Objective structured clinical examination: an overview

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Abstract

Objective Structured Clinical Examination (OSCE) is gaining wide-spread recognition as a means of assessing the clinical skills and other aspects of competence of health professionals. OSCE is rapidly replacing other forms of assessment at all levels of medical and health professional education. Since its development its use has become widespread as the standard for performance based assessment, particularly in undergraduate examinations. OSCE has been in practice in many parts of the world with favorable outcomes and has proven to be a reliable and valid assessment tool. It has been adapted to assess multiple skills like physical examination, history taking, communication skills, technical skills and interpretation of laboratory results, radiographs and ECG etc. The use of more complex cardiovascular simulators and anatomical models has further expanded the skills that can be tested by OSCE. Although it demonstrates certain advantages over other forms of assessment but has proved to be labor-intensive and time consuming. At present it is successfully being used in Pakistan for undergraduate and postgraduate examinations at various medical schools.

Key words: OSCE, validity, reliability, standard setting

The assessment of student's clinical competence is of utmost importance and there are several means of evaluating student performance in medical examination. The Objective Structured Clinical Examination (OSCE) is an approach in which different aspects of clinical competence are evaluated in a comprehensive, consistent and structured manner[1]. Since its development its use has become widespread as the standard for performance-based assessment, particularly in undergraduate examinations. In fact it can be considered as one of the four major teaching innovations in the last five decades that have had a great impact in medical education[2].

What is an OSCE?

An OSCE is a series of timed (5 to 10 minutes) stations (ranging from 8 up to more than 20) through which examinees are assessed by one or more examiners while performing a standardized clinical task during a patient examination or standardized patient interaction using a well-defined structured marking sheet[3-4]. The clinical task can be history taking, clinical examination, data interpretation, management, communication skills, counseling, and technical skills. Marking is done using a task-specific checklist, rating scale, or a combination of both[5].

The OSCE was first described by Harden & Gleeson[6] (1979) as, "timed examinations in which medical students interact with a series of simulated patients in stations that may involve history-taking, physical examination, counseling or patient management".

The use of OSCE not only makes the process objective but also addresses the assessment of all three domains (cognitive, affective and psychomotor) at one point[7-8].

OSCEs have been shown to be feasible and have good reliability and validity so their use has become widespread as the standard for performance-based assessment, particularly in undergraduate examinations. The OSCE was one of the first performance-based examinations to be used in assessing physicians' competence and is now considered the prototype of performance-based assessment in medicine[1].

Over time, the OSCE has been adapted to assess multiple skills: physical examination skills; interpretation of radiographs, ECGs, and laboratory results as they relate to a patient encounter; communication skills; technical skills; and teaching skills. The use of anatomical models, heart sound simulators and more complex cardiovascular simulator has further expanded the skills that can be tested[9].

How to organize an OSCE?

Marks & Humphrey[1] (2009) have described the following steps to organize the OSCE exam:

OSCE- Planning Checklist

Exam Content
- Blueprint
- Recruit case Authors
- Finalize case content

Standard setting
- Decide on pass marks

Standardized patients
- Recruitment
- Training

Logistics
- Location of the exam
- Number of tracks required
- Staff

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- Equipment and models

Examiner
- Recruitment
- Training

Budget
- Administrative staff
- Examiner
- Standardized patients
- Food
- Equipment
- Site

Post- exam review
- Feedback on cases and process from
  - Student
  - Examiner
  - Administrative staff
- Review of pass marks
- Recommend changes to stations

How to develop case/scenarios

Content experts, who are involved in the training program, should write the OSCE case. Case authors should be provided with a specific skill and domain of practice to be assessed and asked to base their case on an actual patient encounter. The authors are asked to provide the following components for each case[1]:

a. Define the purpose of the stations
b. Clear and concise instructions to candidates
c. Comprehensive scoring checklist
d. Detailed standardized patients instructions
e. Detailed instructions for station set-up

Standard setting: Pass or fail decision?

Setting standards (setting defendable passing score and grades) on an examination has enormous importance and requires the use of systematic methods. Standards need to be set by experienced, unbiased, and qualified judges. Using two or more groups of judges for the rating allows for measuring the agreement between their ratings (reliability) and increases the credibility of the standards[10].

Standard setting for OSCEs involves choosing a pass/fail or cut score that represents the level of competence, students should possess for a skill or purpose assessed by the OSCE[11].

Absolute standard setting approaches are either examination centered (like the Nedelsky, Eble, Jaeger, Angoff and the modified Angoff methods) or examinee centered (like the contrasting groups and borderline group methods), all of which can be used for standard setting in an OSCE[12].

In the Angoff method, a number of judges review all the checklist items of OSCE stations and decide on the score of the borderline examinees on each item (similar to the contrasting groups method)[12]. The average score of the judges is used as the pass score. In the modified Angoff method, the judges decide on the performance of the borderline examinees at the OSCE station level rather than the item level[12].

The contrasting groups and borderline methods are widely used for deciding the pass score on both small scale and large scale OSCE conducted by medical schools[12]. Setting standards by using the borderline approach is practical and accurate when compared with other absolute methods. This method can contribute to improve the reliability and validity of a high stake exam.[13]

There is no consensus regarding which method should be used for standard setting, deciding on a pass/fail mark, in any examination, including the OSCE. Some studies revealed that Angoff's and borderline methods provide reasonable and defensible approaches to standard setting and are practical to apply by non-psychometricians in medical schools. The borderline method has proved to be cost effective so it can be preferred and this method was found to be more suitable for small scale OSCE[11,14-15].

Reliability and validity of OSCE

The most important aspect of any measurement method is its reliability, validity and feasibility. In many disciplines and specialties OSCEs have been studied extensively and their reliability and validity established[16-18].

Reliability

Reliability refers to the reproducibility of assessment data or scores over time. It is a quality of the outcome or results and not the assessment instrument itself. Reliability estimates the random error of measurement[19]. The number of stations needed depend on how much reliability is acceptable based on the intended use of the assessment results. A higher number of OSCE stations are required to achieve a higher level of reliability. In general, acceptable reliability for high stakes (board certification), moderate stake (end of course, end of year summative assessment), and low stakes (in training, formative assessment) OSCE are more than 0.9, from 0.8 to 0.89, and 0.7 to 0.79, respectively[19]. OSCE has proved to be a reliable method of assessing students knowledge and skills in a particular clinical setup.[20-21]

Validity

Validity refers to the accumulation of evidence that supports meaningful interpretation of the assessment results[22]. Without evidence of validity, OSCE results

can not be interpreted. Validity is a unitary conceptthat requires multiple source of supporting evidence[22]. In general, the higher stake OSCE needs the collection of more validity evidence to support interpretation (board certification). OSCEs have been widely critiqued since their development. In the past 10 years, a number of studies on their measurement properties have been published and different conclusions, based on research were made[23].

A paper by Englander reveled that OSCE is a reliable assessment tool with modest validity if designed appropriately[24].

OSCE has proved to be valid and assessment tool with one argument that who will rate the students[21].

Auewarakul et al found OSCEs to be one of the evaluation methods with the most validity evidence[25]. Similarly Varkey also declared it a powerful valid tool for assessment[26].

Hodges presents the challenges and raises questions as to the definition of validity and its meaning in the OSCE context. He explained that "OSCE is valid only in relationship to the authentic clinical situations in which the subjects have to reproduce 'competent behaviors".[27]

Threats to validity

Threats to validity evidence that can affect the interpretation of the OSCE results are many. The major threat to validity evidence of the OSCE is construct under representation due to under sampling (few OSCE stations) or improper sampling of contents[28]. This can be avoided by carefully developing blueprints that cover all the contents and competency to be assessed and by selecting the OSCE that samples common clinical problems and that covers all such content and competency areas. Involving experts in the blueprint development and sampling process will help to minimize this threat. The other threat to validity evidence is construct irrelevant variance (CIV) due to improper training of standardized patients (SP), flawed SP and checklist, too easy or too difficult cases, bluffing of SP, rater bias (central tendency and halo effect), and indefensible pass criteria[28].

Strategies to improve validity and reliability

- Blueprinting is the process in which representative sample of items that should be included in the assessment is established. It maps the content of the examination against the learning outcome of the course. Always Produce a grid summarizing what is to be tested in the OSCE. It is the process by which the content validity of test is established[29].
- According to Harden and Gleeson[6] (1979) different students should not be assessed on different patients, all students have to examine all the patients.
- In order to achieve greater reliability there must be large number of stations and it should be combined with other methods of assessment.[29]
- The procedure of standard setting requires the input of credible judges in establishing the borderline between those who are considered competent and those who are not.[30]
- Communication OSCE stations can be created with acceptable reliability including difficult cases to evaluate communication skills beyond simple history taking.[31]
- Effective case writing is necessary to run a successful OSCE program. It is important to select cases that highlight the skills and techniques that fulfil the preclinical training philosophy of the institution. Careful structuring of OSCE questions and remediation of OSCE problem stations is crucial to support the continued use of OSCE. Item analysis of OSCE stations should be performed to improve the reliability of OSCE scores.[32]
- The OSCE must be designed in a manner that its objectivity is maximized which can be availed by standardized stations provided with checklist or rating scale.[33]
- There must be adequate training of the examiners and standardized patients. Make sure that examiners are fully briefed prior to the examination about the procedure for the OSCE in general and in particular with regard to the station at which they are examining. The examination should be free of any personal feeling, prejudice or bias to improve reliability.[30,33]
- All the candidates are judged on the similar material to avoid the variability implicit in a situation where candidates encountered different patients as some students come across helpful while the others may face temperamental patients.[33]
- The term *critical action* was defined by Petrusa[34] (2004) for the purpose of introducing a clinical standard of care into long-case skill performance examinations. Regarding OSCE it is defined as an OSCE checklist item whose performance is critical to ensure an optimal patient outcome. For example, in an OSCE designed to assess a student's ability to accurately perform all the elements of blood pressure measurement, a student may perform all the steps correctly but fail to measure the blood pressure accurately. This student will score high if the checklist

does not have the critical action of measuring accurate blood pressure reading. Therefore the critical action is essential in evaluating clinical competence but not required in OSCEs to assess the ability to perform steps of any skill.[23]

- Scoring methods for OSCEs vary widely, and they influence reliability. Checklists have been standard in many OSCE programs but global rating scale showed higher inter-station reliability and construct validity[25,35].

Strength of OSCE

- OSCEs demonstrate particular advantages over traditional forms of testing (such as multiple choice tests, short or long essay questions), in assessing communication and interpersonal skills, professional judgment and moral/ethical reasoning.
- During the last three decades, OSCEs have been used throughout the world with different purposes like for formative and summative assessments, to evaluate curriculum and for feed back to students as well as teachers in undergraduate and postgraduate level.[36]
- The OSCE has proved to be a well established assessment instrument for testing various aspects of clinical practice including skills in practical procedures and investigations.[37]
- Every specialist physicians requires competency in written communication. Written communication skills can also be assessed feasibly and reliably with the help of OSCE.[38]
- In the OSCE, subjective bias is removed as far as possible, like the examiner subjective bias is minimized with the checklist and any bias introduced by candidates can be decreased by encountering the same patients. OSCE is structured so that competencies in physical examination, communication skills, history-taking, counseling, patient education, problem-solving, etc. are tested in a range of areas and not just in one or two areas of medicine.[39]
- The OSCE is not a rigid assessment tool. Examinations vary in the number of stations, the duration of stations and the format of stations.
    - It can be adapted according to the level of examinees, particular discipline or speciality and resources.[39]
- A study observed that the OSCE testing led to significant changes in the learning activities of students and they became more interested in clinical activities.[25]
- The use of OSCEs for evaluation reinforces the patient-centered nature of medical practice and reminds students that they are practitioners but not mere masters of medical knowledge.[25]
- It facilitates assessment of core competence and contemporary professional skills in several medical disciplines in an objective and a transparent manner.[40]
- The use of OSCE reduces the bias in assessment of clinical competence of the candidates[24].
- The main advantage of OSCE is the fact that it allows a sampling of multiple areas of clinical competence compared to the traditional oral clinical examination, overcoming the problem of case specificity and resulting in improved reliability[3-4].
- In OSCE marking is done in a standardized way to increase interrater agreement[3].
- It provides a flexible assessment method through the use of standardized patients[3].
- The OSCE is superior to the oral clinical examination because it overcomes the problem of case specificity by sampling a broad area of competency, resulting in better reliability and validity[4].
- It is good for procedural and communication skills otherwise not routinely tested.
- It assesses competence (shows how) rather than performance (does)[3].
- The wider sampling of competencies and the use of structured marking sheets contribute to improvements in reliability and content validity.
- The entire examination is objective and promotes transparency.
- A large number of students can be evaluated within a short time.
- It encourages increased interaction between the examiner and students[41].

Limitations

- All components of clinical tasks can not be captured by a checklist.

During training, trainee ethics and behavior need to be observed which can't be reliably assessed using OSCE[3].

If there is use of real patients then it causes annoyance, inconvenience, or discomfort to patients.

It is labor-intensive.

All clinical situations can not be simulated by standardized patients[3].

It is time-consuming for the author.

The validity of OSCE suffers with fewer stations[42].

Checklists in OSCEs at times were broader than the task, which can promote bias in marking[42].

- If not planned appropriately, OSCE can become another tool for testing rote recall[42].
- There are lots of chances students collect OSCE stations and questions from their seniors regarding their specialties and make a pool which is continuously transferred to the juniors and in this way students can score high on those stations which are reused.

OSCE and Learning Theories

The educationists emphasize on those instructional methods which promotes active learning which is consistent with adult learning theories. OSCEs seemed to be ideally suited for these learning goals because they provide an opportunity for active participation and learning (building on already acquired skills and knowledge).

Evolution of OSCE in Pakistan

In our country, for many years, medical student evaluation focused on knowledge assessment using written tests comprising of short or long assay questions or/and MCQs as opposed to performance assessment.

Now a day in our country there is paradigm shift in the field of medical education. The medical education has been focused on competency based curricula and examinations. The objective structured clinical examination (OSCE) is the one way of evaluating clinical competency of medical students, residents and postgraduate students.

In Pakistan first time OSCEs have been introduced in the early nineties by the CPSP as an assessment technique for postgraduate examination in the discipline of family medicine[43]. The Aga Khan University (AKU) and King Edward Medical College (KEMC) implemented this technique in the late nineties at undergraduate level. Analysis of OSCE at AKU regarded it as a system of examination that can be used to evaluate affective and psychomotor domains[44]. At KEMC students offered positive and constructive feedback and demanded its implementation in all clinical subjects[45].

The Ziauddin Medical University (ZMU) introduced OSCE in 2004 for the assessment of clinical competencies at the undergraduate level. In a study at ZMU, students appreciated OSCE and offered constructive feedback on structure and organization of the process and also this study regarded OSCE as a practical and useful assessment tool in early years of medical education and found that it identified deficiencies in their clinical skills[46]. The Shifa College of Medicine started OSCE in 2003[42].

It is also being used successfully for undergraduate examinations by the Dow University of Health Sciences, University of Health Sciences Lahore and many other Medical colleges and Universities all over the country.

Implications in our setup

Undergraduate medical education in Pakistan has been based on the traditional model of learning which is teacher centered. The most common teaching modalities are lectures and small-group clinical rotations. Students' knowledge is principally assessed through oral exams and essay-type questions, while their skills are assessed in short and long case formats. The limitations of these assessment approaches include an emphasis on the simple recall of facts and the limited sampling of clinical domains. In addition, the assessment of students' clinical skills with non-standardized patients and settings compromises reliability and validity[42].

The main objective of OSCEs is to evaluate students' skills and approach at a higher level of integrated learning which is not possible with traditional evaluation approaches that rely principally on written or oral examinations.

In the last few years, the Higher Education Commission and Pakistan Medical and Dental Council (PMDC) have carried out an initiative to promote student-centered, small-group and self-directed learning and a patient-oriented style of care to promote better critical reasoning and clinical problem solving among students. This has resulted in several innovations in curricular design, namely well-defined objectives, learner-centeredness, use of small-group learning environments and more reliable and valid assessment tools[42]. Private sector medical colleges and universities like AKU, ZUM, and Shifa College of Medicine, are taking the lead in implementing these innovations.

In Punjab province almost all public and private sector medical colleges are under the umbrella of University of Health Sciences which is playing pivotal role in improving medical education by implementing modern strategies of assessment for medical graduates. It is suggested that in the same way in other provinces single regulatory university should be established for producing uniformity and improvement in the quality of education which in turn will improve the patients care.

The OSCE is a very reliable and valid method of measurement so it should be implemented in the early clinical years like from third and fourth years.

The OSCE can also be used to some extent in the first professional by using manikins, ECG, laboratory investigations, anatomical models, histological slides etc. The overall impact of incorporation of OSCE in early years would have tremendous effects in the performance of students in their clinical years and they will take more interest in studies.

The OSCE is more reliable and valid as compared to written test and MCQ's, therefore, the OSCE needs to be made part of the assessment process for undergraduate and residents in training.

It is suggested that PMDC the regulatory body of medical colleges in the country should recommend its use in early clinical years.

At present the OSCE is being used successfully in our country for postgraduate and final year exams at various places like CPSP, DUHS, AKU, UHS, KEMU, ZMU, SCM. It should be implemented at all medical colleges as an assessment tool for medical graduates in early years of their clinical rotations.

Conclusion

Now a days, it looks that depriving students of valid and reliable assessment tools, like an OSCE, is unethical[42]. There is no single method of assessment which can measure all aspects of clinical evaluation. The OSCE enables the assessment of resident's competence in a more reliable and valid way compared to the traditional clinical examination but a multi method approach to assessment using multi choice questions, OSCE, and performance based assessment is the way to a more accurate assessment.

Performance based testing has become an expectation for the assessment of physician competency. As described by miller[47] (1990), physicians must show or demonstrate their skills, as well as provide evidence of having a sound base of medical knowledge. An OSCE-style examination provides a valid, reliable and feasible means of assessing the range of skills physicians require to practice competently[34].

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