ORIGINAL ARTICLE

Satisfaction of Internal Medicine Clerkship Students with the Mini-Clinical Evaluation Exercise (Mini-CEX) at Mashhad University of Medical Sciences

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Background: The assessment of clinical skills is an integral part of medical education. The assessment of clinical skills is an integral part of medical education. Given the importance of student satisfaction as a key determinant of educational effectiveness, this study aimed to evaluate the satisfaction of medical students during their clinical clerkship with the implementation of the Mini-CEX in the General Internal Medicine Ward at Hasheminejad Hospital, Mashhad.

Method: This descriptive-analytic cross-sectional study involved 53 clinical clerkship medical students at Hasheminejad Hospital, Mashhad (2023–2024). The participants (58.5% male, 41.5% female; mean age 23.66 years) included all students assigned to the General Internal Medicine rotation. After obtaining written informed consent, data were collected using the validated Mini-CEX questionnaire developed by Habibi et al.

Results: Practical assessment scores ranged from 0 to 10. The highest scores were observed in the Professionalism domain (9.26 ± 0.72), while the lowest were in Clinical Reasoning (8.91 ± 0.68). Statistical analysis showed no significant difference between scores and gender. Overall satisfaction was high, with mean scores in all evaluated dimensions exceeding 8.

Conclusion: The results reflect the positive impact of using the Mini-CEX. Medical students in the clinical phase achieved acceptable scores and reported high satisfaction with the process. These findings support the continued use of Mini-CEX and the integration of student-led improvements. Future research with larger cohorts and longitudinal designs across various clinical wards is recommended to better understand the students' viewpoints.

Keywords: Mini-Clinical Evaluation Exercise (Mini-CEX), Medical Education, Student Satisfaction, Internal Medicine, Clinical Clerkship, Clinical Reasoning

مدى رضا طلاب التدريب السريري في قسم الطب الباطني عن تمرين التقييم السريري المصغر (Mini-CEX) في جامعة مشهد للعلوم الطبية

الخلفية: يُعدّ تقييم المهارات السريرية جزءًا لا يتجزأ من التعليم الطبي. ونظرًا لأهمية رضا الطلاب كعامل رئيسي في فعالية التعليم، هدفت هذه الدراسة إلى تقييم رضا طلاب الطب خلال فترة تدريبهم السريري عن تطبيق نظام التقييم السريري المصغر (Mini-CEX) في قسم الطب الباطني العام بمستشفى هاشمي نجاد، مشهد.

الطريقة: شملت هذه الدراسة الوصفية التحليلية المقطعية ٥٣ طالبًا من طلاب الطب المتدربين سريريًا في مستشفى هاشمي نجاد، مشهد (٢٠٢٣-٢٠٢٤). وشمل المشاركون (٥٨,٥٪ ذكور، ٤١,٥٪ إناث؛ متوسط العمر ٢٣,٦٦ سنة) جميع الطلاب الملتحقين بقسم الطب الباطني العام. بعد الحصول على موافقة خطية مستنيرة، جُمعت البيانات باستخدام استبيان التقييم السريري المصغر (Mini-CEX) المُعتمد، والذي طوره حبيبي وآخرون.

النتائج: يُعدّ تقييم المهارات السريرية جزءًا لا يتجزأ من التعليم الطبي. النتائج: تراوحت درجات التقييم العملي بين ٠ و١٠. سُجّلت أعلى الدرجات في مجال الاحترافية (٩,٢٦ ± ٠,٧٢)، بينما سُجّلت أدنى الدرجات في مجال التفكير السريري (٨,٩١ ± ٠,٦٨). أظهر التحليل الإحصائي عدم وجود فرق دال إحصائيًا بين الدرجات والجنس. كان الرضا العام مرتفعًا، حيث تجاوز متوسط الدرجات في جميع الأبعاد المُقَيّمة ٨.

الخلاصة: تعكس النتائج الأثر الإيجابي لاستخدام التقييم السريري المصغر (Mini-CEX). حقق طلاب الطب في المرحلة السريرية درجات مقبولة وأبدوا رضاهم التام عن العملية. تدعم هذه النتائج استمرار استخدام التقييم السريري المصغر (Mini-CEX) ودمج التحسينات التي يقودها الطلاب. يُوصى بإجراء بحوث مستقبلية على مجموعات أكبر وتصميمات طولية عبر مختلف الأقسام السريرية لفهم وجهات نظر الطلاب بشكل أفضل.

الكلمات المفتاحية: التقييم السريري المصغر (Mini-CEX)، التعليم الطبي، رضا الطلاب، الطب الباطني، التدريب السريري، التفكير السريري

رضایتمندی کارآموزان بخش بیماری‌های داخلی از تجربه آزمون عملی مینی سی ایکس در دانشگاه علوم پزشکی مشهد

زمینه و هدف: ارزیابی مهارت‌های بالینی دانشجویان پزشکی جزء جدایی‌ناپذیر آموزش است. از آنجا که رضایتمندی دانشجویان شاخصی کلیدی برای اثربخشی آموزشی است، این مطالعه، با هدف بررسی میزان رضایتمندی کارآموزان از اجرای آزمون مینی سی ایکس در بخش جنرال بیماری های داخلی بیمارستان هاشمی‌نژاد مشهد انجام شد.

روش: این مطالعه مقطعی توصیفی- تحلیلی بر روی ۵۳ کارآموز بخش پزشک عمومی بیمارستان هاشمی‌نژاد مشهد (۱۴۰۳-۱۴۰۲) انجام شد. شرکت‌کنندگان (۵۸/۵٪ مرد، ۴۱/۵٪زن؛ میانگین سنی ۲۳/۶۶ سال) دانشجویانی بودند که برای گذراندن بخش داخلی از طرف دانشکده پزشکی به بیمارستان معرفی شده بودند. پس از کسب رضایت آگاهانه، پرسشنامه استاندارد مینی سی ایکس (حبیبی و همکاران) که روایی و پایایی آن تأیید شده بود، توسط دانشجویان تکمیل شد.

یافته‌ها: نمرات آزمون عملی بین ۰ تا ۱۰ بود. بالاترین نمره در حیطه حرفه‌ای‌گری (۰/۷۲ ± ۹/۲۶) و کمترین در حیطه استدلال بالینی (۰/۶۸ ± ۸/۹۱) کسب شد. تحلیل داده‌ها عدم تفاوت آماری معنادار بین نمرات آزمون و جنسیت را نشان داد. ارزیابی میزان رضایتمندی کلی، رضایت بالایی از فرآیند مینی سی ایکس را نشان داد؛ میانگین نمرات در تمامی ابعاد بررسی شده، بالاتر از ۸ بود.

نتیجه گیری: این مطالعه حاکی از نتایج مثبت استفاده از مینی سی ایکس است. دانشجویان نمرات قابل قبول در ارزشیابی بالینی کسب کرده و رضایت نسبتا بالایی از فرآیند داشته‌اند. این یافته‌ها از تداوم استفاده از مینی سی ایکس و اعمال اصلاحات پیشنهادی دانشجویان حمایت می‌کند. توصیه می‌شود مطالعات مشابه با حجم نمونه بیشتر و طراحی طولی در سایر بخش‌های بالینی، و نیز مطالعات کیفی برای درک عمیق‌تر دیدگاه‌های دانشجویان انجام شود.

واژه های کلیدی: تمرین ارزیابی بالینی کوچک (مینی سی ایکس)، آموزش پزشکی، رضایتمندی، بیماری های داخلی، استدلال بالینی، ارزشیابی

مشہد یونیورسٹی آف میڈیکل سائنسز میں منی کلینیکل ایویلیوایشن ایکسرسائز (Mini-CEX) کے ساتھ انٹرنل میڈیسن کلرک شپ کے طلباء کا اطمینان

پس منظر: طبی مہارتوں کی تشخیص طبی تعلیم کا ایک لازمی حصہ ہے۔ طبی مہارتوں کی تشخیص طبی تعلیم کا ایک لازمی حصہ ہے۔ تعلیمی تاثیر کے کلیدی عامل کے طور پر طالب علم کے اطمینان کی اہمیت کو دیکھتے ہوئے، اس مطالعہ کا مقصد مشہد کے ہاشمینجاد ہسپتال کے جنرل انٹرنل میڈیسن وارڈ میں Mini-CEX کے نفاذ کے ساتھ طبی طالب علموں کی کلینیکل کلرک شپ کے دوران ان کے اطمینان کا جائزہ لینا تھا۔

طریقہ: اس وضاحتی-تجزیہاتی کراس سیکشنل مطالعہ میں ۵۳ کلینیکل کلرک شپ میڈیکل طلباء شامل تھے جو ہاشمینجاد ہسپتال، مشہد (۲۰۲۳–۲۰۲۳) میں تھے۔ شرکاء (۵۸٫۵٪ مرد، ۴۱٫۵٪ خواتین؛ اوسط عمر ۲۳٫۶۶ سال) میں وہ تمام طلباء شامل تھے جنہیں جنرل انٹرنل میڈیسن گردش کے لیے تفویض کیا گیا تھا۔ تحریری باخبر رضامندی حاصل کرنے کے بعد، حبیبی ایٹ ال کے ذریعہ تیار کردہ توثیق شدہ Mini-CEX سوالنامے کا استعمال کرتے ہوئے ڈیٹا اکٹھا کیا گیا۔

نتائج: عملی تشخیص کے اسکور ۰ سے ۱۰ کے درمیان تھے۔ سب سے زیادہ اسکور پروفیشنلزم ڈومین (۹٫۲۶ ± ۰٫۷۲) میں دیکھے گئے، جبکہ سب سے کم کلینیکل ریزننگ (۸٫۹۱ ± ۰٫۶۸) میں تھے۔ شماریاتی تجزیہ نے اسکور اور صنف کے درمیان کوئی خاص فرق نہیں دکھایا۔ مجموعی طور پر اطمینان بہت زیادہ تھا، تمام تشخیص شدہ جہتوں میں اوسط اسکور ۸ سے زیادہ تھے۔

نتیجہ: نتائج Mini-CEX کے استعمال کے مثبت اثرات کی عکاسی کرتے ہیں۔ طبی طالب علموں نے طبی مرحلے میں قابل قبول اسکور حاصل کیے اور اس عمل سے اعلیٰ اطمینان کی اطلاع دی۔ یہ نتائج Mini-CEX کے مسلسل استعمال اور طالب علم کی قیادت میں بہتری کے انضمام کی حمایت کرتے ہیں۔ طلباء کے نقطہ نظر کو بہتر طور پر سمجھنے کے لیے مختلف طبی وارڈوں میں بڑے گروہوں اور طول بلد ڈیزائنوں کے ساتھ مستقبل کی تحقیق کی سفارش کی جاتی ہے۔

کلیدی الفاظ: Mini-Clinical Evaluation Exercise (Mini-CEX)، طبی تعلیم، طالب علم کا اطمینان، اندرونی طب، کلینیکل کلرک شپ، کلینیکل ریزننگ

INTRODUCTION

A review of the research literature indicates that the Mini-Clinical Evaluation Exercise (Mini-CEX) has a significant background in medical education environments. Numerous studies have examined its efficacy and acceptance in specialized educational settings. Some research has demonstrated that periodic assessments based on this format definitively lead to skill improvement across all dimensions. The majority of participants have evaluated the experience positively, stating that, unlike traditional assessment formats, this method provides greater opportunities to demonstrate authentic clinical skills (1).

However, other studies have highlighted the operational challenges of this method. For instance, a study on psychiatry residents revealed that although students' overall perception of the Mini-CEX was positive and they considered it an effective experience for performance enhancement, its implementation could be perceived as stressful—particularly when selecting complex cases or when the supervisor's presence distinctly influenced the individual's performance (2).

The education and evaluation of medical students, as the primary pillars of ensuring healthcare quality, have undergone continuous evolution (3). With significant scientific and technological advancements, traditional educational and assessment methods—which primarily focused on the transfer of theoretical knowledge and rote memorization—no longer meet the complex demands of modern medicine. Due to their reliance on subjective information and neglect of practical and clinical skills, these methods often yielded suboptimal results and failed to prepare graduates for real-world challenges (3, 4). Today, the approach to medical education has shifted toward active learning, problem-solving, teamwork, and the development of communication skills (5, 6). In this modern paradigm, students actively participate in the learning process, acquiring necessary knowledge and skills through interactive, evidence-based methods (7, 8).

Parallel to these shifts, assessment methods have also been transformed. Tools such as the Mini-CEX, Direct Observation of Procedural Skills (DOPS), and the Objective Structured Clinical Examination (OSCE) have replaced traditional methods to evaluate student performance accurately and objectively in authentic clinical situations (9-11). By providing constructive and targeted feedback, these tools assist students in identifying their strengths and weaknesses, encouraging performance improvement.

Among modern methods, the Mini-CEX is recognized as a suitable alternative to traditional clinical evaluation due to its transparency, objectivity, and standardization. This tool assesses student abilities in real-world conditions by evaluating skills such as history taking, physical examination, clinical decision-making, and patient communication. One of its most significant advantages is providing immediate feedback following the encounter, which facilitates continuous learning and the attainment of required standards (10, 12). Given the vital role of feedback in learning and professional development, investigating student attitudes and satisfaction regarding these methods—particularly the Mini-CEX—is of great importance (13, 14).

The General Internal Medicine department holds particular significance in medical education, as this field requires a comprehensive understanding of adult diseases, where physicians must be capable of interpreting a wide spectrum of symptoms. In this department, the importance of detailed history taking and systematic physical examinations is more pronounced than in other specialized fields that often focus on a single organ system. Due to this comprehensive nature, student assessment in this ward is critical. Tools like the Mini-CEX are utilized in this department to ensure that students, beyond broad knowledge, have acquired the necessary competence in effective clinical communication and reaching valid preliminary diagnoses.

The present study aims to evaluate the satisfaction levels of medical students in their clinical clerkship (stagers) regarding the Mini-CEX as a tool for clinical performance assessment. The results of this study can contribute to a better understanding of the advantages and challenges of this modern method, providing strategies to improve clinical evaluation processes and enhance the effectiveness of medical education. Collectively, these developments represent a significant step toward training competent, committed, and socially accountable physicians.

METHODS

Study Design and Participants

This descriptive-analytical and cross-sectional study was conducted at Mashhad University of Medical Sciences during the 2023–2024 academic year. The study population consisted of all medical stagers (clerkship students) completing their one-month introductory rotation in the General Internal Medicine ward at Hasheminejad Hospital. Inclusion criteria required that the participants be in their first year of clinical clerkship. Medical interns and students who had previously completed this rotation were excluded from the study.

Sample Size and Sampling

The sample size was calculated based on a mean satisfaction score of 4.3 and a standard deviation of 1.26 (derived from Habibi et al. (15)), with a relative precision of 10%. Although the calculated minimum sample size was 34, a total of 53 students

were ultimately included to enhance the study's power.

Assessment Tool and Procedure

The primary objective was to evaluate student satisfaction with the Mini-Clinical Evaluation Exercise (Mini-CEX). At the beginning of the rotation, students were briefed on the assessment method and the specific clinical competencies to be evaluated. Throughout the course, dedicated sessions were held to teach core skills, including professionalism, communication skills, history taking, and physical examination.

On the final day of the rotation, each student underwent a Mini-CEX assessment. The tool was specifically adapted for the clerkship level by focusing on fundamental clinical skills and excluding advanced aspects of definitive diagnosis and treatment. The assessed domains included:

Professionalism, Communication Skills, History Taking, Physical Examination, and Problem Representation.

The Mini-CEX Encounter

During the assessment, each student was observed by an attending physician while interacting with a real patient. The student was required to introduce themselves, obtain informed consent, elicit the Chief Complaint (CC) and History of Present Illness (HPI), and complete a comprehensive medical history (including Past Medical History, Medications, Family History, and Review of Systems). The supervisor evaluated the student's interviewing technique and patient interaction. This was followed by a focused physical examination, where the supervisor assessed the student's technical proficiency. Finally, the student was asked to present the patient's Problem List.

Scoring and Feedback

Immediately following the encounter, students received constructive feedback regarding their strengths and weaknesses. Correct techniques for physical examination or history taking were demonstrated where necessary, transforming the assessment into a learning opportunity.

Skills were scored using a pre-designed checklist (Checklist 1) on a scale of 0 to 10, categorized as follows: 0–3: Unacceptable, 4–5: Acceptable, 6–7: Good, 8–10: Excellent

The total score for the five evaluated domains (maximum 50) was then proportionally converted to a final score out of 10 for statistical analysis.

Scoring System and Control of Confounders

The final grade for the General Internal Medicine clerkship consisted of two components: a written examination (end-of-rotation exam) and a practical assessment (Mini-CEX). Each component was weighted at 10 points, totaling a maximum grade of 20.

To ensure consistency and minimize scoring bias in this cross-sectional study, several measures were implemented:

- Inter-rater Reliability: All evaluations were performed by a single assessor (the principal investigator, a faculty member of the Internal Medicine department).
- Setting Consistency: All assessments took place in the same clinical ward.
- Case Uniformity: Efforts were made to select patients with comparable clinical complexity for all students.

Data Collection and Instruments

Following the Mini-CEX, participants provided informed consent and completed an anonymous satisfaction questionnaire. To ensure confidentiality and reduce social desirability bias, no names or student IDs were recorded. The research instruments included:

1. Demographic Questionnaire: Recording age and gender.
2. Standardized Satisfaction Questionnaire: This study utilized the validated scale developed by Habibi et al. (2020) specifically for assessing medical student satisfaction with Mini-CEX (15). The content validity and reliability of this instrument had been previously established.

Additionally, to investigate correlations, the following academic records were collected:

- Sub-specialty Internal Medicine scores (including Pulmonology, Gastroenterology, Endocrinology, Hematology, Nephrology, and Rheumatology).
- General Internal Medicine written exam scores.
- Cumulative Grade Point Average (GPA) from the Pre-clinical phase (Basic Sciences and Physiopathology).

Statistical Analysis

Data were analyzed using SPSS software version 14. Descriptive analysis of quantitative variables was performed using measures of central tendency and dispersion, including the mean and standard deviation (for normally distributed data) or the median and interquartile range (for non normally distributed data). Qualitative/categorical variables were presented using frequency and percentage.

To describe the quantitative variables, the distribution of each variable was first assessed. Variables with a normal distribution were reported as mean ± standard deviation, and parametric tests (independent t test) were used for comparisons. The Kolmogorov–Smirnov test was used to evaluate the normality of data distribution. To assess the relationships between variables, the Pearson correlation coefficient was applied. A p value < 0.05 was considered statistically significant for all analyses.

RESULTS

In total, 53 participants were enrolled in the study, including 31 males (58.5%) and 22 females (41.5%). The mean age of the participants was

23.66 ± 1.315 years.

The highest mean score was observed in the professionalism domain (9.26 ± 1.58), while the lowest mean score was related to the problem retrieval and expression domain (8.92 ± 1.97) (Table 1).

Table 1. The highest and lowest scores in the assessment domains

Assessment Domain	Mean (SD)
Domain 1: Professionalism	9.26 (1.58)
Domain 2: Communication Skills	9.19 (1.53)
Domain 3: History Taking	9.09 (1.72)
Domain 4: Clinical Examination	9.11 (1.65)
Domain 5: Problem Representation	8.92 (1.97)

Table 2 shows the Mini CEX scores obtained by the participants according to gender. The mean total score obtained in the practical Mini CEX examination was 9.11. In addition, the scores of the internal medicine ward and the general internal medicine section (including written and practical scores) are also presented separately for males and females. There was no statistically significant difference between the two gender groups in any of the evaluated scores ($P > 0.05$).

Table 2. Mini CEX scores by gender

Variable	Male Mean (SD)	Female Mean (SD)	Total Mean (SD)	p-value
GPA	15.76 (1.36)	15.58 (1.13)	15.68 (1.26)	0.626*
Internal Medicine Score	14.69 (2.19)	13.77 (1.95)	14.31 (2.12)	0.120
General Internal Medicine	17.18 (1.96)	17.30 (1.40)	17.23 (1.73)	0.809
Written Exam Score	7.66 (0.66)	7.68 (1.28)	7.67 (1.50)	0.964
Mini-CEX Score (10)	8.99 (1.74)	9.15 (1.13)	9.11 (1.63)	0.516

Abbreviations: Mini-CEX = Mini - Clinical Evaluation Exercise, GPA = Grade Point Average
*t- test

There was a very strong and statistically significant correlation between the written exam score and the General Internal Medicine ward score in the Pearson correlation matrix ($r = 0.90$, $p < 0.01$). A moderate and statistically significant correlation was also observed between the Mini-CEX score and the General Internal Medicine ward score ($r = 0.43$, $p < 0.01$). However, the correlation between the Mini-CEX score and the written exam score was weak and not statistically significant ($r = 0.04$, $p > 0.05$) (Table 3).

Table 3. Pearson correlation matrix between different scores of clinical clerks

Variable	1	2	3	4	5
Internal Medicine Score	1				
General Internal Medicine	0.23	1			
Written Exam Score	0.20	0.90**	1		
GPA	0.60**	0.31*	0.25	1	
Mini-CEX Score (10)	0.16	0.43**	0.04	0.16	1

Abbreviations: GPA = Grade Point Average, Mini-CEX = Mini - Clinical Evaluation Exercise
*$p < 0.05$, **$p < 0.01$

Table 4 presents the level of participants' satisfaction with the administration of the Mini CEX examination, categorized by gender. The results showed that the mean satisfaction scores in all items were above 8. The highest satisfaction was related to the item concerning the impact of the exam on reducing evaluator (faculty) error, with a mean score of 9.19 ± 0.74. The overall mean satisfaction score was 8.89 ± 0.93, indicating a generally positive perception of the Mini CEX among the clinical clerks. Statistical analysis of the satisfaction data showed no significant difference between males and females in any of the questionnaire items ($p > 0.05$).

In the final section of the questionnaire, clinical clerks were asked to provide suggestions for improving clinical examinations. However, most participants did not offer any specific suggestions. Instead, several respondents commented on the usefulness of the exam and its positive impact on boosting self confidence and recognizing their own mistakes. Only two participants suggested that the exam be conducted in a group format, with each part of the assessment directed to a different student. This suggestion may serve as an initial idea for enhancing the evaluation process; however, its potential benefits and drawbacks should be carefully assessed before implementation.

DISCUSSION

In this study, the role of evaluation as one of the key components of the educational process of faculty members and its impact on the satisfaction of medical clinical clerks with the Mini CEX examination was investigated. Regular and accurate assessment not only helps identify learners' strengths and weaknesses but also facilitates the development and improvement of the educational system and enhances the quality of clinical education. The Mini CEX, as a valid and reliable tool for assessing clinical skills, has mainly been used to evaluate residents and physicians; however, its application among clinical clerks has been less frequently studied. In the present study, for the first time at the clerkship level, this examination was implemented after removing items related to diagnosis and treatment of diseases in order to better match the capabilities of this group (15).

The results showed that most clinical clerks

Table 4. Satisfaction levels regarding the Mini CEX examination by gender

Questions / Items	Male Mean (SD)	Female Mean (SD)	Total Mean (SD)	p-value*
Question 1	8.71 (0.97)	8.50 (1.01)	8.62 (0.98)	0.450
Question 2	8.74 (0.93)	8.59 (0.80)	8.68 (0.87)	0.540
Question 3	18.17 (1.96)	9.23 (0.69)	9.19 (0.74)	0.751
Overall Satisfaction	8.96 (0.52)	9.00 (0.75)	8.89 (0.93)	0.620

Abbreviation: Mini-CEX = Mini - Clinical Evaluation Exercise
***t- test**

reported a high level of satisfaction with both the quality of teaching and the evaluation process. The mean overall satisfaction score was 8.89, and the highest level of satisfaction was related to the item assessing the extent to which the examination reduced evaluator (faculty) error. These findings indicate acceptance of the Mini CEX method by students and highlight its importance in assessing clinical skills and providing constructive feedback to learners.

Analysis of the scores indicated that students who performed rather poorly in the written examination obtained appropriate scores in the clinical and Mini CEX assessments. This finding suggests that clinical assessments more effectively reflect students' actual abilities in real clinical settings and that written examination scores alone cannot be considered a comprehensive indicator of educational competence. Written examinations primarily assess theoretical knowledge, whereas clinical methods such as the Mini CEX evaluate essential skills including history taking, physical examination, clinical judgment, communication, organization, and professional behavior in a more authentic manner. Therefore, combining both types of assessment provides a more comprehensive picture of clinical competence.

Regarding factors influencing scoring, as noted in the studies by Gandomkar and Jalili, characteristics of the evaluator (such as professional position, level of strictness, leniency, and training of evaluators) as well as factors related to the examination format and clinical encounters (including case complexity, subspecialty ward, case focus, patient age, and duration of the encounter) can significantly affect scoring (16). In the present study, efforts were made to provide as uniform conditions as possible for all students in order to Minimize the impact of these factors. The same evaluator (the principal investigator and faculty member of the General Internal Medicine ward) assessed all participants, all students were evaluated within the same ward, and attempts were made to ensure that patients were relatively comparable in terms of case complexity.

Compared with previous studies, the findings of the present study show both similarities and differences. The results, together with evidence from other studies such as those conducted by Joshi et al. (2017), Magar et al. (2017), and Nair et al. (2008), indicate that the Mini CEX is a valid, acceptable, and effective tool for assessing the clinical performance of medical students (1, 10, 17).

Similarly, studies by Habibi et al. (2020) and Joshi et al. (2017) reported that both learners and evaluators considered this method reliable and influential, describing it as a constructive tool in medical education (10, 15). Overall, our findings are consistent with those of Nair et al. (2008), who reported a high reliability coefficient of 0.90 for the Mini CEX; both studies emphasize that this tool functions effectively in assessing real clinical performance, providing rapid feedback, and enhancing educational interaction (17).

In addition, the study by Joshi et al. (2017) conducted among internal medicine residents reported the highest scores in the domain of professionalism and the lowest scores in physical examination and patient communication, which is somewhat consistent with the present findings where professionalism received the highest score while the problem expression domain received comparatively lower scores. In contrast, the study by Habibi in Iran indicated that the implementation of Mini CEX at the residency level was associated with challenges such as time constraints and workload pressure, whereas in the clerkship level of the present study, satisfaction and acceptance were higher. This difference may be related to variations in educational level, evaluators' expectations, and the nature of clinical encounters. Overall, the pattern of scores across different performance domains in the present study is comparable to international findings; however, the higher satisfaction and overall mean scores suggest that implementing the Mini CEX in the early stages of medical clinical training may be more acceptable and educationally effective than at higher levels such as residency.

Among the limitations of this study are its cross sectional design, limited sample size, and the potential for response bias, particularly considering that the participants were clinical clerks who had recently entered the clinical environment and whose opinions may have been influenced by their initial experiences. Nevertheless, the use of standardized questionnaires and maintaining uniform evaluation conditions for all participants helped reduce the impact of these factors.

To improve the generalizability and precision of the

findings, multicenter studies with larger sample sizes and longitudinal designs are recommended. In addition, Mini CEX assessments could be implemented in other medical science disciplines and at different educational levels to enable broader comparisons across fields and training stages.

CONCLUSION

Based on the findings of the present study and previous research, the Mini CEX can be considered an effective, acceptable, and well received tool for assessing the clinical skills of medical students. In addition to enabling direct observation and authentic performance assessment, it provides opportunities for rapid feedback and correction of weaknesses (18). Through direct observation, real performance evaluation, and immediate feedback, this method can improve learning quality, reduce errors, and increase learners' self confidence (19, 20). Therefore, it is recommended that medical education programs incorporate this type of assessment more broadly and systematically alongside traditional evaluation methods in order to enhance the quality of education and better address practical clinical needs. Providing effective feedback, continuous supervision, and adjusting educational programs based on Mini CEX findings can play an important role in training competent and confident physicians. Furthermore, the results of this study may serve as a basis for conducting similar research in other universities and educational centers.

Ethical Considerations:

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. This study was approved by the Ethics Committee of Mashhad University of Medical Sciences under the code IR.MUMS.IRH.REC.1402.174, dated 27/11/2023.

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