RESEARCH ARTICLE

A comparative analysis of the effect of Mini-CEX and conventional assessment methods on clinical skills in anesthesiology students of School of Paramedicine, Hamedan University of Medical Sciences

Farhad Adhami Moghadam[1], *Mohammad Sahebalzamani[2], Fatemah Mohammadi[3], Hojjatollah Farahani[4], Zahra Abdolreza Gharahbagh[5]

1- Ophthalmologist, Associate Professor, Department of Ophthalmology, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran.
2- Ph.D. in Educational Management, Associate Professor, Department of Management, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran **(Corresponding author)**
E-mail: m_szamani@yahoo.com
3- M.S. in Nursing, Faculty of Paramedicine, Hamedan University of Medical Sciences, Hamedan, Iran.
4- Ph.D. in Psychometrics, Assistant Professor, Department of Psychology, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran.
5- M.S. in Pediatric & Psychiatric Nursing, Department of Pediatrics, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran.

Abstract

Introduction: To evaluate students' professional performance, it is important to choose a suitable evaluation system such Mini-Clinical Evaluation Exercise (Mini-CEX). This study was conducted to determine and compare the impact of Mini-CEX and conventional methods on anesthesiology students' clinical skills.

Materials and Methods: In this quasi-experimental study, 34 anesthesiology interns at School of Paramedicine, Hamedan University of Medical Sciences were selected by census method in 2015. According to the opinions of the faculty members of Hamedan University of Medical Sciences, three procedures (patient reception and transfer to the surgery room, report writing, and patient education in recovery) were selected from among the main nursing procedures. The students were divided into two experimental and control groups by simple random sampling method. After training and measuring inter-rater reliability, assessment was done by Mini-CEX method using a researcher-made checklist in six rounds during the course in experimental group and by conventional method in control group. The results were analyzed by descriptive and inferential statistics (paired t-test and independent t-test).

Results: The mean final scores of assessment in experimental group (Mini-CEX) were significantly higher than those of control group. The results of paired t-test showed the mean scores 6.36 ± 67.23 in the patient reception and transfer (P = 0.001), 5.28 ± 37.70 in the patient education (P=0.001) and 4.46 ± 48.82 in the report writing (P=0.001) procedure, indicating a statistically significant difference. In addition, the mean score of students' satisfaction with Mini-CEX method (15.50 ± 62.94) was significantly higher than that of conventional method (14.02 ± 54.82) (P = 0.019).

Conclusion: Students' clinical skills were improved using Mini-CEX method. It is recommended that the medical faculties use new assessment methods to evaluate clinical procedures and promote students' learning.

**Keywords:** Clinical evaluation, Clinical Trial Brief, conventional method.

Introduction

Clinical education is an integral component of nursing education [1]. Promoting the clinical competencies of students in the growing human knowledge has highlighted the significance of developing students' clinical skills [2]. The learning assessment process involves the design and use of correct data collection methods on learning how to transfer data, relating the data to parameters associated with important stages of development and learning, and interpreting the parameters to make appropriate decisions [3]. Clinical assessment is important because it is the key assessment and basis of higher education and a fundamental

factor involved in the success of professional skills in clinical education programs. Assessment in medical education for evaluation of knowledge, skill and attitude is used as a systematic and organized framework [4].

Experts have long been seeking reliable methods to effectively evaluate students' clinical efficiency [5]. The clinical assessment methods accompanied by feedback promote learning in addition to assessing difficult instances in conventional assessment of students [6]. Miller has classified various assessment methods in four levels in terms of learning domains (cognitive, affective, performance, etc.), and has introduced the tests tailored to each level [7].

Observation

Portfolio

Manual of daily performance reports, peer assessment

Clinical and practical assessment like objective structured clinical evaluation (OSCE)

Witten test

Does
Show how
Knows
know
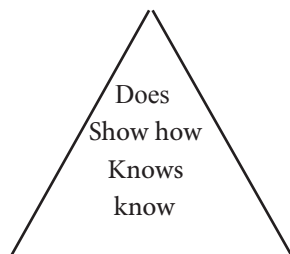
At the top of the pyramid, we have the tests of how to do, including 360º assessment, stimulated clinical environment test, portfolio, OSCE, Mini-CEX and direct observation of procedural skills (DOCS) [8].

Mini-CEX is a method for evaluation of clinical skills and giving feedback on the performance simultaneously. The teacher observes the learner during practice, the learner takes patient history, examines him/her and states the diagnosis and treatment plan. This method is used for taking history, physical examination, professional behavior, clinical judgment of making communication, organization and efficiency [9]. The Mini-CEX is carried out for each procedure in two stages with the same interval. At the end of each stage, the evaluator observes him/her during the procedure, provides the student with feedback and reports his/her weaknesses and strengths. At the end of the second stage of assessment, the evaluator determines the student's score using a structured form and provides him/her with feedback. The test usually takes about 15 minutes and giving feedback takes 5 minutes [10]. In clinical assessment, the knowledge and application of knowledge are not adequate, even knowing how to do the skills, which reflects the competency, is not sufficient, but clinical performance should be evaluated at the level of performance [11].

Currently, Mini-CEX is used to evaluate students and residents in various medical domains, including, surgery, anesthesiology, pediatrics, etc. [9]. However, no study has ever examined the effect of Mini-CEX in evaluating the clinical skills of anesthesiology students in Iran. Given the limitations of conventional assessment methods and shortage of literature on the effect of new evaluation methods on students' clinical skills, the present study was performed to compare the effect of using Mini-CEX and conventional methods on promoting the clinical skills of fourth-year anesthesiology students.

Methods

This quasi-experimental study was conducted on all anesthesiology students of school of Paramedicine who were taking field training course at Hamedan hospitals. They were selected by census sampling and randomly divided into two groups of control and intervention, each with 17 participants.

Data in the Mini-CEX and conventional groups were collected by a three-procedure checklist, including patient admission and transfer to surgery room, report writing in recovery and patient education in recovery after spinal and epidural anesthesia, prepared from the nursing reference books and Mini-CEX test format. The researcher-made questionnaire (Mini-CEX) was designed as follows:

Three checklists were designed for three skills. The report writing checklist included 36 items, the patient education checklist consisted of 28 items and patient admission and transfer checklist comprised of 34 items, which generally evaluated professional practice, communication, organization and efficiency, and clinical care. Every response with zero score showed absence of appropriate behavior for procedure by the student, score 1 indicated below expected level, score 2 showed marginal level, score 3 showed the expected level and score 4 indicated above expected level. This assessment tool was also used to evaluate the clinical skills. The satisfaction questionnaire for anesthesiology students for evaluating conventional and Mini-CEX methods was rated on the Likert scale (completely satisfied, satisfied, neutral, dissatisfied and completely dissatisfied). It included 17 questions and was completed by the students at the end of the apprenticeship course.

In the first phase, before administration of assessment, the required educational protocol was prepared for these two new methods and presented to the trainers of experimental group. In the second phase, the control group was evaluated by conventional method administered at school of Paramedicine and experimental group was tested by Mini-CEX method. The conventional assessment method included two stages:

A. At the beginning of apprenticeship, observation of skills without feedback and assessment

B. At the end of apprenticeship (after four weeks), without feedback and final assessment scoring

The assessment stages in Mini-CEX method were:

A. First test: at the beginning of apprenticeship (observation of skills over 15 minutes and giving feedback over 5 minutes)

B. Second test: Repeating stage one after four weeks and providing feedback and final scoring (emphasizing the student's strengths and weaknesses), final assessment of students in both groups by the checklists prepared by the researcher.

To evaluate the face and content validity of the checklists, first, extensive library and electronic searches on doing each

procedure were done, and primary draft of the checklist for each procedure was prepared. Then, this draft was given to 10 faculty members experienced in clinical affairs at medical faculty, Hamedan University of Medical Sciences and Tehran Azad University of Medical Sciences. Having applied the opinions of the experts, the final checklist was prepared under the supervision of the research team.

In this study, the inter-rater reliability was calculated to be 0.81 by two evaluators on 10 students, and Cronbach's alpha coefficients for the conventional and Mini-CEX methods were obtained to be 0.81 and 0.83, respectively. Study was approved by the ethical committee of Hamedan University of Medical Sciences (grant no: 16/235) in 2015,

The obtained data were analyzed by SPSS-20 software using descriptive statistics (tables, absolute and relative frequency distribution, mean and standard deviation) and inferential statistics (independent t-test for quantitative variables and paired t-test and ANCOVA for qualitative variables).

Results

Regarding the gender distribution of participants, 67% were male and 33% were female. The mean ages of conventional and Mini-CEX groups were 22.17 ± 0.63 and 22.05 ± 0.89, respectively. To ensure homogeneity of the two groups, chi-square test was used for qualitative variables gender and marital status and t-test was used for quantitative variables. Independent t-test was used to compare the mean age of the study groups. Based on the results, there were no significant differences between study groups with regard to gender (P = 0.714), marital status (P = 0.545) and age (P = 0.666), and groups were homogeneous.

Paired t-test was applied to compare the mean and standard deviation of students' scores in conventional and Mini-CEX groups before and after intervention. The findings showed a significant difference between the scores before and after intervention in admission and transfer (P = 0.000), patient education (P = 0.000) and report writing (P = 0.002) procedures in Mini-CEX group. However, no significant difference was reported between the scores before and after intervention in conventional group regarding patient admission and transfer (P = 0.735), patient education (P = 0.210) and report writing (P = 0.460) procedures. On the other hand, intervention only affected the Mini-CEX group.

The comparison results of final assessment scores in the study groups are presented in Tables 1 and 2. Paired t-test was used to compare the mean score of students' satisfaction. The results showed that the mean score of students' satisfaction with Mini-CEX was higher than that of conventional method, indicating a significant difference (P = 0.019).

Table 1; Comparison of mean scores and results of paired t-test before and after intervention for three procedures in conventional and Mini-CEX groups in anesthesiology students of Hamedan University of Medical Sciences in 2015.

Variable	Before intervention					After intervention				
	Mean ± SD (conventional group)	Mean ± SD (Mini-CEX group)	DF	T-test	P	Mean ± SD (conventional group)	Mean ± SD (Mini-CEX group)	DF	T-test	P
Patient admission and transfer	58/00 ± 4/63	57/00 ± 6/85	32	0/622	0/622	57/47 ± 7/28	67/23 ± 6/36	32	-4/16	0/001
Patient education	31/58 ± 1/27	31/47 ± 1/12	32	0/777	0/777	30/64 ± 1/93	37/70 ± 5/28	32	-5/18	0/001
Report writing	42/17 ± 6/34	43/82 ± 4/97	32	0/406	0/406	41/17 ± 6/76	48/82 ± 4/46	32	-3/89	0/001

Table 2: Comparison of mean and standard deviation and results of paired t-test for satisfaction in both groups in anesthesiology students of Hamedan University of Medical Sciences in 2015.

	Mini-CEX		Conventional		Test statistic	DF	p
Satisfaction level	Mean	SD	Mean	SD			
	62.94				-1.601	32	0.019

Discussion

This study compared the impact of new assessment methods, including Mini-CEX and conventional methods on clinical skills of anesthesiology students. The results showed that Mini-CEX exerted more effect on promoting the clinical skills of anesthesiology students than conventional method. Gálvez (2011) reported that administration of Mini-CEX assessment method in pediatric residents was an acceptable method, allowing evaluation of different levels of performance among residents depending on their experience in every clinical environment. The results of ANOVA test indicated a statistically significant difference for general qualifications (P < 0.0001) [12]. Another study performed by Djuria et al. in Indonesia (2013) showed that using Mini-CEX

to assess the clinical performance of nursing students enjoyed acceptable validity, reliability and internal consistency. The Cronbach's alpha for the 47-item Mini-CEX scale revealed a high internal consistency (0.988); therefore, it was found to be valid to evaluate the nursing students' competence [13].

Lio et al. (2013) conducted a study in Thailand and reported a significant interaction between educational level and Mini-CEX score. The scores measured in all dimensions for internal residents were better, showing Mini-CEX to be a proper tool for assessing the career advancement of residents because it measured the education level remarkably in all dimensions. The results of pretest and posttest were found to be 53.76 ± 12.25 and 22.18 ± 10.34, respectively ($P < 0.001$) [14]. In the present study, having obtained successful results in using Mini-CEX to evaluate students and give feedback simultaneously, Mini-CEX was considered to be a key instrument for students' clinical evaluation.

The findings of Parnar et al. (2011) showed that Mini-CEX could be included in surgery apprenticeship course ($P < 0.001$) [15]. Also, this study indicated that the content of feedbacks made Mini-CEX a rich assessment tool regarding critical and supportive feedback. Gandomkar et al. (2014) reported that although Mini-CEX was designed first to evaluate the clinical skills of internal residency program, its easy application than other assessment methods in real environments made it a widely-used instrument in other residency and GP programs as well as other medical disciplines like nursing and midwifery [16].

The findings of the current study showed that the mean score of students' satisfaction with Mini - CEX was higher than the conventional method. Students believed this assessment tool was effective and acceptable, having various satisfaction aspects than conventional method, as reported by other similar studies. In a study analyzing the practical application of Mini-CEX among midwifery students of Mashhad school of nursing in 2012, Hoseini et al. reported a high mean score for satisfaction with this assessment method (67.8 ± 12.5) ($P = 0.973$), and this method was found to be very useful for educating and motivating students [17].

The results of Pishkar Monfared et al. (2011) in Zadehan, Iran revealed that satisfaction with OSPE was significantly higher than conventional assessment method ($P = 0.02$). Considering the nursing students' satisfaction with OSPE in this study, it is necessary to apply it in all medical education departments despite its administrative barriers [1].

Mansourian et al. (2013) showed that the mean score of students' satisfaction with OSPE (74.3) was higher than that of conventional method (49.7), which was statistically significant ($P < 0.0001$). of students, % 93.3 agreed with continuing assessment through OSPE in the following terms. OSPE created more satisfaction in students than conventional

method, indicating the efficacy of new assessment methods to enhance students' learning [18].

Some of the limitations of this study were absence of real conditions to evaluate some procedures, students' and trainers' unfamiliarity with assessment methods, and participants' anxiety during assessment and unwillingness of some trainers and students to perform new assessment methods. Moreover, it was not possible to keep learners' demographic information confidential to remove the effect of trainers' prior knowledge of students (halo effect) on their assessment score.

Conclusion

In general, the results of this study showed a significant difference between the final scores of Mini-CEX and conventional methods in all three procedures of patient admission and transfer, patient education and report writing in recovery. Since providing informed feedback and intervention and education to students in the following tests is a rewarding point of this method, Mini-CEX is believed to be a method with highest educational effect, promoting the strengths and covering the weakness largely by providing feedback and innovative techniques. Further, considering the nature of methods mentioned, this method had more effect than conventional method on promoting medical students' skills. Given the value of Mini-CEX assessment method as well as the results of current study and other similar studies, more attention is suggested to be paid to new assessment methods and their use to evaluate procedures in nursing and other students in order to facilitate the achievement of training competent nurses and ensuring high-quality patient care. The limitations under the control of researcher were applicability of research, access to information on theoretical and clinical scores of students, and a limitation out of the researcher's control was shortage of resources.

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