Validation of objective structured clinical examination for the assessment of clinical skills in the context of an orthopaedic exit exam: the Egyptian Fellowship in Orthopaedics and Trauma experience

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Context

Objective structured clinical examination (OSCE) is widely adopted in medical education to assess the skills of undergraduate students and in postgraduate basic surgical examinations such as MRCS. No orthopaedic exit exam worldwide includes an OSCE component.

Aims

The aim of this study was to describe validation of OSCE to assess clinical skills of final-year orthopaedic trainees appearing for the Egyptian Fellowship in Orthopaedics and Trauma (EFOT) exam.

Materials and methods

The EFOT accreditation committee developed three types of OSCE stations: history taking, clinical examination and informed consent. A pilot study was conducted in November 2011 to assess its feasibility and validity. Analysis of faculty feedback and mapping of the OSCE station bank against intended learning outcomes in the orthopaedic curriculum served as a validation tool.

Results

A total of 51 final year candidates were included in the pilot run. Sixteen faculty members, as well as candidates, participated and provided feedback. Despite introductory lectures about OSCE, only 64% of candidates and 79% of faculty agreed that they received adequate induction. Nevertheless, the majority of candidates (84–92%) and faculty (88–100%) thought that stations' instructions were clear. As an evidence of its validity, 88% of faculty agreed that OSCE, as currently set up, adequately measured candidate performance and 94% agreed that marking sheets covered relevant aspects of performance. Mapping intended learning outcomes showed that the bank covered the nine knowledge attributes in our curriculum. Relevant attributes of the skills and attitude and behaviour domains were also covered.

Conclusion

OSCE is a valid assessment tool that can evaluate clinical skills of orthopaedic trainees at the end of their training. Appropriate candidate, faculty and patient/actor training is fundamental.

Keywords:

assessment, clinical skills, education, feasibility, objective structured clinical examination, orthopaedic exit exam, feasibility, validity

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Introduction

Since its introduction in 1979 [1], objective structured clinical examination (OSCE) has been widely adopted in medical and nursing education to assess the skills and attitudes of undergraduate students [2,3]. There has been a recent interest in utilizing OSCE in the assessment of residents and fellows [4–7], as well as orthopaedic nurses [8,9], in orthopaedic training programs. Although OSCE has recently been incorporated into postgraduate basic surgical examinations such as the MRCS [10], we are unaware of any orthopaedic exit exam worldwide that includes an OSCE component.

In 2010, the Higher Committee for Medical Specialties and the Egyptian Orthopaedic Boards signed an international accreditation agreement with the Royal College of Surgeons in Ireland (RCSI). The purpose of this deal was to bring the level of the training program and assessment strategy in line with international standards and receive the accreditation of the RCSI. Following comprehensive training by process and subject experts from the RCSI, members of the Egyptian Fellowship in Orthopaedics and Trauma (EFOT) international accreditation committee developed three types of OSCE stations:

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history taking, clinical examination and informed consent. Each station had comprehensive mark sheets, detailed instructions and a list of equipments. This new assessment tool has been incorporated in the new format EFOT examination since November 2011.

The aim of the present study was to validate OSCE component of the EFOT exit exam used to assess the clinical skills of final year orthopaedic trainees. The validation process involved both construct validity and content validity of this newly introduced assessment modality.

Materials and methods

Members of the accreditation committee developed three types of stations. History taking stations consisted of a detailed script usually delivered by a trained actor. Skilful questioning by the candidate in a simulated orthopaedic consultation scenario allowed him to reach a specific clinical diagnosis, sometimes including an accurate level of the lesion. Clinical examination stations involved either a standardized patient or a patient actor. Orthopaedic clinical examination skills were chunked into small bites that fitted the station timing. Candidates were given a short history and asked to perform a full or specific clinical examination task. Towards the end of the station, candidates were asked to summarize their findings, or give a provisional diagnosis to the examiner. The third type of stations (informed consent) tested candidates' professionalism and communication skills. They were introduced to an actor with a specific clinical diagnosis and asked to obtain consent for a specific operative procedure, answering his or her queries and alleviating worries.

All stations were fully detailed with complete station descriptions and documentation:

(1) Comprehensive mark sheets with a task-based checklist, a global-rating scale, a comment box for failing candidates and a critical incidents report box (Fig. 1).
(2) Detailed instructions to candidates, examiners, simulated patients and any other relevant personnel.
(3) A detailed list of equipments and other requirements.

Individual checklist scores were weighted on the basis of the relative importance of each task as judged by the station author and was agreed upon by a panel of experts in a station review meeting. Each station was standard-set separately to determine the pass mark using a borderline regression method (Fig. 2), which utilizes both the checklist score and the global-rating awarded by the examiner.

We conducted a pilot study in November 2011 to assess the feasibility of this new modality, train candidates and faculty and obtain their feedback. The pilot run consisted of three pairs of OSCE stations (one each from the three types of stations). All stations were manned by two faculty members, one acting as an examiner and the other as an observer. Candidates rotated through the three types of stations. Every two rounds of candidates, faculty members rotated through the stations. For the purpose of training, observers were asked to fill in marking sheets, similar to examiners. Feedback questionnaire (Table 1) was designed to evaluate the feasibility, content and construct validity of the three types of OSCE stations. Responses to the faculty and candidate feedback questionnaire were collected and plotted in Microsoft Excel (Microsoft, Warsaw, Indiana, USA).

Our OSCE bank now contains 53 stations: nine history taking, 40 clinical examination and four informed

Figure 1

THE HIGH COMMITTEE OF MEDICAL SPECIALTIES
Trauma & Orthopaedic examination
CLINICAL EXAMINATION (OSCE)

EXAM CENTER	EXAM DATE
CANDIDATE NAME	CANDIDATE NUMBER

Performance area	Parameter	Clear Pass	Borderline	Clear Fail
Communication, clarity and doctor patient relationship	Introduces him/herself to patient			
	Invites questions and encourages dialogue			
	Uses appropriate language			
	Displays empathy (thoughtfulness)			
Explains treatment options. Sound knowledge of indications & contraindications and complications of each option	Discusses the problem			
	Discusses what would happen with no treatment			
	Discusses treatment options			
	Discusses the procedure and answers questions			
	Discuss side effects			
Patient's final decision	Checks patient's final decision			
Simulated Patient's mark				
What does the simulated patient feel?	Did the candidate establish a sympathetic relationship with you?			
	Do you feel that you understood the explanation / information given?			

OVERALL JUDGEMENT

Pass	
Borderline	
Fail	
Serious concerns	

Additional comments

Assessor Name & Signature

Orthopaedic OSCE | Informed consent: DHS 11

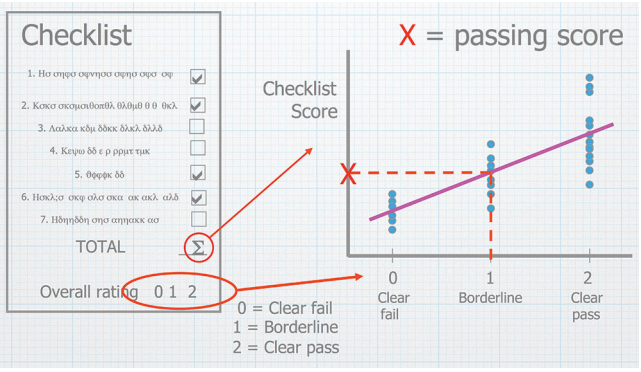
Example of a task-oriented marking sheet from an informed consent objective structured clinical examination (OSCE) station. Examiners are asked to tick a single box opposite each performance parameter. Assessors are blinded to the relative weight of each parameter. At the end of the station, they give a global judgement about the candidate's overall performance, independent of the checklist score.

consent stations. Each station covers several intended learning outcomes (ILOs) from the EFOT curriculum (Table 2), as outlined by the author in the first page of the station. The ILOs covered by stations in the bank were mapped against the EFOT curriculum to ensure that OSCE provided broad sampling across the content of the curriculum. We analysed feedback forms for two purposes. Candidate and faculty suggestions and concerns were used to modify stations. Faculty feedback, together with mapping of the OSCE station bank against ILOs in orthopaedic curriculum and blueprint served as a validation tool for this section of the exam.

Results

A total of 51 candidates who were already registered for the final EFOT exam were included in the OSCE pilot run. Sixteen faculty members, as well as candidates, took part and provided their feedback (Table 3, Figs 3 and 4).

Figure 2



Graphic representation of the borderline regression method of standard setting an objective structured clinical examination (OSCE) station. Total checklist score is plotted against the global (overall) rating. Pooled data from all candidates taking this station are used to construct a regression curve. Pass mark for the OSCE station is the score where the borderline rating intersects the regression line.

Despite introductory lectures about the OSCE section, only 64% of candidates and 79% of faculty agreed that they received adequate induction before the pilot session (Table 3). Nevertheless, the majority of candidates (84–92%) and faculty (88–100%) thought that instructions for the stations were clear (Figs 3 and 4). The only exception was instructions for the informed consent station, judged as clear by only 75% of faculty. Confusion arose due to the debate as to whether candidates should fill a consent form and ask

Table 1 Faculty feedback questionnaire used to determine feasibility and validate the construct and content of objective structured clinical examination stations selected for the pilot run

Number	Question	A	B	C
1	I was given clear induction before the start of the OSCE session			
	Instructions for the station were clear			
2	(1) History taking			
3	(2) Clinical examination			
4	(3) Consent			
	Time for the station was adequate			
5	(1) History taking			
6	(2) Clinical examination			
7	(3) Consent			
	This station adequately measures the appropriate skill			
8	(1) History taking			
9	(2) Clinical examination			
10	(3) Consent			
11	Relevant equipment were provided			
12	Faculty interaction was noninterrupting/ supportive			
13	Patient/actor interaction was clear, realistic and friendly			
14	OSCE as currently set up adequately measures candidate performance			
15	Marking sheet covers relevant aspects of candidate's performance			

Candidates were asked to fill a similar questionnaire with the exception of the last question (number 15). Both faculty and candidates were asked to tick A if they agreed, B if they neither agreed nor disagreed or C if they disagreed with the relevant statement; OSCE, objective structured clinical examination.

Table 2 The three major domains of the Egyptian Fellowship in Orthopaedics and Trauma curriculum with the first level attributes in each domain

Knowledge		Attitude and behaviour		Skills	
K1	General orthopaedics	AB1	Good clinical care	S1.1	Clinical assessment and management
K2	Trauma surgery	AB2	Maintaining good medical practice	S1.2	Preoperative planning
K3	Hip surgery	AB3	Teaching and training, appraising and assessing	S1.3	Preoperative preparation
K4	Knee surgery	AB4	Relationship with patients	S1.4	Exposure and closure
K5	Ankle and foot surgery	AB5	Working with colleagues	S1.5	Intraoperative technique
K6	Shoulder and elbow	AB6	Probity	S1.6	Postoperative management
K7	Hand surgery	AB7	Health		
K8	The spine				
K9	Paediatric orthopaedic				

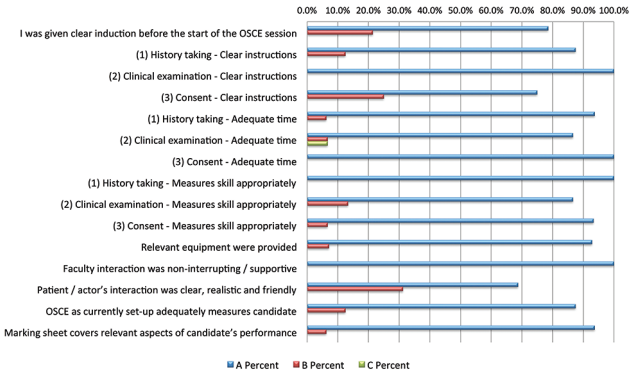
Skills domain includes the following: (S1) core competencies, (S2) trauma and (S3) orthopaedic operative skills classified according to anatomic regions. Only S1 attributes are presented here since the other two attributes are assessed with procedure based assessment (PBA) forms and the logbook.

Table 3 Summary of the faculty and candidates feedback responses (shown as per cent of the total)

Number	Question	Faculty responses			Candidate responses		
		A (%)	B (%)	C (%)	A (%)	B (%)	C (%)
1	I was given clear induction before the start of the OSCE session	78.6	21.4	0.0	63.8	25.5	10.6
	Instructions for the station were clear						
2	(1) History taking	87.5	12.5	0.0	92.0	8.0	0.0
3	(2) Clinical examination	100.0	0.0	0.0	84.3	13.7	2.0
4	(3) Consent	75.0	25.0	0.0	88.2	7.8	3.9
	Time for the station was adequate						
5	(1) History taking	93.8	6.3	0.0	78.4	17.6	3.9
6	(2) Clinical examination	86.7	6.7	6.7	82.4	15.7	2.0
7	(3) Consent	100.0	0.0	0.0	88.2	11.8	0.0
	This station adequately measures the appropriate skill						
8	(1) History taking	100.0	0.0	0.0	90.0	10.0	0.0
9	(2) Clinical examination	86.7	13.3	0.0	60.8	33.3	5.9
10	(3) Consent	93.3	6.7	0.0	90.2	9.8	0.0
11	Relevant equipment were provided	92.9	7.1	0.0	83.0	14.9	2.1
12	Faculty interaction was noninterrupting/supportive	100.0	0.0	0.0	80.0	16.0	4.0
13	Patient/actor's interaction was clear, realistic and friendly	68.8	31.3	0.0	76.0	22.0	2.0
14	OSCE as currently set up adequately measures candidate performance	87.5	12.5	0.0	72.0	26.0	2.0
15	Marking sheet covers relevant aspects of candidate's performance	93.8	6.3	0.0			

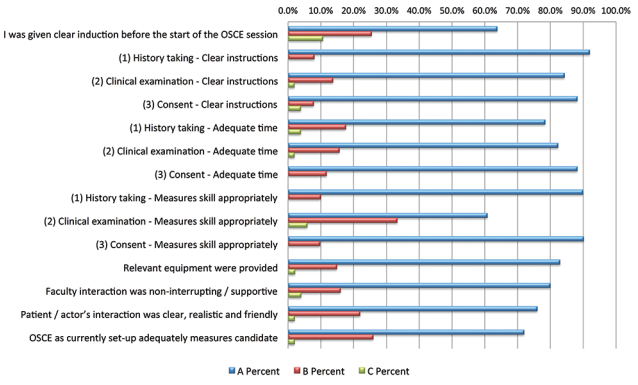
OSCE, objective structured clinical examination.

Figure 3



Faculty feedback. (A) = Agree, (B) = neither agree nor disagree and (C) = disagree.

Figure 4



Candidate feedback. (A) = Agree, (B) = neither agree nor disagree and (C) = disagree.

the patient to sign it. It was later agreed that candidates, having discussed the options and intended operative procedure, should only get the patient's verbal consent.

As an evidence of its validity, 88% of faculty agreed that OSCE, as currently set up, adequately measured candidate performance (Table 3). Ninety-four per cent agreed that marking sheets covered relevant aspects of candidate performance. Our experienced faculty agreed that the stations adequately measured the appropriate skill (100% for the history taking and 93% for the consent station). Despite a decent percentage (39%) of candidates doubting or disagreeing whether the clinical examination station adequately measured the appropriate skill, the majority of the faculty (87%) thought the station was valid for the particular skill assessment. Although the instructions to candidates clearly indicated that the required task was measuring shoulder passive range of motion only, most candidates got carried away with assessing active range of motion as well, wasting valuable time and missing out on using a goniometer to obtain precise measurements. Mapping ILOs tested by each station (Table 4) showed that our bank covered the nine knowledge domains outlined in our curriculum and blueprint. Relevant domains of the skills and attitude and behaviour domains were also covered.

Discussion

This study, to the author's knowledge, is the first study to describe and validate OSCE usage for the assessment of clinical skills in the context of an orthopaedic exit

Table 4 Mapping of the intended learning outcome covered by stations in the objective structured clinical examination bank against domains of the Egyptian Fellowship in Orthopaedics and Trauma orthopaedic curriculum

Knowledge			Attitude and behaviour		
K1	General orthopaedics	2	AB1	Good clinical care	13
K2	Trauma	5	AB2	Good medical practice	0
K3	Hip	4	AB3	Teaching, training and assessing	0
K4	Knee	8	AB4	Relationship with patients	52
K5	Ankle and foot	5	AB5	Working with colleagues	0
K6	Shoulder and elbow	8	AB6	Probity	0
K7	Hand	6	AB7	Health	0
K8	The spine	9			
K9	Paediatric orthopaedic	3			

The major attributes in the 'knowledge' and the 'attitude and behaviour' domains and the number of stations covering each attribute. All objective structured clinical examination stations covered at least one, and up to three, of the S1.1 'skills' attributes.

exam. It showed that OSCE is a valid assessment tool that can evaluate clinical skills of orthopaedic trainees at the end of their training. Validity was confirmed by the experienced faculty who shared in the pilot run and provided their feedback, as well as mapping of the ILOs tested by stations in the OSCE bank against the EFOT curriculum. Specifically, our panel of experts confirmed that OSCE, as currently set up, adequately measured candidate performance (88%), that marking sheets covered relevant aspects of candidate performance (94%) and that the three types of stations adequately measured the appropriate skill tested (87–100%). Mapping of test items to specific learning outcomes showed that the content of our OSCE assessment bank aligned with the learning objectives of the curriculum and blueprint, which ensures adequate sampling across subject area and skill domains.

Our pilot run confirmed the feasibility of the three types of OSCE stations designed by the accreditation committee. The instructions were judged to be clear (75–100% faculty and 84–92% candidates) and time adequate (87–100% faculty and 78–88% candidates). However, the pilot run also highlighted points that needed attention and improvement. We decided to renounce the requirement for filling up a consent form and actually asking the patient/actor to sign it by the end of the consultation, in favour of just obtaining his or her verbal consent. This station is actually manned by a faculty member who ensures that the appropriate process was followed in obtaining the patient's or actor's informed consent. In addition to ensuring adequate communication, clarity and doctor–patient relationship, the examiner observed whether the candidate discussed the problem, what would happen with no treatment, the treatment options and the procedure offered, as well as any side effects. Filling and actually signing a form would be impractical given the short time of the station (7 min). The patient's or actor's impressions as to how sympathetic the candidate was and how well he understood the explanations or information given were incorporated into the marking sheets.

The importance of appropriate candidate, faculty and patient/actor training was also highlighted. Despite very specific instructions given in the clinical examination OSCE, a large number of candidates (39%) performed unnecessary tasks, thus wasting valuable station time. Only 80% of candidates agreed that faculty interaction was noninterrupting/supportive (100% of the faculty thought themselves to be supportive). The significance of patient/actor training was evident by the feedback about how clear, realistic and friendly their interaction was (only 69% of faculty and 76% of candidates agreed). During the pilot run, two history-taking mirror stations were set. The scenario involved a middle-aged patient with spinal claudication. In one of the stations, the patient actually had spinal claudication and was therefore very authentic in giving the history. The actor in the corresponding station was a younger individual who did not follow the script precisely, resulting in a lot of confusion for the candidates. As we do not employ professional actors, we now insist on a protected calibration session for the faculty member to sit with the patient/actor before each exam and revise the scenario with him or her.

A potential limitation of this study was the low number of candidates, compared with those in the published literature on the use of OSCE in medical school examinations. However, this is expected in a study involving a high stakes exit examination. In fact, the number of final year candidates participating in our study (51 residents) is comparable to that in another study from the largest training program in Canada, in which 47 residents spanning the 5-year training program participated [4], and double the number of residents (24 and 25, respectively) participating in two similar studies from Ohio, USA [5] and Toronto, Canada [11]. In contrast, we recruited a large and experienced panel (16 university professors or equivalent) whose faculty feedback confirmed the validity of the three types of OSCE stations for assessing clinical skills of orthopaedic candidates sitting this exit exam [12,13]. Alignment between the curriculum and our OSCE bank further reinforced the content and construct validity. Another potential limitation is the lack of reliability measures (Cronbach *a* coefficient, *a* if item deleted, rater reliability, corrected item total correlation coefficients etc.) [14,15]. However, this study involved

a small pilot with a small number of stations. With the fourth diet of actual OSCE exams underway, enough data may be available to perform such study in the near future.

Published literature on orthopaedic OSCE reports on a wide variety of station designs. We decided to restrict our assessment to truly clinical tasks as opposed to computer-based stations [4] or practical (as opposed to clinical) tasks [8,10]. Although in the past our exit exam included similar practical examination involving objective structured questions on a variety of specimens (bone, clinical photographs or orthopaedic implants), our new format has been largely clinical. There is a real deficiency in history taking and physical examination skills of orthopaedic residents both in our program and other parts of the world [5]. There remains a role for a variety of modalities, which we might introduce in the future as our assessment strategy evolves [7]. We also decided against video recorded OSCE stations [6], which in our program would involve a lot of costs in equipment and support personnel. The present format of manned OSCE stations with checklist and global scoring in the mark sheet utilizes the expertise of the examiners who are in a position to make a (global) judgement about the performance.

OSCE has been implemented as an integral part in the final EFOT exam since November 2011 with favourable feedback from candidates, faculty and our external inspecting body (the RCSI). Senior orthopaedic surgeons (university professors or equivalent) acted as faculty members. Their expertise was instrumental to the success of the OSCE, as their global rating forms the basis of exam standard setting through a borderline regression method [13,16,17].

Conclusion

OSCE is a valid assessment tool that can evaluate clinical skills of orthopaedic trainees at the end of their training. Appropriate candidate, faculty and patient/actor training is fundamental.

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Conflicts of interest

There are no conflicts of interest.

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