and Case presentation; Counselling skills
G.	Genitourinary system			All SLO's PE21.1 to 21.17; History elicitation, General physical examination, Systemic examination and Case presentation; counselling skills

[Table/Fig-3]: Sequencing of SLO's over three years-Section 3.

b) **Timetable for phase 2 MBBS students:** Total of 91 students reported for the clinical posting, and were grouped into six batches (out of 100, 91 students were eligible to enter phase 2 after phase 1 exams). Each batch attended two weeks of clinical posting (10 effective days). Following was the timetable framed for them:

Day 1-Overview of growth in children

Day 2-Developmental milestones

Day 3-Complementary feeding and dietary history

Day 4-Breastfeeding

Day 5-Immunisation

Day 6-Normal newborn care

Day 7-Vital signs in Paediatrics

Day 8-Paediatrics case sheet writing

Day 9-Objective Structured Clinical Examination (OSCE) internal assessment and feedback

Day 10-Repeat assessment for students who have not passed the examination previous day.

Signing log books; checking of student doctor programme performance.

Students were informed to do self-directed learning on the topic-Recommended Dietary Allowance (RDA) and dietary sources of all vitamins' on day 1 of clinical postings. Paediatrics topics for Self Directed Learning (SDL) were chosen from the list of competencies given by NMC. The students were provided with list of reliable sources (textbooks and articles) from which they could read and understand the topic. These topics were assessed as one of stations in OSCE assessment.

c) **Structuring of teaching sessions planned for MBBS 2nd year (phase 2) students:** During the two weeks of clinical posting, the duration of three hours in each session was divided into four parts.

- Introductory lecture was taken to improve the students' knowledge about the topic planned for the day (cognitive domain)
- Demonstration of psychomotor domain (history elicitation, bedside skills, procedural skills) and affective domain (counselling skills) by the teachers and observation by students.

- Assisting students perform the above psychomotor and affective domain skills on real patients or under stimulated environment.
- Verbal feedback by the teacher to the student about their performance.

d) **Designing assessment method for phase 2 MBBS [11-13]:** When designing the assessment method for the above-mentioned phase 2 MBBS syllabus, the following were taken into consideration:

- Certifiable skills, during assessment.
- Selection of other observable skills which need direct observation during assessment.
- Using assessment elements that are easy to use in the workplace with the available resources i.e. patients, simulations [11], available time, infrastructure, number of faculty available for the assessment.

Hence, OSCE was considered to be an ideal method for assessment [14]

e) **Designing the feedback systems [2,15]:** Feedback systems were designed considering following requirements:

- Bidirectional feedback
- Needs to be on-going process starts from first step of learning to attaining the competence [14].
- Well timed feedback soon after learning activity which will help the learner to initiate remedial measures as the learning event is still fresh in their mind [14].
- Feedback to be given in an objective manner, rather than being subjective or judgemental [14].

Incorporating the above requirements two levels of feedback systems were designed:

Teacher to Learner-Verbal feedback based on first hand observation during teaching and assessment.

Learner to Teacher-feedback documented as Google forms designed by senior faculty.

(Associate Professor in Department of Paediatrics)

B) **Sensitisation of the involved stakeholders [6]:**

Teachers have undergone faculty development programme conducted in this institution.

- Meeting was conducted to sensitise the teachers about how this new educational programme helps in the implementation. Here is an example on how to putforth the planner in such a department meeting [pdf-1].
- Both learners and teachers were sensitised that achieving the targeted competency is on-going process which is spanned over three learning years. Here is the example of sample framework to achieve the competency which was used to sensitise the stakeholders how the curriculum works [Table/Fig-4].

The learners were sensitised to use logbook and maintain the documentation periodically, the use of reflection section by learners is equally important in improving their skills.

II) Implementation

a. **Teaching sessions:** Immunisation session implementation, [Table/Fig-5] shows how the preimplementation plan had been applied during the teaching session.

b. **Assessment**: The content of OSCE is depicted in [Table/Fig-6]. Ten OSCE stations were prepared for the assessment. Exam was conducted in batches of approximately 15 students. Total 81, out of 91 students took the OSCE. Each student was given the same scenario.
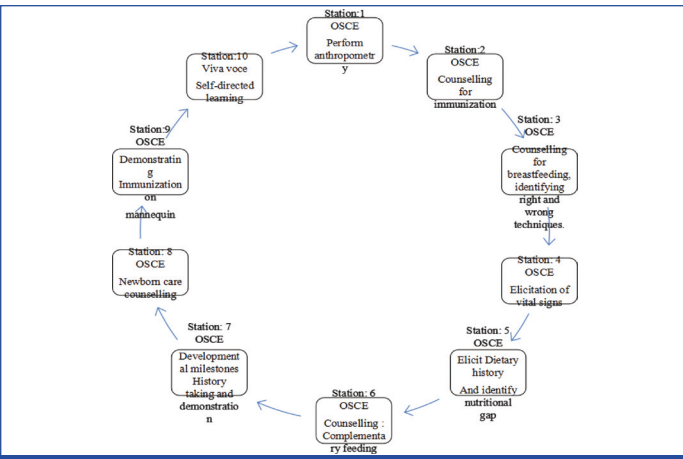
Example task: A 4-year-old female child was brought by the mother-Elicit the developmental history and demonstrate the developmental milestones (this child with parent was available in OSCE station and the student reads the task and performs what is required).

Competency	Subcompetency	SLO's	Teaching method	Assessment method
Assess child with short stature and manage appropriately	1. Identify the deviation in growth of the child. 2. Know about the causes of short stature. 3. Know when to suspect constitutional delay/nutritional cause/pathological causes. 4. Do relevant investigation wherever required. 5. Know how to follow-up patient with growth issues. 6. Know when to refer for immediate intervention. 7. Give complete advice to the parents	PHASE 2; 1. Definition, factors affecting normal growth, 2. Patterns of growth in infants, children and adolescents.	Lecture	Short Answer Questions (SAQ)
		3. Methods of assessment of growth (WHO and Indian national standard). 4. Parameters used for assessment of physical growth in infants, children and adolescents.	Bedside clinics	
		5. Age-related nutritional needs of infants, children and adolescents. 6. Calorific value of common Indian foods.	Small group discussion	Multiple Choice Questions (MCQ)
		7. Elicit, document and present an appropriate nutritional history (dietary recall). 8. Calculate the age-related nutritional gap calorie and protein.	Bedside clinics DOAP sessions	Bedside skill assessment OSCE
		Phase 3 Part 1: 1. Nutritional status of infants, children and adolescents: Assessment, classification and recognise deviation.	Bedside clinics,case scenarios, DOAP	Bedside skill assessment OSCE
		Phase 3 Part 2 1. Diseases of other organ systems which can interfere with growth. 2. Endocrine diseases in children. 3. Chromosomal disorders.	Lecture	SAQ's OSCE
		4. Discuss the aetiopathogenesis, clinical features and management of a child with short stature. Elicit history, perform examination, document and present.	Bedside clinics and case scenarios	Bedside skill assessment Mini-Clinical Examination (Mini-CEX)

[Table/Fig-4]: Sample framework to achieve for competency.

Time		Content	Example
45 minutes	Knowledge	Introduction lecture ↓	1. Explain the components of the UIP and the NIS. 2. Vaccine description with regard to classification of vaccines, strain used, dose, route, schedule, risks, benefits and side effect, indications and contraindications. 3. Define cold chain and discus the methods of safe storage and handling of vaccines. 4. Describe components of safe vaccine practices-patient education/counselling, adverse events following immunisation, safe injection practices, documentation and medico-legal implications. 5. Explain term implied consent in immunisation services.
45 minutes	Demonstration or observation	Demonstrate the psychomotor domain and affective domain by the teacher (history taking/elicitation of signs/counselling). Observation by students and clarification of doubts ↓	1. Observe the handling and storing of vaccines. 2. Document immunisation in an immunisation record. 3. Observe administration of UIP vaccine 4. Practice infection control measures and handing of sharps. 5. Educate and counsel a patient for immunisation
1 hour	Assisted perform	Dividing students into groups of 4-5 Each group to perform the skill and elicitation of history and signs on patients or simulated environment ↓ Teacher in charge rectifies the mistake of the students ↓	1. Document immunisation in an immunisation record. 2. Practice infection control measures and handing of sharps. 3. Educate and counsel the patient for immunisation 4. Demonstration of administration of vaccines in mannequin
30 minutes	Feedback	Teacher gives overall feedback about each group performance	Non formal verbal feedback

[Table/Fig-5]: Design of teaching session.

[Table/Fig-6]: Structure of exam conducted.
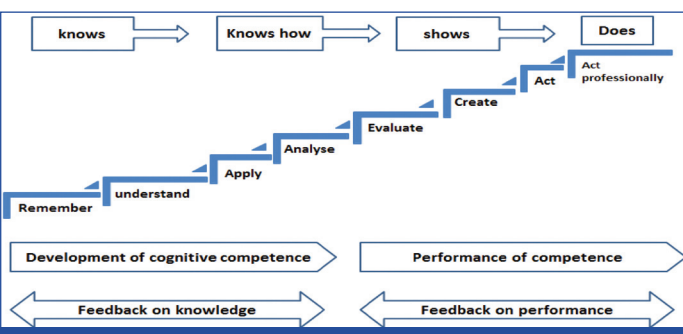
Examiner was provided with the checklist used to evaluate the student objectively [Table/Fig-7].

OSCE station: Developmental milestones					
	Roll no.				
Checklist with marks	81	82	83	84	85
Introduce yourself and explain purpose (1/4 m)	¼	¼	¼	0	¼
Ask for child date of birth and current age (1/2 m)	¼	½	½	0	½
Ask gross motor milestone history (1/2 m)	½	½	¼	½	½
Ask for fine motor milestone history (1/2 m)	½	½	½	½	½
Ask for language milestone history (1/2 m)	¼	½	½	0	¼
Ask for social milestone history (1/2 m)	½	½	½	½	½
Use of appropriate tools in assessing (1 m)	0	½	0	½	½
Calculate development quotient (1/2 m)	½	½	½	½	0
Interpretation of above findings (1/2 m)	0	½	0	½	0
Thank the patient (1/4 m)	0	¼	¼	¼	0
Total score	2.75/5	4.5/5	3.25/5	3.25/5	3/5
Certified (yes/no)	Yes	Yes	Yes	Yes	Yes

[Table/Fig-7]: OSCE station: Developmental milestones checklist, with results and findings.

The mean score for this station (OSCE station 7) of one of the batches (14 students) was 4.1. mean scores for OSCE stations 1,2,3,4,5,6,8,9,10 were 3.5, 2.3, 3.0, 4.2, 3.76, 3.46, 3.1, 3.9, 3.4, respectively.

c. **Feedback:** Teacher to student-Incorporating the preimplementation requirements, verbal feedback at each level from learning to attaining the competency was as implemented [Table/Fig-8].

[Table/Fig-8]: Feedback at each step to help students progress-up the competency ladder [15].

Student to teacher-Google feedback form was given to the students to know their feedback about the teaching sessions and assessments [pdf-2].

The responses were enclosed [Excel sheet 1].

d. **Students doctor programme:** This is a new concept introduced by NMC for CBME curriculum. The goal of learner doctor programme is to provide learners with experience of longitudinal patient care, being a part of healthcare system and hands-on care of patients in Outpatient Department (OPD) and Inpatient Department (IPD) setting. Focuses of learner doctor method in phase 2 are: History taking, physical examination, assessment of change in clinical status, communication and patient education.

During the implementation of this programme for phase-2 students, a checklist was prepared as per the guidelines given by NMC [pdf-3] [8]. Each student was assigned a patient during their clinical posting in paediatrics. They were explained about the programme and were instructed to complete the requirements of checklist given to them. At the end of their posting, logbook was checked by the designated faculty for its completeness and quality of report on the patient assigned. Verbal feedback was given to students regarding the same.

DISCUSSION

The present study explains necessary steps to be taken to do feasible implementation rather than just an on-paper protocol. Prior understanding of limitations and strengths at Institutional level will help in proper strategy framing and implementation of CBME undergraduate curriculum. Developing curriculum planner subject-wise becomes important to ensure that all competencies in curriculum are covered and that clinical postings and skill lab postings rotation align with the competencies requiring direct observation [9]. Sequencing the 398 Specific Learning Objectives (SLO) in a more meaningful way to take the Indian medical graduate through hierarchical manner of learning-understanding interpretation and application.

Competency based undergraduate curriculum is a learner centred approach. It gives greater flexibility for students to attain the competencies at their pace. Teaching and learning becomes a more accountable process when compared to traditional methods. A cross-sectional descriptive study involving students from 74 colleges across India was conducted to assess learners' perspective of the newer curriculum components in the phase 1 MBBS. The present study showed nearly 75% students felt that the concepts of early clinical exposure, foundation course, attitude ethics and communication sessions were useful, hence proving that this new innovation is most welcome by the students [16].

Though, many curriculum implementation support programmes and medical education technology teaching programmes have been conducted nationwide, there are still no uniform guidelines on how to practically apply the SLO's to teaching the long spanned subjects like paediatrics, obstetrics and gynaecology, medicine and surgery. Faculty development is also at premature stage as most of medical faculty still do not prioritise curriculum planning [4,17,18]. Hence, designing and implementation is a lot cumbersome and time consuming process. The teaching session design described in this article is alomst comparable to Gagne's instructional design in applying theory to teaching practice The gagne's nine events of instructions includes 1) gaining attention of listeners 2) informing the learner of the objective 3) stimulating recall of prerequisite learning 4) presenting the stimulus 5) providing learning guidance 6) eliciting the performance 7) providing feedback about performance corrections 8) assessing the performance and 9) enhancing retention and transfer [15].

The postgraduate residents were also involved in conducting these interactive sessions. Prior discussion them about the session

planning and involving them in process of teaching enhanced the self-esteem of our postgraduate residents [19] Formal training of residents in teaching CBME-UG [20] curriculum, will provide more effective manpower in managing the classes [10]. Each Paediatrics unit must consist of one professor, one associate professor, two assistant professors and three senior residents in order to effectively continue the CBME teaching along with patient care. There is a need for recruiting academic advisors in each department to guide the faculty and the learner through this CBME programme and ensure its consistent functioning [15]. Newer methods of teaching such as small group discussion, clinical videos and case scenario based discussion, demonstration of affective and psychomotor skills bedside or under simulated atmosphere and self-directed learning make knowledge application more appreciable and learner centered. Components of CBME such as, self directed learning and student doctor programme, shift the responsibility of learning from the teachers to the students. Formative assessment methods are more powerful tools because they direct the students' learning efforts towards learning outcomes at the level of understanding, interpretation and application which are always retained longer and have greater transfer value at workplace [1,2,21,22].

Limitation(s)

Lack of alignment and integration in the above conducted teaching programme was a drawback. Though, the concept of alignment and integration is one of the main focus of CBME, its initiation requires preparedness of all the individual departments.

CONCLUSION(S)

Competency based medical education-undergraduate curriculum implementation was successful in term of student feedback and performance. It was noted that appropriate planning and sensitisation of students as well as the teachers, helped in running the programme smoothly. The department module which was developed, aided in the thorough understanding of the strengths and limitations in running the CBME programme for the undergraduates. Strengthening of feedback systems through proper validation and reliability checks is also the need of the hour. Further, research must be carried out to identify tools which can be used to continuously evaluate the effectiveness of implementation. This will facilitate the incorporation necessary changes in response to real time challenges.

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