



## Mini-Clinical Examination (Mini-Cex) As a Formative Assessment Tool for Ent Interns at Anims

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### KEYWORDS

Mini-CEX;  
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### ABSTRACT:

**Background:** Competency-based medical education (CBME) requires robust formative assessments that provide structured feedback and encourage reflective practice. The mini-Clinical Evaluation Exercise (mini-CEX) is a validated workplace-based assessment tool, though its utility in ENT training in India remains underexplored.

**Aim:** To evaluate the effectiveness, feasibility, and acceptability of the mini-CEX as a formative assessment tool for ENT interns at ANIIMS.

**Methods:** A prospective cross-sectional study was conducted among 50 ENT interns over five months. Each intern underwent multiple mini-CEX encounters across outpatient, inpatient, and emergency settings. Seven domains—medical interviewing, physical examination, professionalism, clinical judgment, counseling, organization/efficiency, and overall competence—were assessed using a 9-point scale. Pre- and post-intervention scores were compared using paired t-tests, with 95% confidence intervals and p-values calculated. Intern and faculty feedback on feasibility and acceptability was also obtained.

**Results:** Mean overall competence improved significantly from  $5.0 \pm 0.8$  to  $7.2 \pm 0.7$  ( $\Delta=2.2$ ,  $p<0.001$ ). The proportion of interns rated “Superior” ( $\geq 7$ ) increased from 4% to 56%. All domains showed significant post-intervention improvements, with mean gains ranging from +1.8 to +2.2 points ( $p<0.001$ ). Feasibility analysis revealed an average of 3.2 encounters per intern, mean

time of 16.4 minutes per encounter, and high levels of satisfaction (74% overall satisfied; 90% valued feedback). **Conclusion:** The mini-CEX significantly enhanced clinical competence, communication, and professionalism of ENT interns at ANIIMS. It was feasible, well-accepted, and time-efficient, supporting its integration into CBME frameworks for ENT training in resource-limited medical institutions.



## INTRODUCTION

Competency-Based Medical Education (CBME) has redefined the landscape of medical training worldwide by shifting the focus from time-bound, knowledge-centered learning to competency-driven, outcome-based education. The overarching philosophy of CBME emphasizes the acquisition of essential skills, attitudes, and professional behaviors along with knowledge, thereby ensuring that graduating medical professionals are equipped to meet the health needs of society. Within this framework, formative assessment plays a critical role, as it provides continuous feedback, guides reflective practice, and fosters self-directed learning. Traditional summative assessments—such as written examinations, objective structured clinical examinations (OSCEs), and viva voce—often fail to capture the nuances of clinical performance, communication, and professionalism that are essential for holistic medical practice. This necessitates the adoption of workplace-based assessment (WPBA) methods that allow for direct observation of trainees in authentic clinical environments.<sup>[1]</sup>

One such WPBA tool is the mini-Clinical Evaluation Exercise (mini-CEX), originally developed by the American Board of Internal Medicine (ABIM) in the 1990s. The mini-CEX is a structured tool that evaluates a trainee's performance across multiple domains, including medical interviewing, physical examination, clinical judgment, professionalism, organization/efficiency, and counseling. It is designed to be brief, flexible, and adaptable to real-life patient encounters, typically lasting 15–20 minutes, with an immediate feedback session following the encounter. Unlike traditional long case examinations, which may emphasize completeness and comprehensiveness in a single patient presentation, the mini-CEX prioritizes frequent, focused assessments across diverse clinical settings and patient problems. This iterative process of observation and feedback supports skill refinement and progressive professional growth.<sup>[2]</sup>

Several studies have established the validity, reliability, feasibility, and educational impact of the mini-CEX across different specialties, such as internal medicine, pediatrics, anesthesia, and surgery. Studies demonstrated its effectiveness among anesthesia residents, reporting significant improvement in domains like history-taking and counseling after repeated encounters. Similarly,

studies highlighted its relevance for CBME-based interns, showing that structured observation coupled with feedback enhanced self-awareness and competence. These findings underscore the universal applicability of the mini-CEX in medical training.<sup>[3][4]</sup>

The specialty of Otorhinolaryngology (ENT) presents unique challenges and learning opportunities for medical interns. ENT practice requires the integration of fine clinical skills, such as detailed history-taking for ear, nose, and throat complaints, meticulous physical examination techniques using specialized instruments, precise decision-making regarding surgical versus conservative management, and clear, empathetic communication for counseling patients and their families. Furthermore, ENT conditions are highly prevalent in primary care and hospital settings, making proficiency in this domain essential for all medical graduates. However, in many institutions, ENT postings for interns are relatively short and often underemphasized compared to major disciplines. Traditional assessments may inadequately capture interns' readiness to handle real-world ENT cases, especially in resource-limited or geographically isolated institutions.<sup>[5]</sup>

The Andaman & Nicobar Islands Institute of Medical Sciences (ANIIMS), Port Blair, is a peripheral medical college catering to a diverse patient population in a geographically isolated setting. Resource constraints and limited specialist manpower amplify the importance of optimizing medical training for interns. In such contexts, formative assessments like the mini-CEX hold promise not only in enhancing clinical competence but also in motivating interns and faculty towards a culture of feedback and reflective learning. Despite the global evidence supporting mini-CEX, its utilization in ENT training in India, particularly in remote and resource-limited areas, remains underexplored.<sup>[6]</sup>

### Aim

To evaluate the effectiveness of the mini-Clinical Evaluation Exercise (mini-CEX) as a formative assessment tool for ENT interns at ANIIMS.

### Objectives

1. To assess the clinical skills, communication abilities, and professionalism of ENT interns using mini-CEX encounters.



2. To evaluate the improvement in performance of ENT interns after repeated mini-CEX assessments.
3. To analyze the feasibility, acceptability, and satisfaction levels of interns and faculty with the mini-CEX as a formative assessment tool.

## MATERIALS AND METHODOLOGY

### Source of Data

The study was conducted among ENT interns posted in the Department of Otorhinolaryngology at Andaman & Nicobar Islands Institute of Medical Sciences (ANIIMS), Port Blair.

### Study Design

A prospective cross-sectional study design was adopted.

### Study Location

The Department of ENT, ANIIMS, Port Blair, Andaman & Nicobar Islands, India.

### Study Duration

The study was conducted over a period of 6 months.

### Sample Size

A total of 50 ENT interns participated in the study.

### Inclusion Criteria

- All interns posted in the Department of ENT during the study period.
- Interns who provided written informed consent for participation.

### Exclusion Criteria

- Interns who declined consent.
- Interns who were absent for the majority of the ENT posting and thus could not complete the planned mini-CEX encounters.

### Procedure and Methodology

Each intern underwent multiple mini-CEX encounters during their posting. The assessment was conducted using a structured mini-CEX proforma adapted from the American Board of Internal Medicine (ABIM) guidelines<sup>[2]</sup>.

### Domains Assessed:

Medical Interviewing Skills. Physical Examination Skills. Humanistic Qualities and Professionalism. Clinical Judgment. Counseling Skills. Organization/Efficiency. Overall Clinical Competence

### Rating Scale:

A 9-point scale was used:

1–3: Unsatisfactory

4–6: Satisfactory

7–9: Superior

### Process:

Each intern was observed by faculty during patient encounters in outpatient, inpatient, and emergency settings. Encounters typically lasted 15–20 minutes, including direct observation and interaction with the patient. Immediately after each encounter, structured feedback was provided by the assessor, focusing on strengths, areas for improvement, and specific strategies for skill enhancement. Each intern had repeated encounters across different patient cases to ensure comprehensive assessment.

### Sample Processing

Performance scores across domains were recorded on the structured proforma. Pre-intervention and post-intervention scores were compiled. The data were anonymized for analysis to maintain confidentiality.

### Statistical Methods

Descriptive statistics were used to calculate means, standard deviations, and median scores. Paired t-tests were applied to compare pre- and post-intervention mean scores. Distribution shifts across rating categories (Unsatisfactory, Satisfactory, Superior) were analyzed. A p-value <0.05 was considered statistically significant. Qualitative feedback from interns and faculty was analyzed thematically.

### Data Collection

Data were collected prospectively using the mini-CEX forms completed during each encounter. Informed consent was obtained before participation. Feedback from interns and faculty regarding the acceptability and feasibility of the tool was also recorded. Ethical



clearance was obtained from the Institutional Ethics Committee of ANIIMS.

## OBSERVATION AND RESULTS

**Table 1: Primary effectiveness of mini-CEX as a formative assessment tool (N=50)**

Outcome	Pre mini-CEX	Post mini-CEX	Effect size ( $\Delta$ or RD)	Test (df)	95% CI	P-value
<b>Overall clinical competence (score 1–9)</b>	5.0 $\pm$ 0.8	7.2 $\pm$ 0.7	$\Delta$ = 2.2	Paired t(49)=20.6	1.99 to 2.41	<0.001
<b>Rated “Superior” (<math>\geq 7</math>) overall</b>	2/50 (4.0%)	28/50 (56.0%)	RD = +52.0 %pts	2-prop z=6.89	+37.2 to +66.8 %pts	<0.001
<b>Any domain improved by <math>\geq 1</math> point</b>	–	46/50 (92.0%)	–	1-prop z vs 50% = 7.42	81.9% to 96.9%	<0.001

Notes: Effect for means = post–pre; proportions tested vs 50% (or pre vs post for two-proportion z). CI for  $\Delta$  uses paired SE with  $r=0.50$ .

Table 1 demonstrates the primary effectiveness of mini-CEX as a formative assessment tool among 50 ENT interns. The mean overall clinical competence score improved markedly from 5.0  $\pm$  0.8 before intervention to 7.2  $\pm$  0.7 after intervention, yielding a significant mean difference of 2.2 (95% CI: 1.99–2.41,  $p<0.001$ ). The proportion of interns rated as “Superior” (score  $\geq 7$ ) also rose substantially from 4.0% (2/50) at baseline to 56.0%

(28/50) post-intervention, a relative difference of +52 percentage points (95% CI: +37.2 to +66.8,  $p<0.001$ ). Furthermore, nearly all interns showed domain-wise improvement: 92.0% (46/50) achieved at least a one-point rise in any domain score, which was highly significant compared with the null expectation of 50% (95% CI: 81.9–96.9,  $p<0.001$ ).

**Table 2: Post-encounter competency by domain (against “satisfactory” threshold of 6) (N=50)**

Domain (post)	Mean $\pm$ SD	One-sample t vs 6 (df=49)	95% CI (mean)	p-value
Medical interviewing	7.1 $\pm$ 0.7	11.11	6.90 to 7.30	<0.001
Physical examination	7.0 $\pm$ 0.6	11.79	6.83 to 7.17	<0.001
Humanistic qualities / professionalism	7.4 $\pm$ 0.5	19.80	7.26 to 7.54	<0.001
Clinical judgment	6.9 $\pm$ 0.7	9.09	6.70 to 7.10	<0.001
Counseling	7.0 $\pm$ 0.6	11.79	6.83 to 7.17	<0.001
Organization / efficiency	7.0 $\pm$ 0.6	11.79	6.83 to 7.17	<0.001
<b>Overall clinical competence</b>	<b>7.2 <math>\pm</math> 0.7</b>	<b>12.12</b>	<b>7.00 to 7.40</b>	<b>&lt;0.001</b>

Interpretation: All post-mini-CEX means were significantly above the satisfactory benchmark of 6.

Table 2 evaluates post-encounter competency by individual domains against the “satisfactory” threshold of 6. All seven domains assessed showed mean values well above this benchmark. Medical interviewing (7.1  $\pm$  0.7), physical examination (7.0  $\pm$  0.6), counseling (7.0  $\pm$

0.6), and organization/efficiency (7.0  $\pm$  0.6) clustered around the superior range, each with one-sample t values  $>11$  and  $p<0.001$ . Humanistic qualities and professionalism had the highest post-score (7.4  $\pm$  0.5), with a very narrow confidence interval (95% CI: 7.26–



7.54) and a *t* value of 19.80, indicating consistent performance across interns. Clinical judgment, although slightly lower at  $6.9 \pm 0.7$ , still significantly exceeded the

benchmark (95% CI: 6.70–7.10,  $p < 0.001$ ). Overall competence averaged  $7.2 \pm 0.7$ , again significantly above 6 ( $t = 12.12$ ,  $p < 0.001$ ).

**Table 3: Improvement after repeated mini-CEX encounters (paired pre vs post) (N=50)**

Domain	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	$\Delta$ (Post–Pre)	Paired <i>t</i> (df=49)	95% CI for $\Delta$	<i>p</i> -value
Medical interviewing	$5.2 \pm 0.8$	$7.1 \pm 0.7$	+1.9	17.8	+1.69 to +2.11	<0.001
Physical examination	$5.0 \pm 0.9$	$7.0 \pm 0.6$	+2.0	17.8	+1.77 to +2.23	<0.001
Humanistic/professionalism	$5.6 \pm 0.7$	$7.4 \pm 0.5$	+1.8	20.4	+1.62 to +1.98	<0.001
Clinical judgment	$4.8 \pm 0.9$	$6.9 \pm 0.7$	+2.1	18.1	+1.87 to +2.33	<0.001
Counseling	$5.1 \pm 0.8$	$7.0 \pm 0.6$	+1.9	18.6	+1.70 to +2.10	<0.001
Organization/efficiency	$5.0 \pm 0.8$	$7.0 \pm 0.6$	+2.0	19.6	+1.80 to +2.20	<0.001
<b>Overall clinical competence</b>	<b><math>5.0 \pm 0.8</math></b>	<b><math>7.2 \pm 0.7</math></b>	<b>+2.2</b>	<b>20.6</b>	<b>+1.99 to +2.41</b>	<b>&lt;0.001</b>

Computation: Paired SEs from  $SD_{diff} = \sqrt{(SD_{pre}^2 + SD_{post}^2 - 2 \cdot r \cdot SD_{pre} \cdot SD_{post})}$  with  $r = 0.50$ .

Table 3 highlights the magnitude of improvement across domains after repeated mini-CEX assessments. Gains were evident in every competency area, with mean improvements ranging between +1.8 and +2.2 points on the nine-point scale. Clinical judgment showed the largest gain of +2.1 (95% CI: 1.87–2.33,  $p < 0.001$ ), while humanistic/professionalism improved by +1.8 (95% CI:

1.62–1.98,  $p < 0.001$ ). Medical interviewing, counseling, and organizational efficiency all improved by nearly +2 points with highly significant *p* values ( $< 0.001$ ). Overall competence rose from  $5.0 \pm 0.8$  to  $7.2 \pm 0.7$ , reflecting a mean difference of +2.2 (95% CI: 1.99–2.41,  $p < 0.001$ ). All paired *t* values exceeded 17, indicating robust within-participant improvement.

**Table 4: Feasibility, acceptability, and satisfaction with mini-CEX (Interns N=50; time/process metrics as Mean  $\pm$  SD)**

Metric	Value	Comparator & Test	95% CI	<i>P</i> -value
Encounters per intern (count)	$3.2 \pm 0.6$	vs 3 (one-sample $t(49) = 2.36$ )	3.03 to 3.37 (mean)	0.022
Time per encounter (minutes)	$16.4 \pm 2.9$	vs 20 (one-sample $t(49) = -8.78$ )	15.58 to 17.22 (mean)	<0.001
Immediate feedback helpful (Agree/Strongly Agree)	45/50 (90.0%)	vs 50% (1-prop $z = 5.66$ )	78.6% to 95.7%	<0.001



<b>Satisfied with mini-CEX overall</b>	37/50 (74.0%)	vs 50% (1-prop z=3.39)	60.4% to 84.1%	<0.001
<b>Scheduling feasible during OPD</b>	41/50 (82.0%)	vs 50% (1-prop z=4.53)	69.2% to 90.2%	<0.001
<b>Faculty time adequate*</b>	36/50 (72.0%)	vs 50% (1-prop z=3.11)	58.3% to 82.5%	0.002

Table 4 examines the feasibility, acceptability, and satisfaction with mini-CEX among the interns. On average, interns completed  $3.2 \pm 0.6$  encounters each, significantly higher than the target of 3 ( $p=0.022$ ). Each encounter lasted  $16.4 \pm 2.9$  minutes, which was significantly shorter than the planned 20 minutes (95% CI: 15.58–17.22,  $p<0.001$ ), indicating time efficiency. Regarding perceptions, 90.0% of interns agreed or strongly agreed that immediate feedback was helpful, a proportion far exceeding the 50% benchmark (95% CI: 78.6–95.7,  $p<0.001$ ). Overall satisfaction with mini-CEX was reported by 74.0%, and 82.0% considered scheduling feasible during OPD hours, both statistically significant improvements over the comparator proportion of 50% ( $p<0.001$ ). Additionally, 72.0% felt faculty had adequate time to conduct and discuss the assessments (95% CI: 58.3–82.5,  $p=0.002$ ).

## DISCUSSION

Findings show large, statistically robust gains in overall and domain-specific performance after repeated mini-CEX encounters among 50 ENT interns. The jump in overall clinical competence from  $5.0 \pm 0.8$  to  $7.2 \pm 0.7$  ( $\Delta=2.2$ ;  $p<0.001$ ) and the shift in “Superior” ratings ( $\geq 7$ ) from 4% to 56% mirror the core promise of the mini-CEX: brief, repeated, directly observed encounters with immediate feedback that drive measurable improvement. This pattern is consistent with the original mini-CEX work demonstrating broader sampling and better reproducibility than the traditional CEX, particularly when trainees are seen multiple times by different assessors. Wu Y *et al.* (2020)<sup>[7]</sup>

All post-encounter domain means exceeded a satisfactory threshold of 6 (medical interviewing  $7.1 \pm 0.7$ ; physical examination  $7.0 \pm 0.6$ ; professionalism  $7.4 \pm 0.5$ ; clinical judgment  $6.9 \pm 0.7$ ; counseling  $7.0 \pm 0.6$ ; organization/efficiency  $7.0 \pm 0.6$ ), reinforcing that mini-CEX encounters can lift performance across

communication, examination, judgment, and professional behaviors. Similar domain-level gains and attainment of satisfactory-to-superior performance have been reported when mini-CEX was introduced for MBBS interns in Orthopaedics, where five encounters produced significant improvement and mean times around 17 minutes per encounter—very close to program’s  $16.4 \pm 2.9$  minutes. Ramula M *et al.* (2018)<sup>[8]</sup>

The pre–post improvements we observed across domains (+1.8 to +2.2 points, all  $p<0.001$ ) align with experience from internal medicine and other specialties, where mini-CEX programs embedded longitudinally and supported by faculty development have shown positive educational effects and changes in assessor practice behaviors. The “many short observations + feedback” design is a key driver of learning gains, and programmatic implementations emphasize repeated sampling and rater preparation to maximize educational impact. Sharma Y *et al.* (2018)<sup>[9]</sup>

Feasibility and acceptability data in cohort were strong: interns averaged  $3.2 \pm 0.6$  encounters, 90% agreed feedback was helpful, 74% were satisfied overall, and 82% found scheduling feasible during OPD. These are congruent with ENT-specific experience showing mini-CEX to be feasible in high-volume Indian outpatient settings with modest per-encounter time ( $\approx 11$  minutes procedure time plus feedback) and without additional staffing differences in duration likely reflect local patient mix and feedback practices. Notably, 16.4-minute average sits between the  $\approx 11$  minutes seen in one ENT program and the  $\sim 25$ -minute median reported in the earliest multi-site study, suggesting timings are both realistic and efficient. Casanova JM *et al.* (2014)<sup>[10]</sup>

High perceived usefulness of immediate feedback in study matches the wider literature: systematic reviews identify the mini-CEX as having among the strongest validity evidence of direct-observation tools, with



narrative, behaviorally specific feedback central to its impact. At the same time, reliability is sensitive to case specificity and rater stringency/leniency, underscoring the value of multiple encounters, multiple assessors, and rater training—practices we used and which likely contributed to the large, consistent effect sizes here. Rogausch A *et al.* (2015)<sup>[11]</sup>

Acceptability findings intern satisfaction 74%; perceived faculty time adequacy 72% harmonize with reports from anesthesia and other disciplines, where both trainees and faculty view the mini-CEX favorably while acknowledging operational challenges - scheduling, initial anxiety that tend to diminish as programs mature and observers become more practiced in time-efficient, high-quality feedback. Lo MC *et al.* (2024)<sup>[12]</sup>

## CONCLUSION

The present study demonstrates that the mini-Clinical Evaluation Exercise (mini-CEX) is a highly effective formative assessment tool for ENT interns at ANIIMS. Significant improvements were observed across all assessed domains—including medical interviewing, physical examination, clinical judgment, professionalism, counseling, and organizational skills—after repeated encounters with structured feedback. The marked rise in the proportion of interns achieving “Superior” ratings and the consistently high post-intervention mean scores confirm the educational value of this tool. Furthermore, both interns and faculty reported high levels of feasibility, acceptability, and satisfaction, emphasizing its practicality even in a resource-limited, geographically isolated setting. Integrating mini-CEX into the competency-based medical education framework for ENT training can strengthen clinical competence, communication, and professionalism, ultimately improving patient care outcomes.

## LIMITATIONS OF THE STUDY

1. The study was conducted at a single institution (ANIIMS), which may limit the generalizability of findings to other medical colleges or specialties.
2. The sample size was modest (n=50), representing only one cohort of interns, thereby restricting external validity.

3. Assessment was confined to the ENT posting; extrapolation to long-term performance or other clinical domains was not explored.
4. Faculty time constraints and variability in assessor stringency or leniency could have influenced ratings despite standardized guidelines.
5. The relatively short duration of the study (fmonths) did not allow for evaluation of long-term retention of skills or the sustained impact of mini-CEX on clinical competence.

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