Medical Research Archives

European Society of Medicine

OPEN ACCESS

Published: March 31, 2024

Citation: Kumar, N., Parsa, A. D., 2024. Design and Validation of an integrated Objective Structured Clinical Examination (i-OSCE) for a non-surgical aesthetics postgraduate program. Medical Research Archives, [online] 12(3). https://doi.org/10.18103/mra.v12i3.5180

DOI: https://doi.org/10.18103/mra.v12i3.5180

ISSN: 2375-1924

RESEARCH ARTICLE

Design and Validation of an integrated Objective Structured Clinical Examination (i-OSCE) for a non-surgical aesthetics postgraduate program.

Narendra Kumar[1*], Ali Davod Parsa[2]

[1]Avinyaa Health Pte Ltd, 160 Robinson Road, Business Federation Center, Singapore.

[2]Associate Professor of Health Economics and Policy Faculty of Health Medicine and Social care- Anglia Ruskin University, East Road, Cambridge, CB1 1PT

[*]narendra.kumar.19@ucl.ac.uk

ABSTRACT

Introduction: The Objective Structured Clinical Examination (OSCE) is a popular and practical method for evaluating future clinicians' competence and suitability for independent clinical practice. The present study aimed to develop and validate an integrated objective structured clinical examination to assess aesthetic physicians' critical thinking and clinical competency.

Methods: Initially, an expert panel consisting of five Aesthetic Practitioners with over 15 years of experience and a senior clinical academic were invited to develop a blueprint for the integrated objective structured clinical examination. Through this blueprint, the essential qualities and skills were identified for assessment. In addition, training workshops for examiners and simulated patients were organized to ensure process standardization. The final integrated objective structured clinical examination consisted of 12 stations (four clinical, four critical thinking, and four rest stations lasting 180 min).

Results: The Interclass correlation coefficient between the station checklist items was 0.946 (average upper bound 0.916, lower bound 0.968; $p<0.00$), which was considered significant. The Inter-Item Correlation Matrix among the clinical station and critical thinking checklist items also showed statistical significance. The Pearson correlation coefficient (PCC) was used to ascertain the correlation between the checklist and global ratings, yielding a high correlation (0.80 0.934).

Conclusion: The integrated objective structured clinical examination is a valuable and reliable tool for assessing trainees' aesthetic physicians' clinical competence and critical thinking.

Keywords: OSCE, Non-Surgical Aesthetics, Clinical Examination, Critical Thinking, Clinical Reasoning.

Introduction

Assessment and evaluation are critical steps in medical education that rely on selecting a proper and robust instrument. An appropriate assessment tool helps to determine the effectiveness of educational programs and ensures that future clinicians are competent and suitable for independent clinical practice[1]. However, the assessment tools currently used are insufficient to holistically test learners' knowledge, skills, behaviour, and critical thinking abilities. In such cases, using the 'test battery' approach makes utilising a mix of assessment tools for measuring an array of learning domains more practical[2,3].

Traditionally, clinical assessment strategies combine 'short' and 'long' case evaluations. However, criticism of its low-reliability[4] and modern-day constraints, such as increased litigation and student appeals[5], has led institutions to focus on exams that produce trustworthy, more easily defendable outcomes. Accordingly, the conventional assessment strategy evolved to overcome the challenges of traditional methodologies, such as reliance on the patient's performance, examiner's bias, non-standardized grading scheme, and candidate's actual performance, which went through an evolution process; consequently, the assessment process became standard. As a result, the number of variables affecting students' performance was reduced and paved the path favouring the introduction of objective structured clinical examination (OSCE), the "gold standard" for clinical assessments globally[6]. It examines the skills and ability to understand that the assessment results will reflect trainee physicians' day-to-day clinical performance in real-life scenarios. In various studies, OSCEs have been shown to be helpful in terms of reliability and validity[7]. However, the long examination time is a cause of concern for trainee physicians and costs to program directors[8]. OSCE mainly assesses the affective, cognitive, and psychomotor learning domains. Nonetheless, performance is affected by factors such as knowledge to apply in real-life scenarios, non-clinical skills (decision-making, teamwork, resource management, planning, and critical thinking), attitudes, environment, emotional state, physical state, and personality traits. The drawback of the OSCE is that it cannot be easily used to measure nonclinical skills[3].

In clinical education, critical thinking skills are measured by high-fidelity patient simulations, such as the "California critical thinking skills test, California critical thinking disposition inventory, Del Bueno's performance-based development system, health science reasoning test," and Watson-Glaser critical thinking appraisal. However, these tools lack the ability to measure health profession-related attributes, the practical reality of medical professionals, and psychometric properties[9,10].

Critical appraisal is a subcategory of critical thinking that specifies one's ability to make clinical decisions using evidence. Various studies have concluded that critical thinking can be refined, and without this essential ability, trainee physicians' decisions can have negative ramifications. There is evidence of a direct correlation between critical thinking and academic success; unfortunately, many trainee physicians struggle with tests that explicitly measure it[11]. While evaluating strategies for critical thinking, there is a prominent spotlight on evidence-based

practice and its role in medical education. Numerous systematic reviews have inferred that clinically integrated assessment methods are required to improve the skills of evidence-based practice further[12]. Critical appraisal has been incorporated into some high-stake professional and fellowship examinations, where physicians are examined to assess their ability to judge a clinical paper in a short time based on its research design, result and whether to consider this to change one's clinical practice.

However, no evidence in the literature reports the development and implementation of an evaluation tool for assessing clinical skills, analytical thinking, and non-clinical skills in NSA educational programs. Therefore, the current study aimed to develop and validate an integrated objective structured clinical examination (i-OSCE) by integrating clinical and critical thinking stations for the NSA postgraduate program.

Methods

OSCE STATION BLUEPRINTING

Blueprinting is the standard process of mapping the intended learning outcomes, which comprise knowledge and understanding and intellectual, practical, affective, and psychomotor skills related to the postgraduate curriculum on NSA, with the knowledge and skill competencies to be tested at individual stations. In addition, an 'expert panel' consisted of five aesthetic practitioners and a senior clinical academic with over 15 years of experience. A consensual and ceaseless approach was adopted to identify the tasks to be assessed that are essential and relevant to the NSA practice, thereby validating the content of i-OSCE (Table 1).

Table 1: OSCE Station Blueprinting

Matrix	Station 1 Upper Face	Station 2 Mid / Lower face	Station 3 Total face	Station 4	Station 5	Station 6	Station 7	Station 8
Consultation skills pertaining to the non-surgical facial aesthetics	■							
Awareness of the relationship between the signs of ageing and the underlying anatomy	■							
Assessment of Skin quality	■							
Conduct a full-face assessment to identify treatment needs for optimal results	■	■						
Clinical Photography		■						
Develop a treatment plan that which will deliver the optimal effect and most natural-looking results with the selection of appropriate product		■	■					
Safe Injection technique		■	■					
Post-treatment Advice		■	■					
Complication Management				■				
Situational Judgement				■				
Critical understanding of the research relating to facial assessment					■			
Critical understanding of the research relating to botulinum toxin						■		
Critical understanding of the research relating to dermal fillers							■	
Critical understanding of the research relating to complication management								■

CONTENT DEVELOPMENT AND VALIDATION

A 2-day OSCE writing workshop was conducted with 15 aesthetic practitioners and clinical academicians in the presence of three expert facilitators divided into three small groups. After a brief and structured presentation on the OSCE, all the groups had a facilitator-led practice session to construct

each station's case scenarios. This was followed by critical feedback from the facilitator to participants. The three working groups met regularly to construct case scenarios, candidate instructions, a standardized patient information sheet, and, most importantly, the marking sheet, where the entire scenario was deconstructed to make a performance checklist effectively to match the blueprint theme.

Finally, the expert panel was reconvened to review the constructed cases with the checklists and parity of competencies across the cases. Fifty stations (25 clinical and 25 critical thinking) were selected for storage in the repository, managed by an OSCE administrator.

CLINICAL STATIONS

These stations consisted of a simulated scenario for consultation on facial aesthetics. Here, candidates must have an appropriate history, clinical photography, and facial assessment to reach a specific, accurate diagnosis. Both standardized patients and patient actors were utilized within these stations. Candidates were given a brief history and were asked to perform (either all or some aspects) a clinical examination and discuss it with the patient. At the end of the station, candidates were invited to summarize their findings or provide a brief management plan, including its justification, to the examiner. The other stations assessed candidates' professionalism and communication skills.

CRITICAL THINKING (CT) STATIONS

Twenty-five CT stations were created, where candidates were asked to critically appraise their validity and reliability (formulating PICO, review methodology, and critical analysis of the discussion), whether the article was published in a peer-reviewed journal, and whether they decided to adopt it in clinical practice (applicability).

MARKING SCHEME

Each checklist score was weighed based on the allotted task's significance, as the station author deemed, which later reached further agreement from an expert panel in a station review meeting. Finally, each station received an independent standardization to create pass marks with the help of the borderline regression method, which utilized a combination of the checklist score and the examiner's single 3-point global rating; Clear pass, Borderline, or Clear Fail (Table 2).

Table 2: Example of a checklist/marking scheme

Candidate's Name		Circuit		Examiner's Code		
Station: History taking, Facial assessment and formulating a management plan for the patient						
(2=does well, 1= adequately, 0=poorly or not done)						
Part 1- Initial Approach to the patient						
Introduction				2	1	0
Informed Consent Taken					1	0
Part 2- Information Gathering: Clinical content						
Overall assessment considering medical History, lifestyle				2	1	0
Assessment of the Skin Quality				2	1	0
Full face assessment				2	1	0
Clinical Photography				2	1	0
Part 3 – Information Gathering: communication skills						
Determine for which area(s) is the treatment being sought				2	1	0
Check the candidate's understanding of the treatments available				2	1	0
Educate the patient on the change in their skin/bone/muscle anatomy and the need for a long-term treatment plan				2	1	0
Inform the patient on procedures available					1	0
Create a treatment plan to deliver the best results				2	1	0
Discuss potential risks and benefits of treatment so that they can make an informed decision				2	1	0
Part 4 – Safe procedural practice and Post-treatment Advice						
Selection of appropriate treatment option				2		0
Appropriate injection technique				2	1	0
Post-treatment advice given					1	0
Part 5- Rapport and professionalism						
Polite and courteous and maintain a good rapport throughout				2	1	0
Carries out examination fluently and professionally				2	1	0
SP Mark				2	1	0
Examiner's Comments						
Overall Judgement (Global Scoring)						
Clear Pass		Borderline		Clear Fail		

ASSESSOR TRAINING

All examiners participated in an hour-long orientation program to familiarize themselves with the OSCE, competency testing, and scoring guidelines. Further, they were provided with a guide describing the definitions of competencies, a checklist, and global ratings.

STANDARDISED PATIENT (SP) TRAINING

Healthy volunteers were recruited with the help of a modelling agency to act as 'simulated' patients for all stations. They underwent coaching conducted by professional medical actors and experts in clinical and communication skills. The SPs were given a task-specific station and

practiced playing their roles until perfection. As they were also responsible for completing part of the checklist, a calibration video was shown to practice marking and debriefing.

PILOT STUDY

A pilot study was conducted with ten aesthetic practitioners to examine the feasibility of the i-OSCE. The eight planned stations were run by one examiner and one observer. Subsequently, the results were reviewed, including feedback from individual stations, to amend i-OSCE documents for final implementation during the summative examination.

FINAL i-OSCE

The final examination comprised four clinical and four critical thinking stations of 15 min each and four rest stations with 40 trainee physicians. The total exam run time was 180 min.

STATISTICAL ANALYSIS

The Pearson correlation coefficient (PCC) was used to investigate the strength of the correlation between utilizing the checklist and the global rating (clear pass, borderline, or clear fail), which helped measure the validity of the marking criteria used. To calculate the inter-rater reliability (IRR), Cronbach's alpha was used through two-way mixed effects: intra-class correlations (ICC) for consistency and internal reliability. To interpret ICCs, we used Cicchetti's classification (IRR less than 0.40, poor; 0.40–0.59, fair; 0.60–0.74, good; 0.75–1.00, excellent). [13] Moreover, content validity was measured with the help of experts. Statistical analysis was performed using IBM SPSS Statistics for Mac (version 27.0; IBM Corp. Armonk, NY, USA).

Results

The inter-class correlation coefficient between the station checklist items was 0.946 (average upper bound 0.916, lower bound, 0.968; $p<0.00$), which was considered significant (Table 3).

Table 3: Intraclass Correlation Coefficient

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True ...	
		Lower Bound	Upper Bound	Value	df1
Single Measures	.688[a]	.578	.793	18.611	38
Average Measures	.946[c]	.916	.968	18.611	38

Furthermore, the Inter-Item Correlation Matrix among the clinical station checklist items and critical thinking checklists showed statistical significance (Table 4).

Table 4: Inter-Item Correlation Matrix of station checklist

Inter-Item Correlation Matrix								
	Station_1	Station_2	Station_3	Station_4	Station_5	Station_6	Station_7	Station_8
Station_1	1	0.722	0.744	0.819	0.629	0.674	0.836	0.656
Station_2	0.722	1	0.81	0.726	0.675	0.601	0.75	0.725
Station_3	0.744	0.81	1	0.837	0.579	0.556	0.674	0.607
Station_4	0.819	0.726	0.837	1	0.43	0.503	0.633	0.446
Station_5	0.629	0.675	0.579	0.43	1	0.84	0.799	0.859
Station_6	0.674	0.601	0.556	0.503	0.84	1	0.874	0.803
Station_7	0.836	0.75	0.674	0.633	0.799	0.874	1	0.86
Station_8	0.656	0.725	0.607	0.446	0.859	0.803	0.86	1

Finally, the Pearson correlation coefficient (PCC) was used to ascertain the correlation between the checklist and global ratings (Table 5), yielding a high correlation (0.80 0.934).

Table 5: Checklist Vs Global Assessment Correlation

Station	Pearson Correlation
1	0.865
2	0.82
3	0.934
4	0.8
5	0.856
6	0.848
7	0.891
8	0.875

Discussion

This is the first integrated OSCE validation study to combine clinical and critical thinking skills for postgraduate NSA education. The OSCE is a flexible assessment method used to evaluate competence through direct observation based on objective criteria. It comprises several "stations" where examinees are required to conduct a range of clinical tasks against required clinical competence displaying the skills and attitudes over a given duration. The OSCE has been used to assess the skills most important to the healthcare professionals' success, such as data acquisition,

interpretation, troubleshooting, engagement, and management of erratic patient behaviour, otherwise difficult to obtain during the classic clinical review[14]. Miller's framework for clinical competency development recommended four stages; "knows the facts"; "knows how to elaborate and integrate the understanding", "shows how" they apply knowledge, skills and attitude for the patient outcome; and finally, "does" employ all the skills in their independent practice to serve the community, proven to work reasonably well in medical education settings[15,16]. Evidence suggests that the OSCE helps assess the third stage, "shows how," by concentrating on the clinical skills in a safe learning environment.

Critical thinking is a crucial cognitive method for creating and utilizing knowledge. It functions in problem-solving and social, clinical, or ethical decision-making. Moreover, it is equally valuable for analysing complex data, assessing situations, and taking suitable actions. In a recent article, "critical thinking is described as a cognitive process, purposeful, self-regulatory judgment that has two components of cognitive skills (interpretation, analysis, inference, evaluation, explanation, and self-regulation) and a motivational component (the disposition toward critical thinking)"[17].

In recent years, more focus has been placed on improving higher-level thought (critical thinking and clinical reasoning skills) to help physicians retain their clinical integrity and medical professionalism[18]. More than two-thirds of the reported diagnostic mistakes are linked to physicians' lack of critical thinking ability in the present context[19]. Given the belief that healthcare professionals must be logical thinkers, there is no consensus on the most successful model for teaching and evaluating critical thinking and clinical reasoning skills. [10] Recent research that assessed a wide range of quantitative and qualitative competencies, including behavioural and communication skills, showed that the OSCE was valid, reliable, and essential for positive educational effects. Several authors have advocated that emphasizing the aim of OSCEs is to develop affability in critical thinking as a precursor to practice[20].

There is no valid assessment instrument that combines clinical and critical appraisal skills to evaluate safe practices in nonsurgical aesthetics. Therefore, using different stations to assess clinical and critical thinking abilities is beneficial for this evaluation. The various clinical skills measured included consultation skills pertaining to the NSA, knowledge of signs of ageing and underlying anatomy, assessment of skin quality, full-face assessment to identify treatment needs, clinical photography, development of an efficient and optimal treatment plan, safer injection techniques, post-treatment advice, complication management, and situational judgments. The critical appraisal skills assessed during the evaluation included understanding the research related to facial assessment, botulinum toxin science, rheology of the soft-tissue fillers, and complication management.

There were many challenges while planning and implementing this study. Training faculty members, station construction, standardized patient training, and deployment were tedious and expensive. It requires support and strong commitment from Higher Education institutions and program directors.

However, these constraints can be overcome with a supportive learning environment.

Although Cronbach's alpha is regarded as a reliable statistical measurement for an assessment tool[21], some studies argue that it should not be used for internal reliability as the sole measurement, as it is directly proportional to the examination length; therefore, it indicates the station's stability, not internal consistency[22,23]. However, the concurrent use of Pearson correlation coefficient (PCC) or Spearman's rank correlation helps overcome this issue[24].

It has shown that the generalisation coefficients differ significantly from 0.40 to 0.85, while most of these vary from 0.5 to 0.6[8]. In the present study, the average intraclass correlation coefficient measures ranged between 0.916 and 0.968, greater than the reliability coefficient threshold of 0.8 or over. The variability in the generalizability coefficients may be attributed to the examinees' variable performance at different OSCE stations (content specificity). Therefore, integrated objective structured clinical examination is robust and can test applicants for their competence in carrying out multiple component tasks.

Conclusion

Integrated objective structured clinical examination (i-OSCE) is a reliable and accurate assessment tool for examining trainees' aesthetic physicians' professional competence. This tool objectively evaluates trainee physicians' critical thinking and clinical skills, including clinical reasoning. Program directors should consider the deployment of i-OSCE along with OSPE as an assessment tool in the postgraduate curriculum for non-surgical aesthetics.

Disclosures:

The author declares no potential conflicts of interest concerning this manuscript's research, authorship, or publication.

Funding:

The author received no financial support for this manuscript's research, authorship, or publication.

Acknowledgements:

The research for this article was done as part of a PhD thesis at the University College London, United Kingdom. The authors would also like to thank all experts for participating in the study.

Ethical Approval:

The Faculty Research Ethics Panel of the Faculty of Medical Science, Anglia Ruskin University, Chelmsford, United Kingdom approved this study.

ORCID ID:

1. Dr Narendra Kumar
ORCID ID: https://orcid.org/0000-0003-4911-9726
2. Dr Ali Davod Parsa
ORCID iD: https://orcid.org/0000-0001-7390-4308

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