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# Mini clinical evaluation exercise (Mini-CEX): A tool for assessment of residents in department of surgery

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## Abstract:

**BACKGROUND:** The mini-clinical evaluation exercise (mini-CEX) is a formative assessment tool designed to provide feedback on skills essential to good medical care by observing an actual clinical encounter. However, the bigger advantage of mini-CEX is the structured feedback that it provides to the students as well as the faculty, thus helping them to make better decisions.

**MATERIALS AND METHODS:** This study was a cross-sectional observational study. Sixteen surgery residents volunteered for participation and five professors conducted sessions; hence, 80 mini-CEX encounters. Seven core clinical skill assessments were done, and the performance was rated on a 9-point scale (grouped into *unsatisfactory*, *satisfactory*, and *superior*). Immediate feedback to the residents was given by the faculty. Delayed feedback from faculty and residents regarding the perception of mini-CEX was taken. Statistical analysis was done using SPSS version 20 and analysis of variance (ANOVA) for inferential statistics.

**RESULTS:** As planned, 80 (100%) mini-CEX encounters were conducted. Surgery residents showed improvement that was statistically significant in the competencies of medical interviewing skills, physical examination skills, humanistic qualities/professionalism, and counseling skills. Most of the faculty (80%) were able to identify the gaps in the knowledge of students and areas of improvement for their teaching. However, 60% of the faculty felt that it required more effort than traditional methods. The mean time taken by the assessor for observation and feedback to residents was 12.51 min and 5.68 min, respectively. The mean scores of evaluator satisfaction and resident satisfaction with mini-CEX sessions were 6.04 and 7.49, respectively.

**CONCLUSIONS:** Mini-CEX improves the learning environment in residency and also leads to improvement in medical interviewing skills, physical examination skills, humanistic qualities/professionalism, and counseling skills. It is done in the actual patient encounter and hence prepares the resident better for dealing with patients in the future.

## Keywords:

Clinical competence, medical interviewing skills, professionalism, residents

## Introduction

Despite an increasing emphasis on workplace-based assessment (WPBA) during medical training, the existing system largely relies on summative assessment, whereas formative assessment is less valued.

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Various tools have been described for workplace-based assessment, mini-clinical evaluation exercise (mini-CEX) being one of them. mini-CEX is well accepted in western countries; however, it is scarcely used in India.<sup>[1]</sup>

Mini-CEX is a useful method of assessing clinical competence. It is called mini

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because it takes comparatively less time than a conventional case presentation. However, the bigger advantage of mini-CEX is the structured feedback that it provides to the students as well as the faculty, thus helping them to make better decisions.<sup>[2]</sup> Mini-CEX is a 10 to 20 min snapshot of doctor/patient interaction. It is designed to assess the clinical skills, attitudes, and behaviors of students essential to providing high-quality care.

Students are asked to undertake four to six observed encounters with different observers for each encounter. Each of these encounters represents a different clinical problem, and trainees should sample from each of the core problem groups identified as important (for example history taking, physical examination, diagnosis, communication, counseling, etc.). However, not all elements need to be assessed at each encounter. Each encounter takes about 20 min, with the first 15 min for the encounter and the last 5 min for feedback. Immediate feedback is provided by the person assessing the performance.<sup>[2]</sup> Mini-CEX conforms to the highest level of Miller’s pyramid, that is, “Does.”<sup>[3]</sup>

In a study by Norcini *et al.*<sup>[4]</sup> it has been concluded that even though the measurement characteristics of the mini-CEX are similar to those of performance assessments, which utilize standardized patients, the difficulty of the mini-CEX varies with the patients that a resident encounters. This effect can be mitigated to a degree by the examiners, who slightly overcompensate for patient difficulty, and by the fact that each resident interacts with several patients. Furthermore, the mini-CEX has higher fidelity than other formats, permits evaluation based on a much broader set of clinical settings and patient problems, and is administered on-site, in a real setting.

In our institution, surgery residents do not have a structured assessment program during residency, and the focus is on the summative assessment at the end of the course. Similarly, there is no structured feedback that can help the residents to take remedial actions well in time. Mini-CEX, a workplace-based assessment tool can prove beneficial in identifying the gaps in knowledge and any improvement required in teaching. Hence, this study was conducted for the application of mini-CEX for surgery residents and to obtain the perception of faculty as well as the residents toward mini-CEX.

## Materials and Methods

### Study design and setting

The project was conducted at a tertiary care institute having residents in the department of surgery from May 2019 to September 2019.

### Study participants

There were seven professors in the Department of Surgery at the time the study was planned. Out of these, five professors gave their consent to be part of the study. They were sensitized before conducting mini-CEX sessions.

### Data collection tool and technique

- 1) The concept of mini-CEX was explained to the faculty members and the systematic ways and methods of giving feedback were conveyed to them.
- 2) All 16 surgical residents who consented were sensitized toward mini-CEX.
- 3) Preparation of a feedback questionnaire for students and faculty was done and the questionnaire was validated by the peer group.
- 4) Five sessions of mini-CEX were conducted for each resident in different settings of the out-patient department (OPD), in-patient department (IPD), and emergency ward with an emphasis on not repeating the clinical cases. It was taken care that each student should have at least one session in each setting, that is, OPD, IPD, and emergency.
- 5) The students were assessed using standard mini-CEX Proforma testing 7 core clinical skills rated on a 9-point scale. A score of 1–3 was considered unsatisfactory, a score of 4–6 was considered satisfactory, and a score of 7–9 was considered superior [Figure 1].
- 6) Immediate feedback was provided to the students by the faculty.
- 7) Duration of each mini-CEX was recorded.
- 8) The difficulties were identified, recorded, and appropriate measures were taken to address them.
- 9) At the conclusion, the opinion of residents and faculty members regarding their experience with mini-CEX was taken using a pre-validated questionnaire. The results were analyzed using statistical tools (Ethical code no. – IEC-138).

Figure 1: Mini-CEX proforma

### Statistical analysis of all components of mini-CEX

- Analysis was done by SPSS version 20 to calculate the descriptive statistics
- P-value of < 0.05 was taken to be significant
- Analysis of variance (ANOVA) was used to calculate inferential statistics.

### Ethical consideration

The study was conducted only after approval from the institutional ethics committee (IEC-138) and after obtaining due consent from participating faculty and surgery residents.

## Results

As planned, 80 (100%) mini-CEX encounters were conducted. Five professors of surgery conducted one session each with all 16 surgery residents.

### Patient setting

Forty sessions (50%) were conducted with ambulatory patients, 24 (30%) sessions were for inpatients, and 16 (20%) were conducted in the emergency department.

### Focus areas

The focus areas during the evaluation were (according to the evaluating professor)

- Data gathering 91%
- Diagnosis 51%
- Therapy 34%
- Counseling 59%.

### Complexity of cases

As far as the complexity of cases was concerned, 32 (40%) were in the low category, 26 (32.5%) were in the moderate category, and 22 (27.5%) were in the high category.

### Competencies of residents assessed on a 9 point scale

A mini clinical evaluation exercise was performed, and students were marked on a 9-point scale. The marks from 1 to 3 were considered in the group unsatisfactory, a score of 4 to 6 was included in the satisfactory group, and a 7 to 9 score was considered superior. The change in the number of students in all categories for each competency from the initial to the final session is depicted in Table 1.

On application of ANOVA, there was a statistically significant difference in scores of medical interviewing skills, physical examination skills, professionalism, and counseling skills.

On multiple comparisons, the following differences were seen:

- 1) Medical interviewing skills: The statistically significant improvement in scores was seen from the first to fourth sessions.

- 2) Physical examination skills: The statistically significant improvement in scores was seen from the first to fourth sessions.
- 3) Humanistic qualities/professionalism: The statistically significant improvement in scores from the first session was seen only by the time the fifth session was conducted.
- 4) Clinical judgment: There was no statistically significant improvement seen in scores of clinical judgments.
- 5) Counseling skills: In the counseling skill competency, the statistically significant difference of scores was found from second to fifth sessions.
- 6) Organization efficiency: There was no statistically significant improvement seen in scores of clinical judgments.
- 7) Overall clinical competence: This competency of overall clinical competence also did not show statistically significant improvement in scores over the course of sessions.

The median score in different skills of residents is shown in Table 2.

The mean time taken by the assessor for observation was 12.51 min (7 min–20 min).

The mean time taken for feedback to the resident by the assessor was 5.68 min (4 min–10 min).

The mean score of evaluator satisfaction was 6.04 (4–9). The mean score of resident satisfaction with mini-CEX sessions was 7.49 (4–9) and showed that residents had good-to-high satisfaction rates with the exercises conducted.

After the completion of the sessions, both faculty and residents were requested to fill out the feedback questionnaire. Faculty feedback and residents' feedback are shown in Figures 2 and 3, respectively.

## Discussion

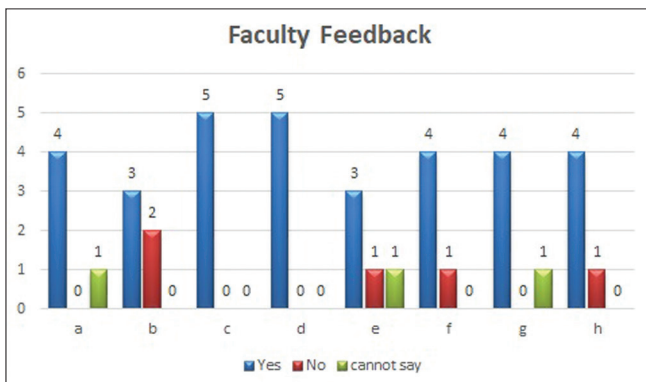
We observed that conducting mini-CEX for surgery residents in the Indian setting is feasible without utilizing too many resources, which has also been observed by other authors.<sup>[1,5,6]</sup>

We observed that 50% of our sessions were conducted with ambulatory patients, 43.75% of sessions were for inpatients, and 6.25% were conducted in the emergency department.

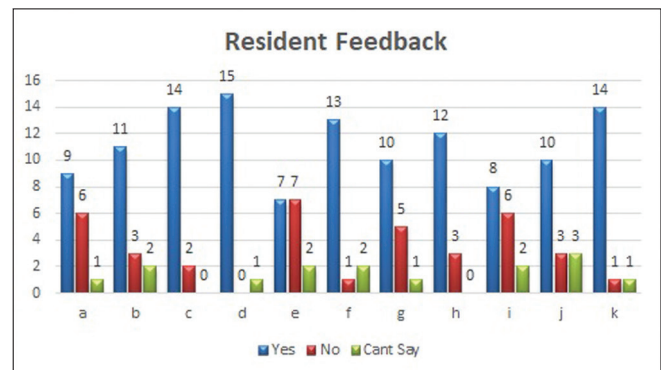
These results compared favorably with those of Norcini et al.,<sup>[7]</sup> in which 38% of sessions were conducted in ambulatory patients, 54% in IPD, and 14% in the emergency department (information on setting was missing for 4%). In yet another study conducted by

**Table 1: Showing change in the number of students in all categories**

	Session	Unsatisfactory	Satisfactory	Superior
Medical interviewing skillsw	Initial session	5 (31.25%)	11 (68.75%)	0
	Final session	2 (12.5%)	13 (81.25%)	1 (6.25%)
Physical examination skills	Initial Session	7 (43.75%)	9 (56.25%)	0
	Final Session	1 (6.25%)	14 (87.5%)	1 (6.25%)
Humanistic qualities/professionalism	Initial Session	7 (43.75%)	9 (56.25%)	0
	Final Session	2 (12.5%)	11 (68.75%)	3 (18.75%)
Clinical judgment	Initial Session	3 (18.75%)	13 (81.25%)	0
	Final Session	2 (12.5%)	13 (81.25%)	1 (6.25%)
Counseling skills	Initial Session	8 (50%)	8 (50%)	0
	Final Session	2 (12.5%)	10 (62.5%)	4 (25%)
Organization efficiency	Initial Session	4 (25%)	12 (75%)	0
	Final session	3 (18.75%)	12 (75%)	1 (6.25%)
Overall clinical competence	Initial Session	1 (6.25%)	15 (93.75%)	0
	Final Session	1 (6.25%)	13 (81.25%)	2 (12.5%)



**Figure 2:** Showing feedback from faculty where. (a) Any improvement in clinical skills was noted. (b) Can prove helpful to improve clinical and communication skills. (c) Valid method for formative assessment. (d) Can become a good formative assessment tool. (e) Adequate time devoted. (f) More effort than traditional methods. (g) Improvement in learning attitude of residents. (h) Able to identify gaps in knowledge and areas of improvement in their teaching methods



**Figure 3:** Resident's feedback (a) Valid method for formative assessment. (b) Recommendation for the continuation of activity. (c) Effective formative assessment tool. (d) Sufficient time for the complete session. (e) Adequate time is given for feedback. (f) Anxious/uncomfortable during the session due to observation. (g) Feedback from teachers motivated to improve. (h) More comfortable in communication with patients and relatives. (i) Improvement in clinical skills. (j) Non/less-threatening environment. (k) Able to identify gaps in knowledge

Singh and Sharma,<sup>[5]</sup> 75% of sessions were conducted in the ambulatory setting (OPD) and 25% of sessions were conducted in the IPD setting.

The focus areas during the evaluation in our study were data gathering (91%), diagnosis (51%), therapy (34%), and counseling (59%). Similar results were reported by Goel and Singh,<sup>[8]</sup> where data gathering was 92%, diagnosis 60%, therapy 45%, and counseling was 30%. Singh and Sharma<sup>[5]</sup> reported data gathering to be 89.6%, diagnosis to be 62.7%, therapy to be 28.4%, and counseling to be 36.6%. While comparing the complexity of cases, we had 61.25% cases in the low category, 47.5% in the moderate category, and 3.75% were in the high category, whereas Singh and Sharma<sup>[5]</sup> reported 51.5% in the low category, 44% in the moderate category, and 4.5% were in the high category. In yet another study done by Liao *et al.*,<sup>[9]</sup> the observations were quite different. They reported 2.4% cases in the low category, 78.7% in the moderate category, and 10.7% were in the high category, whereas the data was missing in 8.2%.

In our study, the mean score was 5 for medical interviewing skills, humanistic qualities/professionalism, clinical judgment, and counseling, and overall clinical competency. The mean score was 4 for organizational efficiency and physical examination skills. Norcini *et al.*<sup>[7]</sup> reported a mean score of 6.5 for medical interviewing skills, physical examination, and clinical judgment; 7 for humanistic qualities, and 6.5 for overall competence. Chang *et al.*<sup>[10]</sup> reported a mean score of 6.6 for medical interviewing skills; 6.5 for physical examination, clinical skills, counseling skills, and organization/efficiency; 6.7 for clinical judgment and 6.8 for professionalism. The comparison of the median score of the present study with previous studies is shown in Table 3.

We utilized a standard proforma for mini-CEX for the assessment of surgery residents. However, valid and reliable questionnaires can be developed for medical specialties as shown by Ghadrdoost *et al.*<sup>[11]</sup>

**Table 2: Showing median score in different skills of residents**

Competency	Median score
Medical interviewing skills	5
Physical examination skills	4
Humanistic qualities/ professionalism	5
Clinical judgment	5
Counseling skills	5
Organization efficiency	4
Overall clinical competence	5

**Table 3: Showing comparison of median score of the present study with previous studies**

Competency	Median score	
	Our study	Holmboe et al. <sup>[12]</sup>
Medical interviewing skills	5	6
Physical examination skills	4	6
Humanistic qualities/ professionalism	5	–
Clinical judgment	5	–
Counseling skills	5	6
Organization efficiency	4	–
Overall clinical competence	5	6

We observed that the mean time taken by the assessor for observation was 12.51 min, whereas the mean time taken for feedback to the resident by the assessor was 5.68 min.

Liao et al.<sup>[9]</sup> observed that the mean time taken by the assessor for observation was 19.18 min, whereas the mean time taken for feedback to the resident by the assessor was 14.99 min. More or less similar results were reported by Chang et al.<sup>[10]</sup> who observed assessor observation time to be 14.8 min and a feedback time of 11 min. Our sessions were quicker as compared to both of these authors.

The mean score of evaluator satisfaction was 6.04 in our study, whereas it was 7.98 in the study done by Liao et al.<sup>[9]</sup> and 6 in a Yale Primary Program care reported by Holmboe et al.<sup>[12]</sup>

The mean score of resident satisfaction with mini-CEX sessions was 7.49 in our study, whereas it was 7.96 as reported by Liao et al.<sup>[9]</sup> and 6 as reported by Holmboe et al.<sup>[12]</sup> Our study compared favorably resident feedback with the observations of Norcini et al.<sup>[7]</sup> and Burch et al.<sup>[13]</sup> In another study, the experiences of the participants showed that direct participation in the activities and healthcare techniques led to more sustainable learning for them.<sup>[14]</sup> In our study, 43.75% of residents reported that they felt anxious during the encounter, which was similar to the results reported by Malhotra et al.<sup>[15]</sup> Most of the faculty in our study felt that mini-CEX will prove to help improve the clinical and communication

skills of residents and will lead to improvement in the learning attitude of the residents. Such sentiments were also echoed by Joshi et al.<sup>[1]</sup> Another study found that feedback content could make mini-CEX a rich evaluation instrument, and it was of great value in terms of critical and supportive feedback.<sup>[16]</sup>

Similarly, the positive responses received from both students and faculty highlight that the students are receptive to feedback, provided it is structured, constructive, and helps them to achieve their learning goals.<sup>[17]</sup>

Thus, mini-CEX facilitates feedback and can lead to improved trainee performance but the reluctance of assessors to award failing grades could potentially limit its ability to identify underperforming trainees.<sup>[18]</sup> This was also the problem faced in our study, where, in the initial encounters, the faculty was showing an affinity to give satisfactory scores but after repeated sensitization, they agreed to evaluate impartially and the sessions were conducted from the beginning after complete satisfaction of compliance.

The strength of the study lies in the fact that mini-CEX can be used as a tool for assessment as well as teaching clinical skills as a part of the workplace-based assessment. It can be used as a teaching method because it involves immediate feedback by the assessor, which can lead to improvement in various skills of the resident in further clinical encounters. Because it has a well-marked proforma covering all the aspects of the clinical encounter, it can be used as a clinical tool.

### Limitation and recommendation

There are certain limitations of this study such as fewer residents, time constraints (small duration of the study), and non-consideration of the relationship between the complexity of cases and scoring. Despite these limitations, the application of mini-CEX helped the residents to identify the gaps in their knowledge. Most teachers were also able to identify the gaps in the knowledge of students and areas for improvement in their teaching. Students were objectively and regularly assessed. Students got motivated to modify their learning behavior. It is hoped that the continuation of this activity will help in achieving other intermediate outcomes of motivating teachers to modify their teaching methods.

The results have already shown improvement in the counseling skills of residents and hence it is expected that long-term outcomes of residents will become more competent clinically. Better doctor–patient communication and counseling skills can definitely be achieved with the continuation of mini-CEX sessions.

The results of feedback from faculty and residents were overwhelming. The faculties from other departments also appreciated our efforts and the findings of this study. We are planning to implement it for the subsequent batch of surgical residents. The findings have been appreciated by peers too during the dissemination of data. We are planning to recommend it to the National Medical Commission, India, to incorporate it as part of the surgery curriculum.

### Conclusions

Mini-CEX is an acceptable and practical tool for the assessment of residents; especially formative assessment. It improves the learning environment in residency and leads to improvement in medical interviewing skills, physical examination skills, humanistic qualities/professionalism, and counseling skills. It was done in the actual patient encounter; hence, it is expected to prepare the residents to deal with patients in a better way in the future. However, a higher percentage of faculty felt that mini-CEX requires more effort than traditional methods.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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