

Virtual Structured Objective Clinical Examination In Health Course: Integrative Literature Review

Hervaldo Sampaio Carvalho

PhD. MD. MSc, PostDoc Associate professor. Internal Medicine/Cardiology, Medical School, University of Brasilia. Brasilia, Brazil. E-mail: hervaldo1@gmail.com. ORCID: <https://orcid.org/0000-0002-6102-5493>

Priscila Menezes Ferri Liu

PhD. M.D. MSc., Assistant Professor. Department of Pediatrics. Universidade Federal de Minas Gerais. Belo Horizonte, Brazil. E-mail: pmferri.liu@gmail.com ORCID: <https://orcid.org/0000-0002-8608-8503>

Maria do Carmo Barros de Melo

PhD. M.D. MSc. Full professor. Department of Pediatrics. Universidade Federal de Minas Gerais. Belo Horizonte, Brazil. E-mail: mcbmelo@gmail.com ORCID: <https://orcid.org/0000-0001-9755-0364>

Marcos Paulo Neto Pereira

Medical student at the Faculty of Medicine. Universidade Federal de Minas Gerais. – E-mail: marcos.pereira.2@ebserh.gov.br

Elisa Evangelista Santos

Medical student at the Faculty of Medicine. Universidade Federal de Minas Gerais. – E-mail: elisa.evangelista@ebserh.gov.br

Gabriel Soares e Silva

Medical student at the Faculty of Medicine. Universidade Federal de Minas Gerais. – E-mail: gabriel.silva.12@ebserh.gov.br

Giovanna Correia Pereira Moro

Medical student at the Faculty of Medicine. Universidade Federal de Minas Gerais. – E-mail: giovanna.moro@ebserh.gov.br

Rafael Jose Barros Ferreira

Medical student at the Faculty of Medicine. Universidade Federal de Minas Gerais. – E-mail: rafael.jose@ebserh.gov.br

Fabiana Maria Kakehasi

Corresponding author: M.D. MSc. Associate Professor. Department of Pediatrics. Universidade Federal de Minas Gerais. Belo Horizonte, Brazil. E-mail: fmkehasi@gmail.com ORCID: <https://orcid.org/0000-0003-2685-9107>

Date of Receipt: August 9, 2024 | Approval date: August 26, 2024

Abstract

Introduction: The importance of evaluative processes through virtual platforms, driven by the SARS-CoV-2 pandemic, highlighted the virtual Objective Structured Clinical Examination (vOSCE) as an alternative to in-person assessment. **Objectives:** verify the applicability of vOSCE for the assessment of health competencies. **Methodology:** the steps of the integrated review were followed, using the PICO strategy as guiding questions, assessing knowledge, skills, and attitudes in health education through the vOSCE (intervention) in comparison with the objective structured clinical examination (OSCE). See a selection of articles published between 2010 and 2023, in English. The research was carried out in the PUBMED portal (which includes MEDLINE and LILACS). **Results:** 96 articles were identified and 16 were selected, addressing reliability, feasibility, and acceptability. Its standardization and reach present significant advantages, regardless of the geographic location of the students. From the perspective of limitations, adequate training and infrastructure are still needed for its successful implementation. **Conclusions:** vOSCE allows effective assessments of competencies in the health area, overcoming technological obstacles. It has shown itself capable of offering quality assessments, although the assessment of complex skills, such as physical examination and interpersonal interaction, presents challenges.

Key-words: Medical Education; Competency-Based Education; Educational Assessment; System online.

Resumen

Examen Clínico Objetivo Estructurado Virtual En Un Curso De Salud: Revisión Integradora De La Literatura

Introducción: La importancia de los procesos evaluativos a través de plataformas virtuales, impulsada por la pandemia de SARS-CoV-2, puso de relieve el Examen Clínico Objetivo Estructurado virtual (vOSCE) como una alternativa a la evaluación presencial. **Objetivos:** verificar la aplicabilidad del vOSCE para la evaluación de competencias en salud. **Metodología:** se siguieron los pasos de la revisión integradora, utilizando como preguntas orientadoras la estrategia PICO, evaluando conocimientos, habilidades y actitudes en educación para la salud a través del vOSCE (intervención) en comparación con el examen clínico objetivo estructurado (OSCE). Se seleccionaron artículos publicados entre 2010 y 2023, en idioma inglés. La búsqueda se realizó en el portal PUBMED (que abarca MEDLINE y LILACS). **Resultados:** Se identificaron 96 artículos y se seleccionaron 16, abordando confiabilidad, factibilidad y aceptabilidad. Su estandarización y alcance presenta importantes ventajas, independientemente de la ubicación geográfica de los estudiantes. Desde una perspectiva de limitaciones, todavía se requiere capacitación e infraestructura adecuadas para una implementación exitosa. **Conclusiones:** vOSCE permite evaluaciones efectivas de competencias en el área de salud, superando obstáculos tecnológicos. Ha demostrado ser capaz de ofrecer evaluaciones de calidad, aunque la evaluación de habilidades complejas, como el examen físico y la interacción interpersonal, presenta desafíos.

Palabras clave: Educación médica; Educación basada en competencias; Evaluación educativa; Sistema en línea.

Exame Clínico Objetivo Estruturado Virtual Em Curso De Saúde: Revisão Integrativa Da Literatura

Introdução: A importância de processos avaliativos por meio de plataformas virtuais, impulsionada pela pandemia de SARS-CoV-2, evidenciou exame objetivo estruturado virtual (vOSCE) como alternativa à avaliação presencial. **Objetivos:** verificar a aplicabilidade do vOSCE para a avaliação de competências em saúde. **Metodologia:** foram seguidas as etapas da revisão integrativa, utilizando como perguntas norteadoras, pela estratégia PICO, avaliação de conhecimentos, habilidades e atitudes da educação em saúde através do vOSCE (intervenção) em comparação ao exame clínico objetivo estruturado (OSCE). Foram selecionados artigos publicados de 2010 a 2023, na língua inglesa. A busca ocorreu no portal PUBMED (englobando MEDLINE, e LILACS). **Resultados:** foram identificados 96 artigos e 16 selecionados, abordando confiabilidade, viabilidade e aceitabilidade. Sua padronização e alcance apresenta vantagens significativas, independentemente da localização geográfica dos estudantes. Do ponto de vista das limitações, ainda são necessários treinamento e infraestrutura adequados para sua implementação bem-sucedida. **Conclusões:** vOSCE permite efetivas avaliações de competências na área de saúde, superando obstáculos tecnológicos. Mostrou-se capaz de oferecer avaliações de qualidade, embora a avaliação de habilidades complexas, como exame físico e interação interpessoal, apresente desafios..

Palavras-chave: Educação Médica; Educação Baseada em Competências; Avaliação Educacional; Sistemas On-Line..

INTRODUCTION

Several assessment methods in education have been developed and improved to optimize the evaluation of competencies and learning in the execution of safe professional practices until the end of the training of students in the health area. Teaching-learning processes mediated by information and communication technologies have encouraged the use of simulation of low-complexity scenarios to more complex scenarios for more than two decades¹.

Evaluations of competencies, skills, and attitudes have ideally been designed with the aim of “showing how” and “doing” in face-to-face activities, in clinical scenarios that reflect the daily practice of students, as cited in Miller's pyramid². Within this context, the objective structured clinical examination (OSCE) is now widely used in health courses and allows for a standardized, reproducible, and safe assessment.

On the other hand, the inclusion of assessment processes using virtual platforms is more recent and was driven by the need to adhere to physical distancing rules during the SARS-CoV-2 pandemic. Additionally, the use of these technologies to carry out the virtual structured objective examination (vOSCE) in teaching and assessment in health areas allows for greater reach in terms of the number of students, regardless of the geographic location of application, and has a lower cost compared to the in-person OSCE^{3,4}.

This study aims to verify the applicability of vOSCE for the assessment of competencies, skills, and attitudes in health areas, considering the importance of this knowledge for progress in teaching-learning assessment processes.

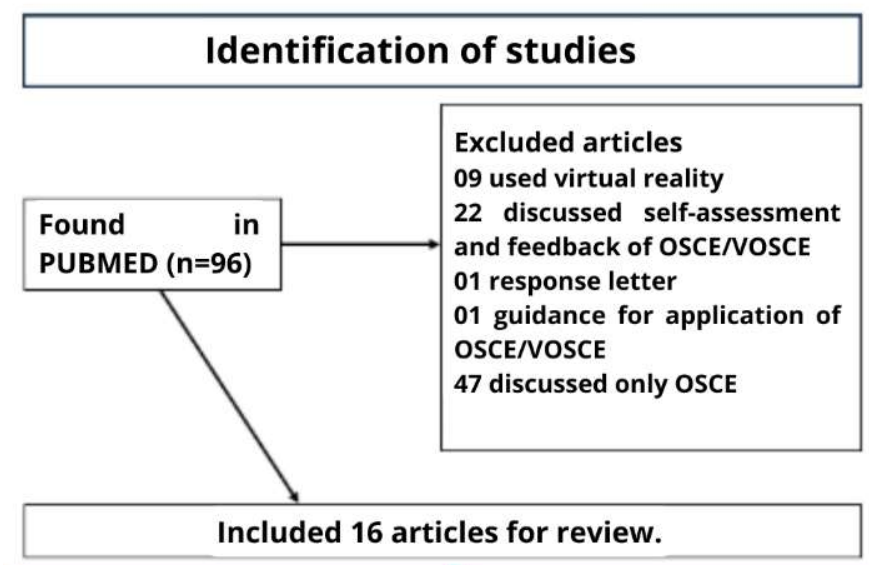
METHOD

To carry out this study, we conducted an integrative review with original articles on the PubMed platform on medical education. The guiding question for the PICO strategy was the assessment of knowledge, skills, and attitudes of health education (population) through the virtual structured objective clinical examination/vOSCE (intervention) in comparison to the structured objective clinical examination/OSCE (comparator).

The following descriptors were used on the PubMed platform “education, medical”, OSCE and vOSCE through the search: “((((((((Education, Medical[MeSH Major Topic] OR (Education, Medical, Undergraduate[MeSH Major Topic])) OR (Education, Medical, Graduate[MeSH Major Topic])) OR (Education, Medical, Continuing[MeSH Major Topic])) AND (Virtual Objective Structured Clinical Examination[Other Term])) OR (Tele Objective Structured Clinical Examination)) OR (VOSCE)) OR (Tele-OSCE)) OR (Virtual OSCE))”.

The inclusion criteria were articles that discussed the vOSCE in any of its particularities related to undergraduate students. We excluded the articles that discussed health education but focused only on the OSCE, or the use of communication technologies (videoconferencing) during the OSCE application, and those that discussed only the OSCE feedback methodology. Articles in English, published between 2010 and 2023, were selected. Two authors independently screened the abstracts of the titles. Articles with titles and abstracts that met the eligibility criteria were included in a detailed evaluation, but, if necessary, they were also evaluated in full in this first stage. In the second stage, four authors evaluated all full texts for this work's composition. From a universe of 96 articles, 16 were selected, after excluding nine articles that discussed the use of virtual reality during the administration of the OSCE, 22 that addressed only self-assessment and feedback in structured face-to-face exams, one that was a response letter to authors, another that was guidance on the execution of OSCE/vOSCE and did not contain evaluation results of the methods and 47 that dealt only with the OSCE.

Figure 1 details the process of searching and selecting articles



RESULTS

The final sample of this review consisted of sixteen scientific articles, selected according to previously established inclusion criteria. Table 1 represents the specifications of each of the articles. Thus, it is possible to perceive the incipience of scientific articles published on the subject, since it is a methodology that is in full development.

The results obtained from the 16 selected articles show an interest in studying virtual OSCE methodologies and comparing them with in-person ones, as well as the concern in standardizing models that guarantee the reliability of the results and the applicability of virtual means in the practical assessment of essential competencies for undergraduate and graduate students in the health area. The methodologies and technologies used are interesting and diverse, contributing to the understanding of the topic.

Table 1. Summary description of the sixteen articles selected in the integrative review, with the main objective, main findings, and conclusions.

Author/year/ Method of the study	Objectives	Main findings	Conclusions
Kiehl et al. (2014) ⁵ Prospective, interventional study	Develop a standardized and quality-assured assessment method for undergraduate studies through a structured objective clinical examination recorded on a single-station video (vOSCE).	155 5th-year medical students performed vOSCE with the application of consent form for surgical procedures, obtaining average scores above 70%, with respective averages of 91.0% for appendectomy, 88.4% for cholecystectomy, and 87.0% for inguinal hernia repair.	vOSCE was found to be feasible and reliable as a method of assessing student communication skills and application of clinical knowledge during informed consent in surgery.
Sartori et al. (2020) ⁶ Prospective, interventional study	Development of an OSCE case that assessed specific telemedicine skills and could identify opportunities for improvement in training in the resident curriculum	Seventy-eight NYU internal medicine residents were evaluated on a simulated case. They performed well in several areas but had specific challenges in telemedicine, such as performing virtual physical exams and using video to obtain a history. There were no differences in telemedicine skill ratings by	The study found that internal medicine residents demonstrated essential communication skills on a post-discharge telemedicine OSCE but showed deficiencies in specific telemedicine skills without recognizing this gap, regardless of year of training or track.

Author/year/ Method of the study	Objectives	Main findings	Conclusions
		training track or year of postgraduate training.	
Boyle et al. (2020) ⁷ Prospective, interventional study.	Design, develop, and implement vOSCE assessment using videoconferencing via Zoom platform in Glasgow/UK.	The vOSCE stations used brief clinical case scenarios. They assessed clinical reasoning in medical students, including hypothesis generation, differential diagnosis, and diagnostic management. They did not include video clips or interactive simulations of standard patients due to the need for rapid adaptation. Security concerns, such as data privacy and online system intrusions, were considered.	The vOSCE was well received by students and examiners, with no concerns or complaints, allowing a summative assessment of clinical performance in a virtual format.
Pante et al. (2020) ⁹ Prospective, interventional study.	To investigate the transfer of an interaction module to a digital environment and confirm whether virtual OSCEs promote the development of telemedicine skills.	The content and technical implementation of the online module were considered successful and transferable, although limitations on interdisciplinary and interprofessional group discussion and networking were highlighted as the main constraints in the virtual environment.	The study revealed that the implementation of virtual OSCE can be a viable alternative for the training of students and resident physicians, although limitations include limited replication of elements that offer personal interaction and exchange in the digital environment.
Shaban et al. (2021) ¹¹ Prospective, interventional study.	The study describes and evaluates the implementation of vOSCE with a new time management system in software format, using four evaluation indices (feasibility, cost-effectiveness, acceptability, and validity), and investigates possible differences in performance results between face-to-face and online OSCEs.	Three vOSCEs and three simulated OSCEs were conducted for training, totaling 6 rounds with 236 medical students, 52 examiners, 50 simulated patients, 22 proctors, and 2,332 station movements. Student results were comparable to traditional OSCEs, with similar or slightly higher scores, possibly due to the lack of physical examination assessment stations. Overall satisfaction was high across all participant groups, highlighting the practicality and closeness to the reality of the software-based timekeeping system. The study emphasized the importance of training and awareness of stakeholders, providing clear guidelines, and conducting an extended pilot OSCE to ensure familiarity with the assessment method.	The study demonstrated the viability, good cost-benefit, and acceptance of the online method of administering the OSCE, despite the unresolved disadvantage of not directly evaluating physical examination stations, relying only on verbal descriptions from students.
Blythe et al. (2021) ¹⁰ Prospective, interventional study.	Create an assessment based on vOSCE to assess the progress of students in the final year of a medical course in London/UK.	Five assessment stations were created addressing different clinical aspects, with the development of an application structure, checklist, and training of standard patients and examiners. The application involved nine students, three of whom were new to the assessment activity, resulting in six approvals. The scoring metric was evaluated and validated by the Angoff method, with no negative considerations	Failure in the assessment activity was not due to methodological problems, but to the student's lack of knowledge or sufficient performance to pass, highlighting the need for the entire team to be involved in the structuring process.



Author/year/ Method of the study	Objectives	Main findings	Conclusions
		about the contribution of each station in the final evaluation.	
Felthun et al. (2021) ¹⁵ Retrospective observational study.	The study aims to compare teleOSCE with the traditional model to assess the impact on the quality of assessment of medical skills and knowledge of medical students at the University of New South Wales, as well as to guide the development and future use of virtual clinical examinations.	Two groups of students were compared, totaling 565 participants, where those who performed the teleOSCE presented significantly higher scores in the Physical Examination, Medical Clinic, and Urgency and Emergency sections compared to the participants of the traditional OSCE. No significant differences were found in other domains evaluated.	The differences in scores may be attributed to the shorter development time of the 2020 teleOSCE compared to the traditional 2019 OSCE, which underwent years of refinement, resulting in more rigorous assessment and lower scores. Further research is needed to improve students' assessment of the physical examination in the teleOSCE by identifying skills that are not accurately assessed and addressing them with other methods.
Arrogante et al. (2021) ³ Descriptive, prospective cross-sectional study.	The study aims to compare the acquisition of nursing skills among final-year students through the traditional and virtual models of the OSCE, describing a highly realistic and interactive virtual examination model, with standardized patients, developed to replace the traditional OSCE during social isolation in the COVID-19 pandemic.	The study involved 234 nursing students, with 123 taking the virtual OSCE in 2020 and 111 taking the traditional OSCE in 2019. Although scores ranged from 65 to 95 points in the traditional OSCE and from 60 to 90 in the virtual OSCE, the average difference between the modalities was only 0.69 points. The virtual OSCE included a preparation stage to reduce student nervousness and receive positive feedback on performance. The main limitations were the assessment of technical skills, addressed with detailed descriptions of the participants, and technological challenges, such as internet access and videoconferencing platforms.	The virtual model of structured clinical examination is a cheap, feasible, and useful option when the traditional OSCE cannot be carried out and can be applied even in periods without the need for social isolation.
García-Seoanea et al. (2021) ⁴ Descriptive, interventional, and prospective study	The study describes the creation, application, and development of a computer-based OSCE case simulation, focusing on competencies such as anamnesis, exploration, clinical judgment, ethical aspects, interprofessional relationships, prevention, and health promotion, without assessing technical or communication skills.	Ten clinical cases covering different medical skills and specialties were selected to meet the curricular requirements. A total of 2,829 students participated, with most indicating an elevated level of stress before the test, but positively evaluating the prior information, the organization of the test day, the preparation during the degree, the knowledge acquired, and the type of medical problems presented. Most students considered the test to be a good learning experience. In the satisfaction survey, most students expressed satisfaction with the experiment's execution.	The computer-based OSCE facilitated collaboration between different medical schools, promoting interdisciplinary work with adequate assessment of students.
Oliven et al. (2021) ¹⁶ Descriptive, interventional study.	The study describes and compares Virtual Patients (VP), a model like OSCE, with traditional oral exams, highlighting that VP, a	Over five years, 586 students participated in exams using the "Virtual Patients" software and oral exams, with significantly higher scores on the oral exams. However, the Pearson correlation	"Virtual Patients" offers a wide variety of cases, allowing multiple tests to enhance students' medical skills.

Author/year/ Method of the study	Objectives	Main findings	Conclusions
	software improved over 12 years that simulates parts of Anamnesis and Physical Examination, avoids biases at the time of the exam and in the distribution of grades because it is a computer program.	coefficient between the scores from the two models was low (0.101), indicating a minimal relationship. As for failure, 17 students did not achieve the minimum score on the VP, while only one failed the oral exam.	
Haidet et al. (2021) ⁸ Descriptive, interventional study	To evaluate the OSCE for teleconsultation compared to the adaptation of traditional face-to-face cases.	Three findings were presented: lack of knowledge and preparation for teleconsultations among residents, need to structure cases with visible signs through teleconsultation for adequate evaluation. The platform allowed evaluators to observe nonverbal expressions more effectively than in face-to-face evaluation.	There is a need for greater training in undergraduate courses for teleconsultations and decision-making in virtual consultations.
Updike et al. (2021) ¹⁷ Descriptive study, with a test event	Discussion on the measures adopted by three Pharmacy faculties to preserve the integrity of the traditional OSCE when adapting it to the virtual model, highlighting strategies, obstacles, and opportunities to protect the integrity of the vOSCE.	The article described the migration of the stations to the online environment and highlighted strategies to maintain the integrity of the assessment, including conducting a pre-test event, creating individual virtual rooms, and sending medical kits for students to use. It also recommended creating a larger bank of stations and monitoring the test time to avoid breaches of confidentiality.	The paper concludes that ensuring the integrity of the virtual OSCE requires experience and communication between implementing groups, to develop and report good practice measures.
Seifert et al. (2022) ¹⁴ Interventional, prospective study	The study aims to evaluate the feasibility and acceptance of a new Tele-OSCE for dental students and examiners and to compare its performance with the face-to-face OSCE.	Fourth-year dental students were evaluated in study (n=34) and control (n=32) groups, with board-certified oral and maxillofacial surgeon examiners (n=9). Both the OSCE and Tele-OSCE consisted of three stations. There were no significant differences in overall student performance between the Tele-OSCE and the previous OSCE, except for the mandibular fracture treatment station, where students scored lower on the Tele-OSCE.	The Tele-OSCE in Oral and Maxillofacial Surgery is feasible and well accepted by students and examiners, with results comparable to the previous non-pandemic OSCE, although the reduced sample may limit the statistical power and generalizability of the results.
Gortney et al. (2022) ¹⁸ Interventional study	The retrospective study aimed to assess whether there was a difference in student performance in a face-to-face OSCE and a vOSCE (virtual Objective Structured Clinical Examination) in an advanced internship final course of the Advanced pharmacy practice experiences (APPE).	Third-year pharmacy students were assessed in groups of 97 students for in-person OSCE (2019) and n = 96 for vOSCE (2021). Four stations were conducted for in-person OSCE and 6 for vOSCE, assessing performance in oral and written communication. There was no significant difference in student performance in oral communication, except for medication history collection. Performance improved between	The use of simulated patients, both in-person and vOSCE formats, has been innovative in pharmaceutical literature. Continuation of the vOSCE may be a viable alternative for assessing skills in pharmacy courses. Limitations include the lack of repeat testing due to the short course duration and variability in student stress levels due to the

Author/year/ Method of the study	Objectives	Main findings	Conclusions
		formative and summative assessments in both formats.	pandemic. Interrater reliability could not be assessed for the simulated patient stations.
Thampy et al. (2022) ¹² Qualitative interventional study	To design, implement, and qualitatively evaluate an online virtual OSCE, as a 'proof of concept' intervention study.	Qualitative research examined the decision-making and consultation stages of intervention design, stakeholder perspectives, and experiences, using questionnaires and online focus groups. Four key themes were identified: optimizing online assessment design, ensuring clinical authenticity, recognizing and addressing feelings and concerns, and incident planning and risk mitigation.	The study highlights effective practices for future applications of online technologies in assessment, offers guidance for their design and implementation, and establishes a foundation for comparative and longitudinal research on the growing role of technology in health professional education and practice.
Saad et al. (2022) ¹³ Qualitative study with phenomenological design	The study explores participants' experiences of developing and implementing vOSCEs in the Australian internal medicine group, assessing quality and usefulness in terms of meeting expected standards, consistency, impact of changes, alignment with goals and mission, and value for money.	The results indicate that the vOSCE met the basic standard of an OSCE but had limitations in assessing clinical skills beyond communication. There was consistency and positive transformation, fulfilling its learning purpose, and proving to be cost-effective due to the reduced need for resources.	The vOSCE virtual clinical assessments show limitations in assessing the clinical competence of the traditional OSCE, suggesting the need for interactive design improvements, despite offering good cost-effectiveness, consistency, and transformation in participant learning.

DISCUSSION

It appears that initial studies proposed the vOSCE methodology, albeit incipient, for the assessment of communication skills with the incorporation of videos.⁵ Others were from the need to extend the application of technologies such as interactive simulation with standard patients with an initial emphasis on the discussion of clinical reasoning and applicability in telemedicine^{6,7,8} From 2020 onwards, the rapid adaptation of assessment processes in scenarios of restriction of in-person activities became evident^{3,6,9-13} even though the methodology was already applied in pre-pandemic times⁵.

After the initial application focused on communication skills, other skills were worked on, involving the collection of anamnesis, clinical reasoning, and including ethical aspects and health prevention and promotion in various areas of health^{4,10,14}. In addition to the geographically expanded application, potential usefulness was verified in the sequential evaluation of the progression of undergraduate or postgraduate students, maintaining consistency and reproducibility, at a lower cost^{10,13}.

There was a description of limitations to the use of virtual assessment regarding the development of physical examination skills and procedures^{3,11}. Felthun et al. (2021) reported better student performance in the physical examination with the virtual methodology, justified by the greater rigor of traditional methods in the assessment

process¹⁶ Another point was the limitation in measuring interaction with the multidisciplinary team^{9,11}.

Considering the main attributes of a "good assessment" such as validity, reliability, feasibility, and acceptability, the studies that evaluated the vOSCE methodology or OSCE with virtual adaptations, showed that it is possible to create, through this method, quality assessments.^{19,20} Most studies address vOSCE for practical assessment of medical students^{4,5,7,10,11,12,13,16}, some for medical residents^{6,8,9}, focusing on the assessment of competence for the use of telemedicine (teleconsultations)^{6,7,8}. Studies were carried out for nursing^{3,15}, dentistry¹⁴ and pharmacy students^{17,18}.

Some studies involving medical students have specifically assessed reliability, development processes, applicability, and strategies to be adopted. Garcia-Seoanea et al. (2021)⁴ developed and applied a computer-simulated case for medical students, with positive results regarding satisfaction and feedback provided. Kiehl et al. (2014)⁵ demonstrated satisfactory results regarding reliability, with assessment by two examiners independently. Boyle et al. (2020)⁷ found satisfactory results regarding the development process, applicability, and acceptability of vOSCE using

videotelephone. Blythe et al. (2021)¹⁰ demonstrated that vOSCE is feasible with prior strategic planning, and careful development of each phase, highlighting the need for the involvement of the entire team in the structuring process. Thampy et al. (2022)¹² qualitatively evaluated vOSCE practices, resulting in the development of models for effective practices, with guidance for design and implementation. Oliven et al. (2021)¹⁶ used virtual OSCE software, concluding that the software allows multiple tests for assessment and improvement of skills as it is a formative process with feedback. Studies involving medical students also evaluated the cost-benefit, with satisfactory results^{11,13}. Studies allowed the evaluation of resident physicians for the use of telemedicine for teleconsultations^{6,8} and one for the general skills for the use of telemedicine⁹.

Two studies focused on the virtual practical assessment process for nursing students. In one of them, the authors demonstrated that the teleOSCE resulted in higher grades when compared to the in-person OSCE, attributing the difference in grades to the lack of time and experience needed to prepare the virtual stations, which may have led to a less rigorous assessment. They concluded that further studies are needed to improve the assessment of the physical examination in a virtual format, identifying skills that cannot be assessed accurately and seeking other complementary methods. On the other hand, Arrogante et al. (2021)³ studied the applicability of the traditional and virtual OSCE models, finding reliable results, with a small variation in the grades measured.

There is still a need for further studies involving other areas of health. Seifert et al. (2022)¹⁴ evaluated the feasibility and acceptability of Tele-OSCE, comparing performance with in-person OSCE (previous) via a checklist in dentistry students. Gortney et al. (2022)¹⁸ compared OSCE and vOSCE in stations using simulated patients, for pharmacy students, concluding that there was no significant difference in student performance, except for collecting medication history. Performance improved between formative and summative assessments in both formats. Updike et al. (2021)¹⁷ discussed the measures adopted by three pharmacy schools for preparing cases and adopting vOSCE. They sought a format that maintained the integrity of the assessment process, describing the necessary adaptation. They consider it important to register virtual assessment models so that good practices can be developed and shared. The synthesis of the evaluated studies showed several positive points of the vOSCE, which were listed below^{3,18}:

1. consistency in assessment, as the scenarios are well structured and controlled when recorded and even with well-established scripts for simulated patients;
2. good cost-benefit and viability by enabling the use of accessible virtual platforms, recorded case scenarios, and a smaller number of participants in the physical organization of the process when compared to the in-person OSCE;
3. institutional viability, the possibility of interdisciplinarity and participation of more than one university or institution, with the use of the same virtual platform and the same set of questions, with

students from different areas of health involved, reducing costs, and improving techniques, regardless of geographical distance;

4. the reliability of the assessment, considering that students assessed using both methodologies (OSCE and vOSCE) achieved similar performance;
5. acceptability, since students participating in vOSCE, as well as evaluators, reported that the process was effective in measuring skills and competencies in the health area;
6. the possibility of improving the evaluation process by reducing subjective differences between evaluators;
7. the quality and transformation of subjects, by enabling students to demonstrate what they have learned and assimilated and, at the same time, offering feedback, helping qualification in future professional life.

On the other hand, several challenges were also highlighted in the studies, and strategies to control them still need to be thought out and improved. Among these, the following can be mentioned^{3,18}:

- a) The assessment of skills related to the physical examination of the patient is more difficult in online assessment. The verbal description of the assessment may not present the same quality of assessment for the demonstration of the execution of the skill, but in the face-to-face OSCE there is not always the need to perform certain exams on actors and mannequins;
- b) interpersonal interaction skills may be more difficult to assess because they depend on the presence of the "Other" (simulated patient) in real-time, but this situation can also occur in person;
- c) the need for an internet network and stable communication in synchronous assessments can be a difficulty for some services;
- d) the need for adequate training of the participating team may require more time to prepare for the assessment.

As limiting factors of the study, we highlight that studies with better methodology design are still needed. Many studies were developed with data collected during the pandemic and virtual evaluation processes were still incipient. The methodologies were diverse and, therefore, difficult to evaluate and compare and consequently to compile the results and effective conclusions. Another issue that should be considered is that the terminologies are diverse and that researchers should try to unify and clarify

which virtual medium was used. The present study contributes to the literature by exploring an innovative and promising topic in terms of evaluation and feedback for students and health professionals. The record of actions developed in the area helps develop new strategies that allow for overcoming current challenges.

CONCLUSION

Based on the results of this research, it can be concluded that competency assessments (knowledge, skills, and attitudes) in the health area can be effectively carried out using the vOSCE. Technological resources are available, and the cost has been significantly reduced in recent years. Researchers and educators in the health area must seek to analyze and build virtual models that meet the objective of making the OSCE an object of excellence from the point of view of formative assessment. The entire process of developing questions, checklists, setting up stations, training evaluators and actors, and providing feedback to students must be planned rigorously, and at the same time, in the end, it is important to seek to understand the results and the satisfaction of all those involved to provide progress and improvements. Although it requires overcoming potential technological obstacles, it has the great advantage of standardizing assessments and reaching a wide range of students, regardless of geographic location.

ACKNOWLEDGMENTS

The authors would like to thank the Instituto Nacional de Ensino e Pesquisa (INEP) for the initiative to seek innovative ideas and encourage research on the topic.

REFERENCES

- Harden RM, Stevenson M, Downie WW, Wilson GM. Assessment of clinical competence using objective structured examination. *Br Med J*. 1975 Feb 22;1(5955):447-51. doi: 10.1136/bmj.1.5955.447. PMID: 1115966; PMCID: PMC1672423.
- Miller GE. The assessment of clinical skills/competence/performance. *Acad Med*. 1990 Sep;65(9 Suppl):S63-7. doi: 10.1097/00001888-199009000-00045. PMID: 2400509.
- Arrogante O, López-Torre EM, Carrión-García L, Polo A, Jiménez-Rodríguez D. High-Fidelity Virtual Objective Structured Clinical Examinations with Standardized Patients in Nursing Students: An Innovative Proposal during the COVID-19 Pandemic. *Healthcare (Basel)*. 2021 Mar 20;9(3):355. doi: 10.3390/healthcare9030355. PMID: 33804700; PMCID: PMC8004020.
- García-Seoane JJ, Ramos-Rincón JM, Lara-Muñoz JP; CCS-OSCE working group of the CNDFME. Changes in the Objective Structured Clinical Examination (OSCE) of University Schools of Medicine during COVID-19. Experience with a computer-based case simulation OSCE (CCS-OSCE). *Rev Clin Esp (Barc)*. 2021 Oct;221(8):456-463. doi: 10.1016/j.rceng.2021.01.006. Epub 2021 Jun 19. PMID: 34217672; PMCID: PMC8464183.
- Kiehl C, Simmenroth-Nayda A, Goerlich Y, Entwistle A, Schiekirka S, Ghadimi BM, Raupach T, Koenig S. Standardized and quality-assured video-recorded examination in undergraduate education: informed consent prior to surgery. *J Surg Res*. 2014 Sep;191(1):64-73. doi: 10.1016/j.jss.2014.01.048. Epub 2014 Jan 30. PMID: 24746952.
- Sartori DJ, Hayes RW, Horlick M, Adams JG, Zabar SR. The TeleHealth OSCE: Preparing Trainees to Use Telemedicine as a Tool for Transitions of Care. *J Grad Med Educ*. 2020 Dec;12(6):764-768. doi: 10.4300/JGME-D-20-00039.1. Epub 2020 Dec 2. PMID: 33391602; PMCID: PMC7771608.
- Boyle JG, Colquhoun I, Noonan Z, McDowall S, Walters MR, Leach JP. Viva la VOSCE? *BMC Med Educ*. 2020 Dec 18;20(1):514. doi: 10.1186/s12909-020-02444-3. PMID: 33334327; PMCID: PMC7746425.
- Haidet P, Hempel EV, Louw BC, Chisty A. Virtual decisions: Using a telehealth OSCE to enhance trainees' triage skills. *Med Educ*. 2021 May;55(5):659. doi: 10.1111/medu.14493. Epub 2021 Mar 17. PMID: 33733539; PMCID: PMC8250726.
- Pante SV, Weiler M, Steinweg B, Herrmann-Werner A, Brünahl C, Gornostayeva M, Brass K, Mutschler A, Schaal-Ardicoglu A, Wagener S, Möltner A, Jünger J. Digitalization within the MME study program - teaching and assessment of communicative and interprofessional skills in the Heidelberg module via video conference together with a virtual OSCE course. *GMS J Med Educ*. 2020 Dec 3;37(7):Doc88. doi: 10.3205/zma001381. PMID: 33364367; PMCID: PMC7740030.
- Blythe J, Patel NSA, Spiring W, Easton G, Evans D, Meskevicius-Sadler E, Noshib H, Gordon H. Undertaking a high stakes virtual OSCE ("VOSCE") during Covid-19. *BMC Med Educ*. 2021 Apr 20;21(1):221. doi: 10.1186/s12909-021-02660-5. PMID: 33879139; PMCID: PMC8057662.
- Shaban S, Tariq I, Elzubeir M, Alsuwaidi AR, Basheer A, Magzoub M. Conducting online OSCEs aided by a novel time management web-based system. *BMC Med Educ*. 2021 Sep 26;21(1):508. doi: 10.1186/s12909-021-02945-9. PMID: 34565376; PMCID: PMC8474905.
- Thampy H, Collins S, Baishnab E, Grundy J, Wilson K, Cappelli T. Virtual clinical assessment in medical education: an investigation of online conference technology. *J Comput High Educ*. 2022 Apr 21:1-22. doi: 10.1007/s12528-022-09313-6. Epub ahead of print. PMID: 35469333; PMCID: PMC9022162.
- Saad SL, Richmond C, Jones K, Schlipalius M, Rienits H, Malau-Aduli BS. Virtual OSCE Delivery and Quality Assurance During a Pandemic: Implications for the Future. *Front Med (Lausanne)*.

2022 Apr 4;9:844884. doi: 10.3389/fmed.2022.844884. PMID: 35445035; PMCID: PMC9013903.

14. Seifert LB, Coppola A, Diers JWA, Kohl C, Britz V, Sterz J, Rüsseler M, Sader R. Implementation and evaluation of a Tele-OSCE in oral and maxillofacial surgery - a pilot report. *GMS J Med Educ.* 2022 Nov 15;39(5):Doc50. doi: 10.3205/zma001571. PMID: 36540562; PMCID: PMC9733482.
15. Felthun JZ, Taylor S, Shulruf B, Allen DW. Empirical analysis comparing the tele-objective structured clinical examination (teleOSCE) and the in-person assessment in Australia. *J Educ Eval Health Prof.* 2021;18:23. doi: 10.3352/jeehp.2021.18.23. Epub 2021 Sep 23. PMID: 34551510; PMCID: PMC8616724.
16. Oliven A, Nave R, Baruch A. Long experience with a web-based, interactive, conversational virtual patient case simulation for medical students' evaluation: comparison with oral examination. *Med Educ Online.* 2021 Dec;26(1):1946896. doi: 10.1080/10872981.2021.1946896. PMID: 34180780; PMCID: PMC8245083.
17. Updike WH, Cowart K, Woodyard JL, Serag-Bolos E, Taylor JR, Curtis SD. Protecting the Integrity of the Virtual Objective Structured Clinical Examination. *Am J Pharm Educ.* 2021 Jun;85(6):8438. doi: 10.5688/ajpe8438. Epub 2021 Feb 11. PMID: 34315707; PMCID: PMC8341239.
18. Gortney JS, Fava JP, Berti AD, Stewart B. Comparison of student pharmacists' performance on in-person vs. virtual OSCEs in a pre-APPE capstone course. *Curr Pharm Teach Learn.* 2022 Sep;14(9):1116-1121. doi: 10.1016/j.cptl.2022.07.026. Epub 2022 Aug 5. PMID: 36154957; PMCID: PMC9352434.
19. Wass V, Van der Vleuten C, Shatzer J, Jones R. Assessment of clinical competence. *Lancet.* 2001 Mar 24;357(9260):945-9. doi: 10.1016/S0140-6736(00)04221-5. PMID: 11289364.
20. Norcini J, Anderson B, Bollela V, Burch V, Costa MJ, Duvivier R, Galbraith R, Hays R, Kent A, Perrott V, Roberts T. Criteria for good assessment: consensus statement and recommendations from the Ottawa 2010 Conference. *Med Teach.* 2011;33(3):206-14. doi: 10.3109/0142159X.2011.551559. PMID: 21345060.

Declarations of conflict of interests: All authors have no competing interests to declare

Financing: This study received financial resources from the Instituto Nacional de Ensino e Pesquisa (INEP), which were transferred to the School of Medicine of the Federal University of Minas Gerais; it also received logistical support in the form of human resources from Empresa Brasileira de Serviços Hospitalares (EBSERH). The subject does not interfere with the author's objectivity.

Statement of responsibility:

The authors work in teams, coordinated by professors Hervaldo Sampaio Carvalho, Fabiana Maria Kakehasi, Priscila Menezes Ferri Liu and Maria do Carmo Barros de Melo. For the elaboration of the article, a compilation of what was published was carried out, a search for scientific articles and then the elaboration of parts by each one of those involved, including the students. The revisions were prepared and discussed by everyone. At the end, everyone read it, suggested changes and approved the final version.

How to cite this article: Kakehasi FM, Carvalho HS, Liu PMF, Melo MCB, Pereira MPN, Santos EE et. al. Virtual Structured Objective Clinical Examination In Health Course: Integrative Literature Review. *Latin AmJ telehealth, Belo Horizonte, 2023; 10(1): 088-097. ISSN: 2175-2990.*