12 Tips for Introducing Simulation Based Assessment in the Objective Structured Clinical Examination

Short Title: 12 Tips for Simulation the OSCE

Craig Brown[a], Jeremy Morse[a], David Nesvadba[a], Ashley Meldrum[a]

[a]Institute of Medical and Dental Education, University of Aberdeen, United Kingdom

Correspondence Details:

Dr David Nesvadba Department of Anaesthesia, Aberdeen Royal Infirmary, Foresterhill, Aberdeen, AB25 2NZ, United Kingdom. e: david.nesvadba@abdn.ac.uk t: +44(0)1224 553144

Abstract

The use of simulation as a tool for assessment in medical examinations is expanding. We describe 12 practical tips for the implementation of simulation based critical evaluation for the Objective Structured Clinical Examination (OSCE). The material in this article is a combination of personal experience and the available literature. 3 themes are discussed encompassing simulation theory for the OSCE, practical features of simulation for the clinical examination and contingency planning. As clinical assessment evolves, the utility for simulation-based practice will advance alongside. An improved understanding of the processes for incorporating simulation into the OSCE will be of benefit to both the medical educator and the student.

Keywords: objective structured clinical examination, simulation, medical examinations

Introduction

Simulation based education (SBE) has become ubiquitous throughout healthcare professional education programmes (Turner & Dankoski 2008; Khan, Ramachandran, et al. 2013; Daniels & Pugh 2018). Whilst the use of simulation in the delivery of educational outcomes has been clearly described, there is little regarding its utility in the assessment of outcomes in the context of the Objective Structured Clinical Examination (OSCE). In this article we reflect on our experience from the last five-years of incorporating simulation-based, full body mannequin stations into our final year high-stakes undergraduate OSCE. These 12 tips are defined in 3 sections concerning the theory for using simulation in the OSCE, the practical aspects of a simulation based OSCE station and contingency planning.

Tip 1

Use medium/high fidelity simulation in the OSCE

The benefits of using SBE as a technique has been well described (Bradley 2006; Okuda et al. 2009; McGaghie et al. 2010). In the context of the OSCE, using mannequins instead of human actors in carefully selected stations has several distinct advantages (Akaike et al. 2012). Most modern mannequins can be easily programmed to represent clinical signs which are challenging or impossible to reproduce in human volunteers but require to be assessed according to the curriculum (for example wheeze, tachycardias, airway obstruction). Indeed, even a simple respiratory examination on a volunteer or actor repeated over OSCE circuits is tiring and often uncomfortable (Gormley 2011). Using mannequins enables human patients/volunteers to be better utilised in other stations and which require direct human-student interaction for assessment (such as breaking bad news communication skills). A mannequin based assessment allows for the evaluation of rare or high-acuity presentations in the OSCE situation such as recognition of the deteriorating patient (Boulet & Murray 2010) while procedural skills which would be unacceptable to perform on humans can also be demonstrated using mannequins (Khan, Gaunt, et al. 2013). Common examples could include airway management and defibrillation which is clearly impossible to be perform on human volunteers. In our experience, a range of curricular outcomes which are challenging to assess can and have been incorporated into the high stakes OSCE examination (Brown & Morse 2018)

Tip 2

Standardise the OSCE stations for simulation

A requirement of OSCE stations is that, as far as is able, there is standardisation of the station across all sites and runs (Battles 2004; de Vet et al. 2006) and ensuring all candidates are exposed to identical stations compared with their peers. Standardisation in this context refers to reducing the number of variables which can impact on the assessment of performance (Khan, Ramachandran, et al. 2013). This is particularly important when using the borderline regression method for pass mark calculation, so that a direct comparison can reliably be made between students. Simulation based assessment may allow a standardisation of the stations greater than can be achieved when using patients. A specific example of this would be cardiac auscultation, where the correct grade of murmur for the question can be selected on the mannequin and can be replicated across all the sites. This standardisation contributes to examination fairness, face validity and equity for students as peer-to-peer comparison is

consistent. Indeed, it has been demonstrated that poorly standardised real patients who vary their performance between candidates can influence the reliability of the examination (Smee 2003; Khan, Ramachandran, et al. 2013).

Tip 3

Exploit the benefits of simulation when question writing

Careful question design and exploiting the benefits of simulation is a key component to ensure success in the OSCE. Using a socio-material framework, such as the actor network theory, will help the design and running of the station (Fenwick & Edwards 2010). Actor network theory acknowledges the relationship between material objects and their surrounding environment (Stark et al. 2001; Muniesa 2015). In simulation-based assessment all components of the station both animate and inanimate, including the mannequin, surrounding environment and equipment available can all be assumed to exert an action. This theory can be exploited to the assessors' advantage when designing an OSCE station. An understanding of how candidates may behave when confronted with a mannequin-based scenario in an OSCE setting can help assessment design. An example of this might be to make it obvious that the pulse oximeter tone is decreasing in pitch, giving an audible marker of falling haemoglobin saturation thus focussing the immediate attention of the candidate.

Tip 4

Get staffing right

We have found that in order to run successful simulation based OSCE stations specific roles for staff are allocated and understood. The station examiner should remain purely as an observer. They should not be involved in operating equipment or acting in any other role within the simulation. This ensures that the cognitive bandwidth of the examiner can be purely focussed on completing the marking scheme for the candidate being assessed. The second role within the station is often a "confederate" or member of staff who is interacting with the candidate during the simulation (e.g. a nurse aiding the student with the initial examination of

an unwell patient). This individual is well-placed to operate the technical aspects of the simulation when required (e.g. adjusting physiological variables at determined time points during the scenario). This role allocation allows the confederate to be scenario focussed rather than being distracted by the marking scheme. This professional to professional (candidate to confederate) interaction is one aspect of the curriculum that can be assessed in a simulation-based station as part of the structured marking scheme (Zayyan 2011).

Tip 5

Consider the physical space

The appropriate physical space for a highly interactive mannequin-based station should be carefully considered (Khan, Gaunt, et al. 2013). These stations typically can involve students, with confederates and an examiner (see tip 4) surrounding a mannequin with associated equipment laid out for the progression of the station. Examples may include patient monitoring, defibrillators and other resuscitation equipment. Elements of the station may lead to significant noise compared with a more traditional OSCE stations (such as monitoring alarms sounding). The sounds generated may be distracting for candidates in other nearby stations. If the assessment centre allows, we recommend using a dedicated room for every mannequin-based station on each site. Many clinical skills institutions have smaller rooms in addition to larger ward-based areas which are used for OSCE assessments. These smaller rooms are ideal for simulation-based activities. The geographical layout on each site may make candidate movement through the OSCE more challenging, but with careful thought and consideration a station in a separate area from the main body of the OSCE can often be accommodated.

Tip 6

Consider the limitations of a mannequin

An awareness of how the mannequin is controlled and its specific capabilities will influence the way the station is constructed and how the candidate interacts with the simulation (Gormley 2011). If a scenario is greatly enhanced by the emergence of certain physical signs (e.g. a rash)

be clear how this can be activated. It is possible to increase the fidelity of a simulation beyond the capabilities of the mannequin in certain ways. One can add props such as attaching printed rashes, adding spectacles or lightly spraying glycerine and water solution onto the face/trunk to give the impression of diaphoresis. We have found that adding measures to enhance realism contributes to the immersive experience and can help candidates progress though a scenario (Brown & Morse 2018).

Tip 7

On the clock- use simulation and time wisely

We suggest that the assessment metrics are not too ambitious and can easily be achieved in the time allocated. Systematic "A-to-E" assessment lends itself to simulation-based settings, but students will be variable in the length of time it takes to complete a thorough evaluation. A longer time to accomplish an assessment does not necessarily correlate with lower scores (as compared with a faster, less comprehensive assessment). In our experience, a comprehensive acute assessment can be achieved in around 5 minutes. Depending on the time available during the station, it may be possible to challenge candidate knowledge further, but further questioning should be specific enough that a candidate does not feel time pressured. Furthermore, simulation practitioners are used to manipulating time within scenarios and this skill can be utilised further within the OSCE environment to move candidates through a station towards the items being assessed.

Tip 8

Practice the station

Testing a simulation scenario will give a useful insight into both technical and non-technical issues and give an opportunity to modify a simulation-based question (Colman et al. 2019). A step-by-step walk through can yield valuable information regarding physical station layout, positioning of equipment and examiner. Real-time testing is also useful and gives the confederate important experience of mannequin operation and opportunity to troubleshoot.

Video recording and playback of these test-runs can also be helpful and allows more detailed analysis from the examination team. In addition, video evaluation can offer a degree of consistency for station stakeholders who may be operating at multiple OSCE sites. Pre-exam briefing of examiners and confederates using walk-through video of the test runs helps standardise performance during the assessment.

We provide pre-exam mannequin-based simulation exposure to students at multiple points throughout their undergraduate training in the form of small group simulation sessions and mannequin based immediate life support courses. The familiarity with equipment and acute scenarios is beneficial for both the student and the educator. We try and emphasise the time critical element to senior students during these sessions in order to prepare for assessment and real-world practice.

Tip 9

What if things go wrong?

With increasing OSCE station complexity the chance of equipment failure rises (Khan, Ramachandran, et al. 2013). Technical failure or malfunction of a mannequin is a real possibility and contingency plans should be available. This may include a secondary back-up mannequin that can be substituted rapidly if required. A good working knowledge of mannequin control will help on-the-fly troubleshooting. The aim is to maintain fidelity for the candidate in order to limit any disadvantage. Some students will find it challenging to engage in a simulation scenario within the context of the OSCE. Clear pre-station instructions will support the scene and allows the candidate to interact with the mannequin in a real-world, real-time fashion. This will enhance the experience and help to limit station breakdown. We suggest that mannequin responses are as natural as possible. The physiology should change in an appropriate way and if results are requested by the candidate (e.g. blood pressure measurement), the response given by the examination team should be relayed in a time-appropriate manner.

Tip 10

Utilise technical support before and during an OSCE

Electronic equipment requires upkeep. A qualified team of technicians who can perform factory standard maintenance and ensure that machinery is working appropriately is essential. We suggest that a mannequin is checked thoroughly prior to an OSCE in order to limit malfunction. Performing anything other than simple repairs during an OSCE run will have a significant impact on candidate flow. Nevertheless, a technician should be available so issues can be identified and potentially remedied. In the event of total technical failure, it is prudent to have non-technical props that can be substituted so a candidate is not disadvantaged. An example of this might be having critical ECG rhythms available in hard copy in place of an electronic monitor that has malfunctioned. The examiner and confederate should have the confidence and authority to improvise if required.

Tip 11

Analyse the station post-exam

We recommend a comprehensive post hoc analysis of station metrics and scores. Candidate performance should be analysed in the usual way to generate the pass mark (Kaufman et al. 2000). In our institution this is done by regressing the candidate score onto the global score for each station. In addition to the statistical analysis, careful consideration should be given to feedback from the examiner and confederate who can give valuable anecdotal information for potential improvements (Reinders et al. 2011). Finally, we have found that asking candidates for specific feedback, particularly when an issue has been encountered, can provide a useful insight for future improvement.

Tip 12

Embrace the future

The landscape of medical training is ever changing. Political pressure is influencing the volume of candidate entry into medical programmes. Courses are emerging for physician associates and advanced nurse practitioners who all undergo the OSCE. We predict the increased utility for simulation-based examination due to the financial and labour-intensive nature of conducting this type of examination. In addition, the Medical Licensing Assessment (MLA) recently published by the GMC has standardised the core requirements for new medical practitioners. The clinical and professional skills assessment (CPSA) element of the MLA is used synonymously with the OSCE. Specific attention is given to the management of resuscitation within the content map, a competency only practicably assessed using simulation. We advocate the incorporation of interprofessional education (IPE) into our undergraduate medical curriculum in order to promote a patient-centred approach. We would like to build on previous studies which show that team performance is enhanced when a multi-disciplinary approach is used in simulation scenarios (Morse et al. 2019)

Conclusions

The OSCE forms a key component for assessment in medical education. We believe that the incorporation of simulation scenarios into our final year OSCE allows students to be assessed on a wide variety of skills essential for the junior doctor. We hope that through the provision of these 12 tips for introducing simulation-based assessment in to OSCE examinations both students and programmes will benefit from the wider range of skills and procedures that can be examined. From our experience these simulation-based stations have provided students with realistic situations that they will face as they begin their medical careers. As with any educational experience, be it teaching or assessment, the key is in the preparation. Through the three stages highlighted in this paper, it is hoped that others will be able to develop assessment stations which can be practically delivered to enhance student experience through the assessment process. We wish to nurture not only technical skills but also key decision-making abilities and cogent critical thought.

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Notes on Contributors

Craig Brown MBChB, BScMedSci (Hons), PGDipMedEd, FHEA is a Consultant in Emergency Medicine at Aberdeen Royal Infirmary and Deputy Lead of the Year 5 MBChB programme at the University of Aberdeen.

David Nesvadba BSc (Hons), MBChB, FRCA is a Consultant Anaesthetist at Aberdeen Royal Infirmary and previous Fellow in Medical Education at the University of Aberdeen

Jerry Morse ProfD, MAcadME, LLM is Lead for Simulation at the Institute of Education for Medical and Dental Sciences and Manager of the Clinical Skills Centre, University of Aberdeen

Ashley Meldrum RGN, BA, MSc (Clin Ed) is a Clinical Facilitator at the University of Aberdeen with teaching and organisational responsibility for students undergoing the MBChB and Physician Associate programmes

Declarations/Conflicts:

None