MINI-CEX: FEASIBILITY, ACCEPTABILITY AND EFFECTIVENESS OF ITS USE IN THE LEARNING OF POST GRADUATE RESIDENTS

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ABSTRACT

Objective: To assess feasibility, acceptability and effectiveness of launching mini-CEX as a Work Place Based Assessment tool in Obs/Gynae post-graduate residency program.

Study Design: Mixed method approach.

Place and Duration of Study: Obs/Gynae dept of Islamic International Medical College Rawalpindi Pakistan, from Aug 2016 to Feb 2017.

Patients and Methods: Twenty one post graduate residents from first to final year MCPS/FCPS and available faculty members (10) were invited to participate. Non-probability convenience sampling was used. We adopted an amended mini-CEX tool. The residents were assessed in history taking, physical examination, clinical judgment, communication skills and professionalism. Copies of the mini-CEX forms were collected and analyzed. Results of the first and last Mini CEX scores were compared to determine the efficiency of mini-CEX. These results were analyzed using SPSS version 21. Perceptions of faculty and PG residents are expressed as average scale frequencies ± 2 standard deviation.

To assess the feasibility; time taken for each encounter was noted. Mean time was calculated. The total time taken for mini-CEX encounters during the study period was extrapolated over a year. For further assessing the feasibility; considerable practical difficulties were identified.

Results: Almost all the residents (18/21) and faculty members (8/10) were satisfied with the mini-CEX as a learning tool. More than 75% of the residents showed gradual improvement in scores from the first to the fourth mini-CEX. The average duration of mini-CEX was 19.51 minutes. Average time taken for the feedback was 13.08 minutes. Seventeen residents were contented with feedback of each session of mini-CEX. Majority of comments indicated that feedback was the strongest characteristic of mini-CEX. Most participants (17 residents; 8 faculty members) never or occasionally experienced trouble organizing the mini-CEX. About 27% residents felt anxious being observed.

Conclusions: This study concluded that Mini-CEX is highly acceptable and feasible educational tool. Its effectiveness was established by statistically significant improvement in results of post graduate residents over a period of time. It was also useful in helping faculty to assess and to give formative feedback to residents on their clinical performance in real workplace based environment.

Keywords: Feedback, Formative assessment, Mini-CEX, Residents.

INTRODUCTION

Assessment drives learning[1]. Learning and assessment of clinical skills is a major challenge in clinical training[2]. In 1972, the American Board of Internal Medicine (ABIM) implemented the Clinical Evaluation Exercise (CEX)[3]. Traditionally the teacher observes the student while he/she examines the patient, obtains pertinent findings, makes diagnosis and gives treatment plan. This exercise takes around two hours. However, it has many weaknesses: 1). Student is evaluated by one examiner, 2). Assessment criterion is widely variable, 3). Student is assessed on single patient[4], 4). Patients vary significantly in their condition and circumstances. Hence, the proficiency in one case does not consistently foresee performance in others. Moreover, in Pakistan, the traditional and current summative examination is not an optimal test of the resident's clinical competence,

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attitudes etc. It creates a "halo effect" as our residents are not at all motivated to learn clinical skills since they are not going to be properly judged in the assessment[5]. Clinical faculty is the best judge to certify the residents[6,7]. Mini-Clinical Evaluation Exercise (Mini-CEX) was devised to overcome these drawbacks[8]. It is a direct assessment by observing a patient - resident interaction for brief time on real patient in their actual workplaces. After each mini CEX, instant and relevant feedback is given[9]. Assessment is documented on a standard rating form that has been analyzed to have high reliability and internal consistency[10]. The rationale of our study was to execute a pilot project that would help us in appraisal of the acceptability, feasibility and effectiveness of Mini-CEX in our institution to be launched as part of our postgraduate curriculum.

PATIENTS AND METHODS

The study was carried out in the Department of Obs/Gynae of Islamic International Medical College at Railway Teaching Hospital Rawalpindi. After taking permission from the stake-holders from August 15th 2016 to February 10th 2017.

Mixed method approach was adapted. Feasibility of mini-CEX was assessed by the 'observation of time' taken by encounters. Acceptability and Feasibility was further assessed by the perceptions of faculty and PG residents through a "cross sectional survey". "Single Subject experimental design"[11] was selected for effectiveness of mini-CEX (residents underwent a series of mini-CEX and their results were compared).

Non-probability convenience sampling was used for the induction of 10 faculty members (with at least 2 years of teaching experience) and 21 residents in the study.

Data collection tools were the amended mini-CEX forms and the survey forms. Amendments, finalization and validation of the forms were done by involving Obs/Gynae faculty, representatives of the faculty of medical education and representatives of residents. We also developed ad hoc questionnaires rather than an existing, validated tool for survey. Two separate questionnaires, for residents and for faculty, with closed ended questions were used to collect data (on a 5 point Likert scale). We ensured the validity of questionnaires by getting the views of participants on the areas of importance that can be improved upon[12]. Validity was also confirmed by other ways e.g. questions which were not completed by the majority were deleted[13]. Internal reliability co-efficient (Cronbach's alpha) were calculated for the 7-item questionnaire for the faculty and 10-item questionnaire for the residents. 'Test-retest reliability' was established (questionnaire was completed by the same participant after an interval of a week or so)[14]. Contribution towards Obs/Gynae residents' learning and perceptions of faculty and PG residents about the method were expressed as average scale Mean ± SD.

Table-I: Statistics of 10 faculty members who participated in the mini-CEX workshops in 2016.

Variables		Number	Percentage (%)
Specialty	Obs/Gynae	10	100
	Others	Nil	0
Gender	Female	10	100
	Male	Nil	0
Years of teaching experience	>10 years (Professors)	2	20
	>5-10 years (Assistant and Associate professors)	5	50
	>1-5 years of Experience (Assistant professors and senior registrars)	3	30

A one day workshop was conducted to train the faculty about the Mini CEX and how to give formative feedback. Residents were issued with booklets of mini-CEX forms and advised to request their teachers to observe them while conducting history and examinations. We tried our best that every resident should have an exposure of new faculty member while undergoing each of the 4 mini-CEX encounters. We tried to ensure selection of cases with almost equal complexity for the same year of residency. Difficulty level of the case matching the year of residency was also taken into account; e.g. cases with least difficulty level for first year residents and vice versa. We tried to select the most common and important cases.

Table-II: Statistics from the assessment forms of mini-CEX.

Variables	Classification	% Age
Setting	Outpatient department (OPD)	34 (40.47%)
	Inpatient (wards:obstetrics/gynae)	42 (50.00%)
	Labour room/Emergency room	8 (9.53%)
	Total	84 (100%)
Difficulty level of cases	Simple	22 (26.19%)
	Difficult	53 (63.09%)
	Very difficult	09 (10.72%)
	Total	84 (100%)
Main Theme of assessment	History and examination	39 (46.43%)
	Investigation / Treatmant	24 (28.57%)
	Counseling of the patient/relative	13 (15.47%)
	Ethics and professionalism	08 (09.53%)
	Total	84 (100%)
Nature of Patients	Fresh patients	21 (25.00%)
	Patients for follow up visits	26 (30.95%)
	Admitted patients (>48 hours of admission)	37 (44.05%)
	Total	84 (100%)
Time taken for observation	Residents	Mean time taken (± SD)
	Y-1	18.34 (10.2)
	Y-2	21.09 (8.5)
	Y-3	17.88 (9.4)
	Y-4	20.75 (11.7)
	Mean time taken	19.51
Time taken for formative feedback	Residents	Mean time taken (± SD)
	Y-1	14.56 (7.9)
	Y-2	12.23 (6.7)
	Y-3	13.67 (8.6)
	Y-4	11.89 (8.9)
	Mean time taken	13.08
Satisfaction (on 0-1 scale)	Residents	(Mean ± SD)
	Y-1	8.23 (0.7)
	Y-2	7.39 (0.8)
	Y-3	8.67 (0.8)
	Y-4	7.77 (0.9)
	Total	
Satisfaction (on 0-1 scale)	Faculty	(Mean ± SD)
	Professors	7.99 (0.7)
	Associate and assistant professors	8.34 (0.8)
	Senior registrar	9.26 (0.8)
	Total	

Y-1: 1st-year resident, Y-2: 2nd-year resident, Y-3: 3rd-year resident, Y-4: 4th year resident, SD: Standard Deviation

Faculty awarded scores to residents and gave feedback on their performance. The form utilized a six-point scale, with rankings and the key for the rankings was provided. Each resident was instructed to complete four observed mini-CEX sessions. While giving the formative feedback; the faculty member explained to the resident about the things that would have done well, followed by pointing out the things that would had been done better. Both of them agreed on a specific management plan with suggestions for improvements. These results did not contribute to their summative result. Attendance of this WPBA was mandatory. Copies of the mini-CEX forms were collected and analyzed.

Results of the first and last Mini CEX scores of the same resident were compared to determine the efficiency of mini-CEX. These results were analyzed using Statistical Package for Social Sciences (SPSS Inc. Chicago, IL) version 21. Paired t-test was applied to compare scores (for 'clinical competencies' and for 'overall clinical performance' separately) of first and last Mini-CEX for 1st, 2nd, 3rd & 4th year residents. A *p*-value of <0.005 was considered to be statistically significant.

To assess the feasibility mean time of observing students and for giving feedback was calculated. Total time taken for mini-CEX encounters during the study period was calculated. We extrapolated it over a year and this represented the additional commitment of faculty and residents. For further assessing feasibility; considerable practical difficulties were identified.

Table-III: Responses of faculty on mini-CEX (n=10).

S No.	Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
1	I found the mini-CEX easy to conduct	5	3	1	1	-
2	I found it hard to fit this formative assessment (mini-CEX) into my daily schedule	4	2	2	1	1
3	The mini-CEX improved specific competencies of PG residents in six months' time.	4	2	2	1	-
4	I liked the initiative of evaluating residents & giving immediate formative feedback by observing multiple short encounters at their work-place.	5	3	1	1	-
5	I experienced significant problems (logistical + technical) in using the mini-CEX	1	2	1	2	4
6	I would recommend that faculty, not the residents, specify the specific required observations/ assessment.	3	2	-	4	3
7	As an assessor I think the overall educational usefulness of the mini-CEX is in the clinical learning of PG residents of Obs/Gynae is excellent.	5	3	1	1	-

RESULTS

Mini-CEX forms were collected and analyzed from residents on almost monthly basis. Out of these 84 work place based assessments, 23 (27.33%) mini-CEX forms were completed by the 1st year residents, 26 (30.95%) by the 2nd year residents, 22 (26.19%) by the 3rd year residents, 13 (15.47%) by 4th year residents. About 24 (28.57%) WPBAs were assessed by professors, 33 (39.28%) by associate/assistant

professors and 27 (32.14%) by the senior registrars (table-I, II).

For Survey, reliability co-efficient (Cronbach's alpha) were 0.63 and 0.64 for faculty's and residents' questionnaire (18/21) and faculty members (8/10) were satisfied with the mini-CEX as a learning tool. Out of ten faculty members 2 were neutral and 1 was dissatisfied with mini-CEX. Eighteen residents were greatly satisfied with the mini-CEX as an assessment tool and were in favor of using it in future and one was neutral and one was dissatisfied. 27% residents felt anxious being observed. Seventeen residents indicated in comments that feedback is the strongest characteristic.

Table-IV: Responses of residents on mini-CEX (n=21).

S No.	Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
1	Mini-CEX improved my competencies of history-taking, examination and management of Obs/Gynae patients.	9	7	3	1	1
2	Mini-CEX has improved my competencies of communication skills and professionalism.	10	8	2	1	-
3	I liked the suggestion of multiple small observations as brief WPBA	8	7	2	2	2
4	I liked the idea of instant formative feedback to us to correct our mistakes.	11	6	3	1	-
5	We should be allowed to choose the specific required observations	7	7	2	2	3
6	Our faculty members should specify/select all of the required observations	4	3	6	4	4
7	Feedback portion of mini-CEX was very helpful for me in the learning of history taking, examination and management of patient	9	6	3	2	1
8	Feedback portion of mini CEX was very helpful in the counseling and professionalism of patient or their relatives	8	9	1	1	2
9	It was very easy for me to engage a faculty member to observe me.	4	6	4	5	2
10	The overall use of the mini-CEX was convenient for me.	7	8	3	2	1

Table-V: First mini-CEX score vs Last mini CEX score.

Residency Year	Mini-CEX (Clinical Competencies) Total marks -36			Mini-CEX (Overall Clinical Performance) Total marks -36		
	First Mini-CEX	Last Mini-CEX		First Mini-CEX	Last Mini-CEX	
	Marks obtained (Mean ± SD)	Marks obtained (Mean ± SD)	*p*-value	Marks obtained (Mean ± SD)	Marks obtained (Mean ± SD	*p*-value
1st Year	26 ± 5	33 ± 11	0.001	24 ± 5	30 ± 8	0.003
2nd Year	21 ± 5	31 ± 8	0.000	20 ± 4	28 ± 7	0.001
3rd Year	26 ± 8	32 ± 9	0.003	25 ± 6	32 ± 11	0.002
4th Year	27 ± 6	33 ± 9	0.003	24 ± 7	32 ± 7	0.001

respectively. In survey, (table-III & IV) all participants (100%) responded. Most participants (Seventeen residents; Eight faculty members) never or occasionally experienced trouble organizing the mini-CEX. Almost all the residents

More than 75% of the residents showed gradual improvement in scores from the 1st to the 4th mini-CEX (table-V). Paired t-test was applied to compare scores ('clinical competencies' and 'overall clinical performance' separately) of first and last Mini-CEX for 1st, 2nd, 3rd & 4th year residents, which showed a statistically significant improvement (p<0.005) (table-V).

The average duration of mini-CEX was 19.51 minutes (ranging from 8.41 to 30.61 minutes). Average time taken for the feedback was 13.08 minutes (ranging from 4.83 to 21.23 minutes). Hence average time taken for a single session was 32.59 minutes (total sessions were 84 in six months' time). Extrapolation of time on one year: 91.25 hours in total would be required for a year for 168 sessions. In case of ten faculty members each would have to spare 0.76 hours /month. This means that each faculty would take 2 sessions /month if each sessions duration would on average be 0.38 hours.

DISCUSSION

In Pakistan, there are very few published studies on the topic. There is no credible material available that provides clear evidence about launching, feasibility, acceptability and usefulness of WPBA of Obs/Gynae post-graduate residents. A study was conducted at Shifa College of Medicine, Pakistan, for undergraduate students which determined that Mini-CEX was a useful tool for learning and assessment of clinical skills[15]. Dr Yousuf from Aga Khan University, Pakistan, while reviewing the literature, highlighted that generally Mini CEX was found to be a feasible and valid WPBA tool for clinical skills. She claimed justified evidences about the use of mini-CEX in the learning and assessment of under-graduate and post-graduate students[16].

This year, from New Delhi, a study concluded that Mini-CEX was quite acceptable to their residents and faculty members as WPBA. Similar to our study, they also concluded it as feasible without having an extra burden on the systems and on human resources[17]. It is an instrument for motivation, transfer and retention of learning[18]. It is an effective way of improving the competence of residents as shown by their improved results over the span of study time.

A study, in 2017, conducted at Postgraduate Medical Institute Lahore, established that mini-CEX rubric had a high reliability and validity and hence a very valuable instrument in clinical skills' assessment[19]. We have also validated our modified mini-CEX proforma as described in data collection procedure.

Norcinii in 2005 settled that by good quality feedback, the trainer can play an imperative role[20]. Reflections of both the teachers and residents of our study are similar to a study from Ludhiana, India. Almost every participant in both studies appreciated that the feedback was the most precious component and that every encounter motivated them to learn more to improve their competence[21].

A study from Taiwan also presented an interesting but not a statistically significant finding that junior faculty offered longer observation and formative feedback stretches than senior faculty[22]. The same observation was made in our study, that is, initially it was difficult to motivate especially the senior faculty members. However, by the end of study period most of them reflected that their experience was feasible, productive and fruitful.

The major limitations of our study were: 1) the sample size - especially the limited number of faculty members, 2) challenge to generalize our findings on other post graduate programs because the study was conducted in the Gynae/Obs Department of our institution only.

There is also a need for more acceptability and feasibility studies of this WPBA among faculty and residents of other disciplines among Pakistani medical colleges. Further studies of the validity and reliability of the mini-CEX for postgraduate training are required.

Our study would be helpful in reorganizing post-graduate program's curriculum with

inclusion of acceptable and feasible WPBA. It would be of benefit to all healthcare professionals involved in clinical teaching/assessment including undergraduate clerkships etc.

CONCLUSIONS

Our study deducted that mini-CEX is an extremely useful, feasible, acceptable and effective educational tool. It helps faculty to assess and provide formative constructive feed-back to residents on their clinical performance with real patients, in a real environment within a busy teaching hospital. It would be helpful to reorganize post-graduate program's curriculum with inclusion of WPBA. This work would be of benefit to all healthcare professionals involved in clinical teaching and assessment in the workplace.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

REFERENCES

1. W Miller GE. The assessment of clinical skills/competence/ performance. Acad Med 1990; 65 (9 Suppl): 63-7.
2. Behere R. Introduction of Mini-CEX in undergraduate dental education in India. Educ Health (Abingdon) 2014; 27(3): 262-8.
3. Norcini JJ, Blanck LL, Arnold GK, Kimball HR. The mini-CEX (Clinical Evaluation Exercise): A preliminary investigation. Ann Int Med 1995; 123(10): 795-9.
4. Noel GL, Herbers JE, Caplow MP, Cooper GS, Pangaro LN, Harvey J. How well do internal medicine faculty members evaluate the clinical skills of students? Ann Int Med 1992; 117(9): 757-65.
5. Wilkinson TJ, Wade WB. Problems with using a supervisor's report as a form of summative assessment. Postgrad Med J 2007; 83(981): 504-6.
6. Chandra M. Initiating formative assessment of postgraduate students in obstetrics and gynecology. Nat J Integ Res Med 2013; 4(5): 132-7.
7. Kogan JR, Conforti LN, Bernabeo EC, Durning SJ, Hauer KE, Holmboe ES. Faculty and staff perceptions of feedback to residents after direct observation of clinical skills. Med Educ 2012; 46(2): 201-15.
8. GMC. About the foundation programme. Available from: http://www.gmc-ukorg/education/ postgraduate/ regulation. asp. 2006 [cited 2011].
9. Singh T, Modi JN. Workplace based assessment - A step to promote competency based postgraduate teaching. Indian Pediatr 2013; 50(6): 553-9.
10. Hatala R, Ainslie M, Kassen BO. Assessing the mini-Clinical Evaluation Exercise in comparison to a national specialty examination. Med Educ 2006; 40(10): 950-6.
11. Cresswell JW. Experimental Designs. In: Educational Research, Planning, Conducting and evaluating quantitative and qualitative research. 4th ed. Boston: Pearson; 2012: 294-336.
12. Burford B, Hesketh A, Bakeling J, Bagnall G, Colthart I, Illing J, et al. Twelve tips Asking the right questions and getting meaningful responses: 12 tips on developing and administering a questionnaire survey for health care professionals. Med Teach 2009; 31: 207-11.
13. Downing SM. Validity: On the meaningful interpretation of assessment data. Med Educ 2003; 37(9): 830–7.
14. Downing SM. Reliability: On the reproducibility of assessment data. Med Educ 2004; 38(9): 10060-12.
15. Saeed N, Tariq N, Jaffery T. Mini-CEX (Clinical Evaluation Exercise) as an assessment tool at Shifa College of Medicine. RMJ 2015; 40(2): 220-24.
16. Yousuf N. Mini clinical evaluation exercise: validity and feasibility evidences in literature. Educ In Med J 2012; 4(1).
17. Joshi MK, Singh T, Badyal DK. Acceptability and feasibility of mini-clinical evaluation exercise as a formative assessment tool for workplace-based assessment for surgical postgraduate students. J Postgrad Med 2017; 63(2): 100-5.
18. Rushton A. Formative assessment: A key to deep learning. Med Teach 2005; 27(6): 509-13.
19. Arshad A, Moin M, Siddiq L. Reliability of rubrics in Mini-CEX. Pak J Ophthalmol 2017; 33(1): 1.
20. Norcini JJ. Current perspectives in assessment: The assessment of performance at work. Med Educ 2005; 39(9): 880-9.
21. Goe Al, Singh T. The usefulness of mini clinical evaluation exercise as a learning tool in different pediatric clinical settings. Int J Appl Basic Med Res 2015; 5(1): 32-4.
22. Chang YC, Chen CK, Chen JC, Liao CH, Lee CH, Chen YC et al. Implementation of the mini-clinical evaluation exercise in postgraduate Year 1 residency training in emergency medicine: Clinical experience at Chang Gung Memorial Hospital. J Acute Med 2013; 3: 110-5.