

Original Research Article

Impact of introduction of Mini-Clinical Evaluation Exercise in formative assessment of undergraduate medical students in pediatrics

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ABSTRACT

Background: Student's assessment is a systemic process of determining the extent to which the student has achieved the desired competency. Mini-Clinical Evaluation Exercise (Mini-CEX) is an assessment tool applicable in broad range of settings. Very little data is available in Indian settings about Mini-CEX in undergraduate. This study has been undertaken to understand its role in formative assessment.

Methods: In this interventional study 47 students and 7 faculty of pediatrics participated. Students were assessed for two encounters of Mini-CEX. Assessment was as per Mini-CEX rating form followed by feedback.

Results: Mean score range for different competency of data gathering were 1.76 to 2.5 during first mini-CEX and 4.38 to 5.14 during second Mini-CEX. Difference was significant (Cohen's $d > 0.8$). More than 90% of students felt that Mini-CEX is better way to assess clinical skills and would like to be assessed by Mini-CEX. One to one interaction was most important advantage felt about Mini-CEX. Though nearly all faculties felt that Mini-CEX is a better way for assessment half of them disagree to continue using it in future due to time constraints.

Conclusions: In this study we found Impact of Mini-CEX in formative assessment is significant to improve clinical competency at undergraduate level. Improvement in Mini-CEX scores in consecutive encounter signifies its role even as Teaching Learning tool. Need to consider issues about its feasibility for Undergraduate level in settings with limited staff strength.

Keywords: Competency, Feedback in medical education, Formative assessment, Mini-CEX, Summative assessment, Teaching learning tool

INTRODUCTION

Student's assessment is a systemic process of determining the extent to which the student has achieved the desired level of knowledge, skills and attitude. Students need to be assessed for various reasons and skills by various assessment methods both during formative and summative assessment.¹ Presently in India at majority of places the main focus of medical student's assessment is based on summative assessment as formative assessment has also been taken as a miniature of summative assessment.

Formative assessment is mostly devoid of any feedback from faculty at the end so there is less scope of improvement by the student. Assessment in practical examination is also prone to bias because of subjectivity and as it is based on presentation skills of learner. As such only final presentation by student is taken into account as Patient student encounters are not observed leaving limited room to master the skills in most of the cases. Formative assessment has been introduced with objective as an instructional intervention for the evaluation of performance and identifying strength and weakness in

order to reveal the gaps between desired and actual performance.²⁻⁵ Though formative assessment has increasing attention in educational research; it has not yielded single gold standard performance assessment tool that is both reliable and valid.

Undergraduate medical education in India is currently going through a transitional period with new curriculum to be introduced from academic year 2019-20. As per new curriculum Indian Medical Graduate need to possess locally acceptable and globally relevant competencies in all three domains. Though current learning is result oriented there need to be some process based evaluation also. The Mini-CEX (Mini Clinical Evaluation Exercise) is one such evaluation tool designed in 1995 and has been used to evaluate clinical skills of post graduate students in various clinical disciplines.⁶⁻⁸

Norcini has summarized the primary weak areas of traditional assessment method, namely, lack of assessment of a large variety of cases, examined by limited number of faculties and testing only few competencies.⁹

Mini-CEX is a brief and rapid observation of core clinical skills lasting for 10-15 minutes It is workplace-based assessment in which performance of student is evaluated during a focused clinical interaction followed by appropriate feedback.^{6,10}

Mini-CEX has been shown to have better reliability score than Objective structured Clinical examination (OSCE) or long case based examination of same duration.¹¹ Due to direct observation of real patient encounters, it is applicable in a broad range of settings and has inbuilt advantage of immediate structured feedback to the learner after encounter. Mini-CEX formalizes the supervisory interaction between teachers and students. The structured nature of the rating form means that the teacher gives feedback across around range of topics however the assessment can be perceived as threatening to student.¹²

Very little data is available in Indian settings. Majority of Indian studies are for post graduate curriculum and minimal studies for undergraduates in medical education.^{5,10} At the same time we need to assess the Mini-CEX for its feasibility in present scenario of medical formative assessment in clinical subjects in India. Present study has been undertaken keeping in mind scarce data available about introduction of Mini-CEX in Undergraduate curriculum and to understand aspects about its feasibility in Indian settings.

METHODS

This prospective interventional study was carried out in department of pediatrics after IEC approval. Undergraduate medical students in second MBBS during their pediatric clinical posting participated in study. The study was carried out from November 2018 to February 2019. Total 47 students and 7 faculty members

participated in the study. Tools used were Mini-CEX Evaluation form¹³, perceptions of Users were obtained by means of Google form for faculties and students based on 5 point Likert scale and open ended questions.

Pre study protocol

Orientation sessions were conducted for students and faculties in form of video presentation of Mini-CEX. All the faculties agreed for participation. There were doubts regarding scoring of mini-CEX from faculties which were addressed properly. Faculties and students were made familiar with rating form. For a smooth conduction of study Whatsapp group for faculties was made in which references and study material about mini-CEX was shared for self-study. Similar Whatsapp group was made for students and Mini-CEX rating form was also shared in advance for students. Three students were given responsibility of coordination for Mini-CEX exercise. Participation of students was on voluntary basis. In a batch of 48 students 47 students agreed voluntarily for participation. Feedback form was prepared and anonymous responses were obtained. Rating was on 5 point Likert scale for feedback. Students were informed that results will be known to researcher only and as such will not have any impact on their summative assessment.

Actual process

Students were posted in batch of 48 at a time for their pediatric clinical posting, 47 students participated in study. Students were allotted to four units during their posting. They were assessed for two encounters of Mini-CEX at least 2 weeks apart. Students were evaluated on all the areas of Mini-CEX rating form. Main focus was on medical interviewing/ history taking, physical examination skills, Communication/ humanistic approach and over all clinical judgment, 20 minutes of encounter was followed by 5 minutes' sandwich type of feedback from faculty. Focus of feedback was mainly on medical interviewing, physical examination and communication skills. Same process was followed for 2nd encounter after 2 weeks. Any change in score of Mini-CEX in first and second encounters was noted. There were 7 faculty members who participated for Mini-CEX. One of faculty agreed for 2 Mini-CEX encounters per day. Eight students were enrolled on daily basis to be assessed by seven faculty members for six working days for first mini-CEX. Students were randomly assigned to faculty. Cases of equal complexity were kept. After two weeks again same students came for second Mini-CEX. The Faculty member directly observed the student and with help of checklist, rated the student's performance under various domains. Each student was also rated for his/her 'over all clinical competence' which was a global score. After the student-patient interaction was complete, a systemic feedback session of about 5 minutes took place. The faculty first explained to the student what was done well, followed by what could be done better. Student was also corrected on physical examination skills by demonstrating correct

method. These suggestions were put in writing and both faculty and student after going through all aspect in form signed it. Mini-CEX session's anonymous feedback was obtained from students and faculty members. Questioner for feedback for both Mini-CEX was different for students. Open ended questions were included for both faculty members and students. Data was entered in Microsoft excel and was interpreted with help of Epi info version 7. Mini-CEX score on data gathering area was used as it is main focus area for undergraduate students. Students were assessed on standard Mini-CEX rating form 13 for Medical interviewing skills, Physical examination skills, Humanistic qualities, Communication skills and overall clinical competence. Scoring in mini-CEX is 1-3 (unsatisfactory) 4-6 (satisfactory) and 7-9 (superior). Overall satisfaction with Mini-CEX was evaluated on 0 (low)-10(high) scale provided in rating form. Difference in the mean score between consecutive Mini-CEX was analyzed using Effect size. (Cohen's d). Replies to open ended questions were coded and further analyzed for themes and concept. Students and faculties' responses on 5 point Likert scale was merged in form of combining agree and strongly agree, disagree and strongly disagree. Neutral were discarded.

RESULTS

Total of 47 students participated in the project. There were 94 Mini-CEX encounters conducted by seven faculty members (1 professor, 1 additional professor, 2 Associate professor and 3 assistant professors). All the sessions were conducted in Inpatient wards and were directly observed by the faculty throughout. The mean time taken for observation was 18 minutes and for feedback was 5 minutes.

During first Mini-CEX Out of competencies tested students scored least in Physical examination skills (1.77/9) and clinical judgment (1.87/9) score in Humanistic qualities was (2.53/9), over all clinical competency score was 2.1/9. Whereas in second Mini-

CEX there was significant improvement in competencies tested (Cohen's d>0.8 suggestive of large effect size) as shown in Table 1.

These findings highlight that direct observation followed by focused feedback changes learner's behavior.

After completion of Mini-CEX student's feedback was taken using structured questioner. Though responses were obtained on 5 point Likert scale, strongly agree and agree has been clubbed. Similarly strongly disagree and disagree has been clubbed. Neutral has been discarded. All 47 students and 7 faculty members replied to questioner. Regarding orientation session 93% of students were satisfied with time allotted for it whereas 100% students were agreeing that contents in orientation session was adequate to understand process of Mini-CEX. All (100%) students also felt that Mini-CEX is better tool to assess clinical skills than conventional assessment. 96% of students liked immediate feedback given to them and 94% students were in agreement with the score given to them by faculty. Eight percent of student felt that Mini-CEX is more time consuming and more stressful than conventional assessment. All the students (100%) felt that they performed better in 2nd Mini-CEX than first and would be liked to be assessed in future by Mini-CEX and it should be introduced in all clinical subjects. Regarding feedback from faculty members it was observed that 71% of faculty members were satisfied with time and content in orientation.57% felt that preparation for Mini-CEX required more time. 100% of them felt that Mini-CEX is better tool to assess clinical skills than conventional assessment they all (100%) felt that it is more time consuming so 71% of them reported that they would not like to continue using Mini-CEX in future.

Authors also included few open-ended questions; nearly 50% (24/47) of students gave reply to open ended questions. Few of representative narratives from students are in quoted text.

Table 1: Difference in Mini-CEX score in various competencies. (N=47).

Mini-CEX competency	Score 1 st Mini-CEX		Score 2 nd Mini-CEX		Effect size (Cohen's d)
	Mean	SD	Mean	SD	
Medical interviewing	2.38	1.34	4.94	1.51	1.78
Physical examination	1.77	1.32	4.77	1.50	2.12
Humanistic quality	2.53	1.23	5.15	1.85	1.66
Clinical Judgment	1.87	1.10	4.17	1.62	1.67

What was good about Mini-CEX?

"Mini-CEX is a brilliant way to learn and make the future inquisitive about various topics; it encourages the students to study in a better manner. It makes learning interesting

and less monotonous. It helps the students to deal with patients in an early stage. It can immensely change the current education system and produce better set of doctors. I am thankful our college came up with a great imitative."

“It judged and assess my clinical skills which I found poor and established myself to focus and gain the clinical knowledge rather than bookish aspects.”

“We get to interact directly with experienced faculties without any stress of performance and with the thought of learning something from them.”

What is most important advantage of Mini-CEX?

“Directly assessment by the faculties itself is the best way to improve the clinical skills.” “One to one close interaction between students with professors, they can understand the procedure how to take the history, what points is important for particular region,”

“It is very good platform to learn clinical aspect of medicine without this we can't analyze our self only on the basis of theoretical knowledge.”

“Teacher to student interaction is the best thing.”

“Drastic improvement in history taking and general examination because of one to one supervision by professors”

Which is single most important disadvantage in your opinion?

“I don't think there are any disadvantages, but yes professors cannot teach each student personally that I agree but the procedure method can be applying with the help of residents and sometimes with professors.”

“Some of the professors may not have time every day and also they may not like teach us from 2nd MBBS and also all the students may not like to be under the direct observation of the professors.”

Perception of faculty members: Eighty-Five Percentage Faculty members felt that Mini-CEX is better tool at the same time all of them (100%) felt that it is time consuming process. At least half (57%) faculty felt that time constraint would not allow them to continue applying Mini-CEX. Few faculty members also felt that rather than 1:1 interaction if we can modify Mini-CEX to 1:5 teacher student ratios, Mini-CEX can be continued to be implemented in formative assessment.

DISCUSSION

Present study aimed to understand impact of introduction of Mini-CEX in formative assessment for undergraduate students in the subject of pediatrics and to study its effect if any in change in students' learning behavior and perception of both faculty and students towards this novel method of assessment. Globally there are very few studies available for introduction of Mini-CEX at undergraduate level. In India few studies are available for Mini-CEX at postgraduate level.

Mini-CEX has been previously studied among a variety of settings in medical education within and also outside of India and has shown good acceptability though Indian experience with this tool is primarily limited to very few specialties namely ophthalmology, pediatrics at post graduate level Obstetrics and Gynecology and dentistry at Undergraduate level, all of the studies reported good acceptability by participants.^{5,8,14-17} In present study all students agree that it is highly acceptable and better tool than conventional assessment, faculty members had diverged opinion regarding its applicability in a larger batches of Undergraduate students.

One major inbuilt component of Mini-CEX is focused feedback in which first what was done well by the student is reinforced and then discussing the areas which need improvement. One of the most attractive aspects of the mini-CEX is the direct observation of students' clinical skills by an assessor, and the direct, focused feedback enabled by this. Indeed, Norcini et al, found that US trainee performance over the first year of training improved significantly in all aspects of competence (over and above the normal improvement during the year) following the introduction of the mini-CEX, presumably based on performing under observation.^{7,9,18} Similar findings were noted in present study in which Mini-CEX is very well appreciated by students as well as faculty members. Satisfaction and scores allotted after Mini-CEX was very high in present study. Same finding of appreciation by students was documented in other studies.¹⁴ Researches on formative assessment and feedback suggests that these are powerful tools to change trainees' behavior.^{2,18,19} From several studies we know that student does not benefit from mere numerical marks but definitely improve with specific focused narrative feedback which guide students in which area they need to work more.^{2,20,21} In this study also feedback was accompanied by corrective methods especially on physical examination and medical interviewing skills. Students' performance in first and subsequent Mini-CEX after two weeks showed highly significant change both in scoring by faculty and perception from faculty and students. In study by Behere one of limitations which were mentioned that a student could have got much better grades if evaluated on basis of more cases, in present study this limitation was also tried to obviate.⁵ Probably improvement in scores should be the most important factor to introduce Mini-CEX in formative assessment to have better clinical and communication skills in Undergraduate level which not the case at present at most of institution.

Students' perception towards Mini-CEX was highly positive with very high satisfaction and they wanted that it should be continued, should be introduced in all clinical subjects and they perceived like “instead of two, 3-4 session would be more beneficial, with same faculty” and “More and more patient interaction and implemented right from 2nd year”. Same were students' response from undergraduate dentistry in study by Behere.⁵

Regarding disadvantages of Mini-CEX they found none but they also suggested like “professors cannot teach each student personally that I agree but the procedure method can be applying with the help of residents and sometimes with professors”. Two students also felt that” Some of the professors may not have time every day and also they may not like teach us from 2nd MBBS and also all the students may not like to be under the direct observation of the professors”. Feeling uncomfortable by the students in the presence of faculty while medical interviewing has also been observed in other study by Behre⁵. In present study majority of students were feeling more comfortable in subsequent encounters.

Majority of the faculty members agreed that Mini-CEX is a better way to assess clinical skills of student but organizing and implementing Mini-CEX required more planning and is time consuming and at least for larger batches of undergraduate students they would not be able to continue using it in formative assessment. Same findings about feasibility have been observed by Wilkinson and Alves de Lima though in present study there was no difficulty in scheduling encounters as unanimously it was decided and carried out before starting clinical rounds/clinical work, this is one more limitation specially when clinician is stretched due to heavy patient load, administrative work and inadequate staff. One of faculty’s responses towards Mini-CEX was “Not convinced for its application in huge number of students like ours, especially when teacher is stretched between clinical work and academics.”^{22,23}

Faith Hill suggested that any medical school thinking of undertaking Mini-CEX with undergraduates needs to consider number of issues.¹⁵ First to ensure consistency is essential to invest in an extensive staff development program for potential Mini-CEX examiners. Staff needs very clear guidelines that a wide range of examiners are marking to the same standard. In a study by Khalil et al they suggested to carry out feasibility and acceptability studies across the clinical branches among Indian medical colleges.¹⁴ One interesting finding in present study was that students have taken Mini-CEX as a Teaching learning tool also rather than pure assessment tool. So usefulness of Mini-CEX should be further explored especially for undergraduate medical students.

Limitations of this study due to time constraint and limited duration of clinical posting we could carry out only two Mini-CEX encounters per undergraduate student. Ideally in Mini-CEX there should be more encounters and students should have Mini-CEX experiences from many faculties before a conclusion is drawn about performance score of student.

Though there was significant statistically documented short term positive change in learning of undergraduate students, we need to carry out more studies to document findings about lasting change in behavior and its impact in summative assessment and clinical practice. Study was

done in one clinical department so it would be difficult to draw generalized conclusions about advantages, limitations and feasibility of Mini-CEX.

CONCLUSION

This is probably first ever Indian study about impact of introduction of mini-CEX in pediatric undergraduate level for formative assessment. Present study clearly showed that mini-CEX is very useful method for improvement for learning in clinical skills. Most important reason behind this finding could be direct observation based on check list followed by focused feedback by faculty which makes it superior than OSCE and other such methods used for assessment. Improvement in mini-CEX scores in subsequent encounters has demonstrated it to be bringing about positive change in student’s learning and is student centric approach.

This study encompassed various areas (20 structured questioners on 5 point Likert scale and 10 open ended questions) about perception of students and faculty members for first and subsequent mini-CEX encounters and provided significant insight in possible implementation at undergraduate level.

Though response from students and their feedback about mini-CEX is eclectic we need to consider issues about its feasibility in larger student intake medical colleges in India and stretched clinical departments. For that we may try certain modification like individual observation followed by group feedback, involvement of postgraduate resident doctors along with faculty members to conduct mini CEX and at least one directly observed encounter followed by feedback for each student during their clinical posting.

Implications

The high satisfaction with the mini-CEX tool by both faculty and undergraduate students in this and other studies is an encouraging sign towards achieving better clinical skills for students. With upcoming Competency based medical education in future it is likely that mini-CEX would be adopted not only as an assessment tool but also as Teaching Learning tool for its use in undergraduate curriculum across clinical branches in Indian medical colleges.

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