

Mini-CEX in the evaluation of clinical skills in medical graduation

O Mini-CEX na avaliação de habilidades clínicas na graduação médica

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Diniz Neto AP, Lima CFT, Carvalho KRP, Santos RMP, Lima RS, Fernandes RAML, Sales ACV. Mini-CEX in the evaluation of clinical skills in medical graduation / O Mini-CEX na avaliação de habilidades clínicas na graduação médica. Rev Med (São Paulo). 2020; Jan-Feb;99(1):35-9.

ABSTRACT: *Introduction.* Assessment methods of clinical skills in medicine are important for the analysis of students' knowledge, skills and attitudes. Among these methods, the Mini Clinical Evaluation Exercise (mini-CEX) has been highlighted for evaluating the student in real practice environment, in addition to providing immediate feedback. *Objective.* To conduct a systematic review of the literature of the application of Mini Clinical Evaluation Exercise instrument in medical school graduation. *Methods.* Eric, Pubmed and Science Direct were searched. Through two different search strategies: Search A, with publications from 2011 to 2016, and Search B, with publications from 2006 to 2016, including articles with mini-CEX as an instrument for evaluating clinical skills in medical students. General characteristics of the studies, the use of the mini-CEX in medical graduation and the evaluated abilities were examined. *Results.* Of the 140 studies identified, 3 met the inclusion criteria. The studies evaluated clinical skills of medical students using mini-CEX, from the following: communication skills, personal and professional behavior, humanization, clinical judgement, counseling skills, organization and efficiency and overall clinical care. Among these skills, history taking, physical examination and the communication skills are best evaluated by mini-CEX when compared to other skills assessment methods. Finally, competences such as personal and professional behaviours obtained the highest overall scores. *Conclusions.* The mini-CEX is an effective tool, easy to apply and reliable on the evaluation of clinical skills of the medical academics.

Keywords: Education, medical, undergraduate; Evaluation studies; Clinical competence/standards; Medical examination; Educational measurement; Students, medical.

RESUMO: *Introdução:* Instrumentos de avaliação de habilidades clínicas na medicina são importantes para a análise do conhecimento, habilidades e atitudes do estudante. Dentre eles, o *Mini Clinical Evaluation Exercise* (mini-CEX) vem se destacando por avaliar o estudante em ambiente real de prática, além de fornecer *feedback* imediato. *Objetivo:* Realizar uma revisão sistemática da literatura sobre a aplicação do instrumento mini-CEX na graduação do curso de medicina. *Métodos:* As bases de dados pesquisadas foram: Eric, Pubmed e Science Direct. Através de duas estratégias de busca diferentes: Busca A, com período de pesquisa de 2011 a 2016 e a Busca B, com intervalo de 2006 a 2016, foram incluídos artigos que abordam o mini-CEX como instrumento de avaliação das habilidades clínicas em acadêmicos de medicina. Foram consideradas as características gerais dos estudos, o uso do mini-CEX na graduação médica e os critérios avaliados por esse instrumento. *Resultados:* Dos 140 artigos encontrados, três atenderam aos critérios de inclusão. Os estudos avaliaram as habilidades clínicas dos estudantes de medicina com o uso do mini-CEX, a partir da: habilidade de comunicação, atitude/profissionalismo, humanização, raciocínio clínico, habilidades de aconselhamento, organização/eficiência e competência clínica geral. Dentre essas competências, a anamnese, o exame físico e a capacidade de comunicação são melhores avaliados pelo mini-CEX quando comparado a outros métodos de avaliação de competências. Além disso, competências como comportamentos pessoal e profissional obtiveram as maiores pontuações gerais. *Conclusões.* O mini-CEX parece ser uma ferramenta eficaz, de fácil aplicação e confiável na avaliação das habilidades clínicas dos acadêmicos de medicina.

Descritores: Educação de graduação em medicina; Estudos de avaliação; Exames médicos; Competência clínica/normas; Avaliação educacional; Estudantes de medicina.

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INTRODUCTION

In 1972, the American Board of Internal Medicine (ABIM) reviewed its assessment program for medical residents and approved the Clinical Exercise Evaluation (CEX), which is based on the bedside oral examination of a medical resident during a complete medical encounter¹. However, the CEX was criticized as an evaluation instrument because results were unlikely to be generalized, it took two hours to be concluded and it was observed disagreements amidst evaluators, even though they would use the same instrument².

In the 90s, the ABIM proposed the Mini Clinical Evaluation Exercise (mini-CEX), a variation on the traditional CEX, in which one professor or senior staff evaluates a resident with on patient, in various setting, while he/she performs a quick and objective consultation, focused on a specific need of the patient. This assessment tool made itself important because it tries to reproduce, in the finest possible manner, the students' routine in his/her future working place^{1,2,3}. The mini-CEX evaluates seven competencies: history taking, physical examination, professionalism, clinical judgement, counseling, organization and efficiency, and overall competency. Following the consultation, students receive feedback of a faculty member on their strengths and weaknesses during the exercise, as well as suggestions for improvements on their performance³.

The mini-CEX was initially conceived to be used with medical residents. However, it is making its way into undergraduate medical students because it can be utilized for both summative and formative assessment methods³.

Given the scarcity of publications exploring the applicability of the mini-CEX for undergraduate medical students, the purpose of this systematic review is to explore and analyze its utility for assessing these trainees.

METHODS

We performed a systematic review following the methodology proposed by the Cochrane Institute. In order to identify relevant articles we decided to use the following electronic databases: Eric, Pubmed and Science Direct, in January, 2017, gathering two researches strategies. In the first strategy (research A) the following search terms were utilized: "mini-Cex" and "clinical skills", and in the second strategy (research B): "mini-Cex" + "clinical skills" + "assessment methods" + "medical education" + "undergraduate". Only English terms were used.

Articles which brought forth the mini-CEX as an evaluation instrument to judge undergraduate medical students' clinical competencies were included, using clearly described methodology, published in both, English and Spanish language periodicals, in a five years interval (research A) and 10 years interval (research B). In order

to exclude articles, some conditions were considered: case reports, others systematic reviews or meta-analyzes; multi-professional studies or researches from other health fields; studies which embrace the evaluators' formation, as well as articles that discussed examiners and/or students points of view about the theme, or that would only compare mini-CEX to other evaluation methods.

After this database consultation, utilizing both the research strategies and the inclusion and exclusion criteria previously described, studies presented in duplicity were identified. All the abstracts were read and in the cases which it was not enough to determine whether to include or exclude the article, accordingly to the above-mentioned criteria, a full read was performed so to decide its eligibility for the research. In the cases where the abstract was sufficient, its full version was obtained, so to confirm their eligibility. In cases of disagreement amidst the researchers, the attempt to find consensus was preferred. Not being that possible, the majority of the present study authors prevailed.

RESULTS

After the first research was completed (Research A), having as search terms "mini-CEX" and "clinical skills", 72 articles were identified, from which four were eligible for the study and 68 were excluded for fulfilling the exclusion criteria or for not referring to the theme: two articles for commenting about the planning care system of the mini-CEX, two articles for concentrating their efforts on the evaluators' formation results, 17 articles for analyzing the evaluator's point of view in use of the instrument, 26 articles for exploring the mini-CEX use for medical residents, one for approaching the cultural aspect of the assessment tool, five articles for discussing about non-medical area, 10 articles for mainly investigate the student's point of view, two for being meta-analysis, one for reflecting the patient's assistance, one for being a literature review and one for being a systematic review. A whole-through reading was performed for the four eligible articles and three papers were further excluded for not fulfilling the above-mentioned eligibility criteria. In the second research though (research B), done with the following search terms: "mini-Cex" + "clinical skills" + "assessment methods" + "medical education" + "undergraduate", 68 articles were found, among which 12 were selected to a full-reading of their contents; and 56 were excluded for fulfilling the exclusion criteria or for not being related to the theme: one for focusing on educators' formation, six for reflecting the evaluator's point of view in the use of the mini-CEX, 24 for exploring the mini-CEX for medical residents, 16 for approaching the use of the mini-CEX in other health professions, seven for focusing their analyses in other instruments comparing them to the mini-CEX, one for being a literature review and another one for being a systematic review. After the full-reading

of the 12 eligible articles of this second research, two were included in the final study of this systematic review and 10 were excluded for not fulfilling the eligibility criteria or for

not exploring the mini-CEX as an evaluation instrument for undergraduate medical students. The Figure 1 symbolizes the selection process of the articles.

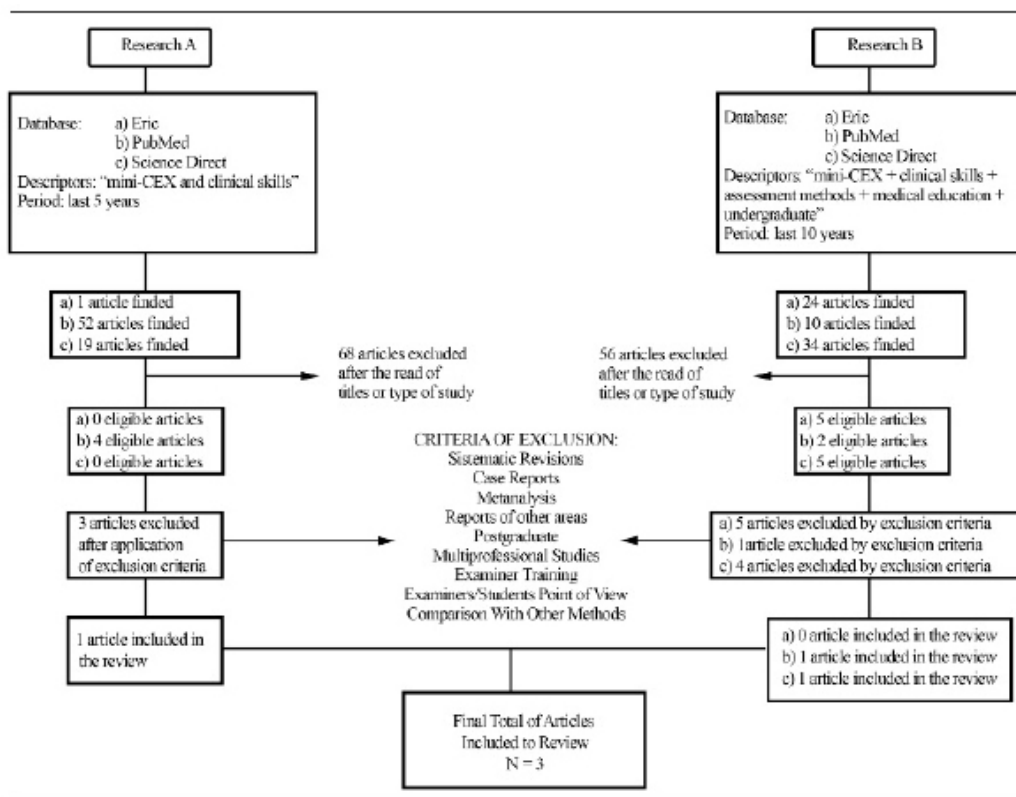


Figure 1. Flow diagram of search results, from 2006 to 2016

Torres et al.⁵ evaluated the viability of the mini-CEX to assess the clinical skills of 177 third year undergraduate medical students. In order to do so, each student performed two mini-CEX in the period of two months, summarizing 354 consultations in general. As a conclusion, the authors state that the use of the mini-CEX is a viable method to evaluate clinical competencies in both, hospital and ambulatorial settings. Furthermore, they point out that the direct observation of the consultation performance by a faculty member, the feedback opportunity by the end of each encounter as well as the gathering of the seven competencies explored by the mini-CEX into a single assessment tool facilitate the formative evaluation for undergraduate medical students.

Castro et al.⁶ analyzed the use of the mini-CEX for 926 undergraduate medical students, each of them performing four evaluations with different evaluators. The authors concluded that amidst the seven competencies evaluated by the instrument, the history taking, the physical examination, and the communication skills are better assessed by the mini-CEX than with other evaluation methods of objective and structured competencies. And it should be so because this evaluation is made in real scenarios and real patients, fostering a better relationship doctor-patient. Besides, the feedback by the end of the

evaluation favors the acquisition, development and improvement of the medical competencies.

As for the third and last article, done by Hill et al.⁷, 326 students were evaluated in three different occasions and evaluators with regards to the history taking, the physical examination, the clinical reasoning and the general management plan in specific fields of the medicine as well as to the satisfaction level among professors and students. As a result, the physical examination obtained the weaker response in both, pediatric and gynecology fields using mini-CEX. However, the personal and professional behaviors obtained the highest general scores. It is important to highlight that students and professors evaluated the mini-CEX as a more effective assessment method than other tools designed to evaluate clinical competencies. Lastly, the study concluded that the use of the mini-CEX has a good utility to evaluate different aspects of the medical encounter.

The three studies pointed in unison that the utilization of the mini-CEX to evaluate undergraduate medical students showed itself relevant when compared to other assessment methods, due to its bimodal characteristic of being as much summative as it is formative. The Table 1 reflects the summary of the three selected articles.

Table 1. Summary of the selected articles for the systematic review

Author, year, Reference	Location	Study duration	Evaluative criteria	Results and conclusions
Torre et al. ⁵ 2007	Medical College of Wisconsin (USA)	July, 2004 to April, 2005	History taking, physical examination, professionalism, clinical reasoning, organization and management plan.	The mini-CEX is viable and well evaluated among students and evaluators considering supervision and betterment of clinical abilities.
Castro et al. ⁶ 2015	International Conference on University Teaching and Innovation/ Facultad de Medicina de la Universitat Rovira i Virgili (Tarragona - Spain)	2002-2006 2007-2013	History taking, physical examination, communication, clinical reasoning, organization.	The mini-CEX improves both, abilities and clinical competencies, as well as communicative, evaluated during graduation, favouring a better relationship in between the doctor and the patient.
Hill et al. ⁷ 2009	Southampton University (England)	July, 2004 to May 2005	History taking, physical examination,, clinical reasoning, management plan.	The mini-CEX is valid and reliable when utilized for undergraduate medical students.

DISCUSSION

The included articles present different methodologies and apply a variable number of mini-CEX per student: Castro et al.⁶ performed four evaluations, Hill et al.⁷ did three and Torre et al.⁵ made a total of two, and this variation may influence both, interpretation and results. Moreover, only one of the studies specifies the year being taken by students who were evaluated, representing a bias of selection⁵. On the other hand, the studies describe a previous training for evaluators in order to apply the mini-CEX on each study, contributing to reduce the information bias, increasing the reliability of the described results^{5,6,7}.

Each study presented their own limitations and difficulties: Hill et al.⁷ demonstrates some external variables of confusion, such as evaluator toughness, complexity of the patient, sex and focus of the case. Torre et al.⁵ described resource limitations, lack of time, assessment of medical students in a single institution and the fact that the applications of mini-CEX were not performed in the presence of the main author so to confirm the content of each clinical encounter and to valid the type and quality of the feedback given to the students. And in Castro et al.⁶ the four mini-CEX applied per student were performed for different evaluators.

In general, students feel sheltered with the presence of a teacher during a medical encounter in a way that if

the academic shall have any hard time on conducting the consultation, the professor may adequately guide the student by giving immediate feedback. It corroborates Megale et al.³ observations which affirm to be indispensable that the professor observes directly the student's ability in a real atmosphere, because only by doing so can one conclude the student reached the necessary satisfaction level in him/her learning³⁻⁷. Megale et al.³ relates, still, that the theoretical knowledge is the very foundation for a high standard clinical practice. However, the theory without practice hardens the handling of real patients. Through mini-CEX, the students learn how to make decisions in uncertain situations, to deal with divergencies, complex and singular cases, besides having the certainty of being observed and tutored by the professor/evaluator that may intervene in case of necessity during the consultation³.

Therefore, it is noticed that the mini-CEX is useful to evaluate students' clinical skills during a medical consultation in a real case scenario, not using simulated patients. Thus, the mini-CEX is a practical, reliable and easy to apply evaluation method. In addition, it may be used with both formative and summative intents. However, it is important to develop new studies designed to assess the utility of the mini-CEX in fostering the acquisition, development and improvement of clinical skills for undergraduate medical students.

Acknowledgments: We would like to thank Thiago Savona for his precious support in the creation of the figures utilized in this study.

Authors' Participation: *Abdias Pereira Diniz Neto, Clarice Freitas Timóteo de Lima, Kelly Rayane Paiva Carvalho e Ruana Manso Porfírio dos Santos:* idealization of the study design, research and bibliographic review, writing and review. *Roberto Santos Lima, Raphaella Amanda Maria Leite Fernandes e Alexandre César Vieira de Sales:* guidance, idealization of the study design, review and correction.

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Received: April 18, 2018.

Accepted: November 16, 2019.