The Objective Structured Clinical Examination (OSCE) as a Determinant of Veterinary Clinical Skills

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ABSTRACT

The Objective Structured Clinical Examination (OSCE) has become an excellent tool to evaluate many elements of a student's clinical skills, especially including communication with the patient (human medicine) or client (veterinary medicine); eliciting clinical information from these conversations; some aspects of the physical examination; and many areas of clinical evaluation and assessment. One key factor is that the examination can be structured to compare different students' abilities.

INTRODUCTION

The Objective Structured Clinical Examination (OSCE) has been used in medicine for 30 years. Since its introduction at Dundee Medical School, in Scotland, its use has spread throughout the world. A recent unpublished literature search carried out in Dundee identified more than 700 published articles on the OSCE. The utility of the OSCE in medicine is undoubted—but does it have potential for veterinary medicine?

The concept of OSCEs for veterinary education is not new. It has been over a decade since the OSCE was recommended as an alternative to traditional examinations in veterinary education, which typically only stimulate factual recall.[1] Nevertheless, only recently has the OSCE been used in some UK veterinary schools.

This article describes the OSCE and highlights its relevance to veterinary education.

THE OSCE: A DESCRIPTION

The exam consists of a number of stations, usually 14 to 18,[2] that candidates rotate through. At each station the candidate is asked to carry out a specific task within an allotted period. The exam is finished when all candidates have completed all stations. Figure 1 shows the general format of a 15-station OSCE. OSCEs with a larger or smaller number of stations have a similar format.

The OSCE may need to be run on several sites at the same time, or repeated, to accommodate the total number of candidates. It is advisable to restrict the number of runs to two for test-security reasons. The candidates for the second run should be sequestered before the end of the first run; they can be briefed while the first run is in progress. This will prevent contamination of the second-run candidates with exam information from first-run candidates.

All candidates go through the same stations. The OSCE stations are selected to reflect the curriculum content and course outcomes and are planned using an assessment blueprint.[3] The purpose of the blueprint is to ensure that all outcomes are assessed and that the curriculum content is appropriately sampled. An example of an exam blueprint for the final-year small-animal clinical studies course at the University of Glasgow, Scotland, is shown in Table 1. Ideally there should be at least one checkmark in each column and each row.

Each station is built around a specific task that the candidate must accomplish within a standard period.[4] Most stations last between five and 10 minutes, but stations of up to 20 minutes are not uncommon.

If a particular task cannot be accomplished in the standard station time, linked or double stations may be employed. Linked stations are sequential stations at the first of which the candidate carries out a task or prepares for the second station, where he or she builds on the findings of the first station or answers questions related to it. Double stations require doubling of resources, including examiners, and take twice the standard station time. A staggered start is

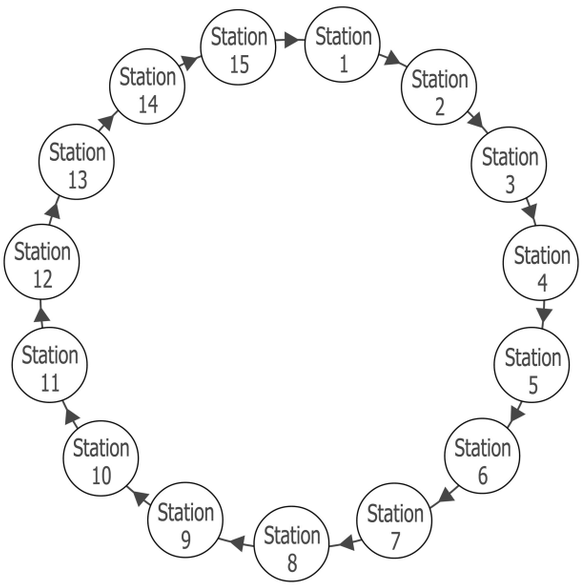

Figure 1: The format of a 15-station OSCE

Table 1: An assessment blueprint for an OSCE in veterinary medicine

Competence	Internal medicine	Cardiopulmonary	Neurology	Soft Tissue	Ophthalmology	Orthopedics	Dermatology	Diagnostic Imaging	Oncology	Anesthesia, Intensive Care, Fluid Therapy	Dentistry	Behavioral Problems	Caged Pets & Exotics	Vaccination, Parasite Control, Zoonoses	Legislation, Prescription Writing, Ethics	Other
Communication skills (history taking; client education; explanation of a condition, treatment, or investigation)	✓			✓	✓				✓							
Clinical exam, technique, or interpretation (on a live animal or cadaver, from photos or video)						✓	✓						✓			✓
Practical skill (theater and surgical skills, urine exam, microscopy, fine needle aspirate, lab techniques)	✓			✓				✓	✓	✓					✓	
Data and image interpretation (biochemistry, hematology, urinalysis, ECG, radiographs, ultrasound)	✓	✓				✓		✓								
Other													✓			

required for both linked and double stations, as candidates cannot start halfway through the task.

Candidates may be observed by one or more examiners while carrying out the task at the station; this is a *manned station*. Each examiner is equipped with a checklist or a rating scale. The checklist is constructed of items that the candidate should carry out at the station. The checklist should not be overly long, as it becomes unwieldy to complete; it is important to remember that only the key or core items, as identified by the subject experts, should be included in the checklist. Global rating scales may also be used, as well as or instead of checklists, and have been shown to be more reliable than checklists.[5] Rating scales give predetermined descriptors for each point on the scale, which provide an accurate description of candidate behavior for a given rating.[5] The use of checklists and rating scales for each station is the reason for the *objective* descriptor in the name ''OSCE.''

There may, however, be stations where the candidate is unobserved (*unmanned stations*); here a paper-based answer is required, or the candidate provides responses at the next station (linked station). The candidates may be given answer books for unmanned stations, which they carry with them round the exam and submit for marking at the end. Alternatively, they can complete an answer sheet at each unmanned station and put it into a ''post box'' at the station, usually a cardboard box with a posting slit that allows input of answer sheets but not their removal.

The sampling of curriculum content and outcomes as demonstrated by the blueprint, the use of checklists and rating scales, and all candidates' seeing the same patients contribute to the *objective* nature of the exam; because a wide range of clinical skills can be assessed within the OSCE framework, the OSCE is a *clinical* exam.

The OSCE is unique among examination formats because it provides a framework to assess the hands-on skills of the candidate in a simulated setting. Hence, it assesses the candidate at the level of *competence*, as opposed to assessing skills in real-life settings, which is assessing at the level of *performance*.[6,7]

The following description of the OSCE considers the six questions that must be addressed by any assessment: why; what; when; where; by whom; and how.[8]

Why?

Traditionally, clinical skills in medicine were assessed using long and short cases.

In the *long case*, the candidate spends a fixed period of time with a real patient, as opposed to a simulated patient, to take a comprehensive clinical history and carry out a physical examination. The examiners later assess the candidate using oral questions based on the patient that the candidate examined. Different candidates see different patients, and different examiners assess different candidates. As a result, the questions put to candidates vary. Some candidates may be presented with an ''easy'' patient, while others will be more ''difficult''; that is, the level of difficulty of the assessment varies. Appropriate sampling of the curriculum is not possible with one long case, which contributes to the lack of reliability and lack of content validity of the results of this type of test.

In the *short case*, one or two examiners directly observe the candidate carrying out a particular task (e.g., eliciting a physical sign or examining an organ system). All candidates, however, are assessed neither with the same patients nor by the same examiners. Though sampling of the curriculum content can be improved by using multiple short cases, the variability of cases seen by the candidates adversely affects test reliability.

In 1969 the fairness of long- and short-case exams for individual candidates was queried.[9] In a landmark article, Wilson and colleagues showed that an individual candidate carrying out the same task was scored differently by different examiners. The range of scores assigned to the same candidate by different examiners viewing the same actions (i.e., poor inter-rater reliability) rendered the assessment unreliable.

The OSCE was introduced to overcome the above problems pertaining to exam content variability, subjectivity, and fairness of the long and the short case.[10] These issues were addressed by structuring OSCE stations to ensure that all candidates go through the same test material, or test material of a similar level of difficulty, and are scored using the same criteria (e.g., pre-validated checklists or rating scales) by the same, or similar, examiners.

It has recently been recognized that some traditional examinations in veterinary medicine lack the reliability and objectivity of the OSCE, and, therefore, some schools in the UK have implemented the OSCE as a fairer form of assessment.

What?

What can be tested in the OSCE is limited only by the imagination of the test designers. Stations can be developed to test course outcomes such as clinical skills (e.g., chest examination); practical procedures (e.g., urine testing); patient investigations (e.g., interpretation of a chest radiograph); patient management (e.g., completing a prescription sheet); communication skills (e.g., breaking bad news); IT (information technology) skills (e.g., accessing a database); and providing patient education (e.g., lifestyle advice).

Knowledge is invariably assessed by the OSCE.[11,12] Though marks are not usually given for answering knowledge-based questions, without the underlying knowledge and understanding the candidate cannot carry out the instructions at each station. Critical thinking and clinical judgment are the other cognitive skills that can be assessed in an OSCE.

The OSCE can also be used to assess attitudes[13] and professionalism, but both of these can be more conveniently assessed using the portfolio framework.[14]

The OSCE has been described in a range of medical specialties: family medicine,[15] general practice,[16] surgery,[17] pediatrics,[18] internal medicine,[19] obstetrics and gynecology,[20] emergency medicine,[21] psychiatry,[22] oncology,[23] and anesthesiology.[24] As basic training in medicine becomes increasingly integrated,[25,26] so does its assessment, and the OSCE framework supports integrated assessment.

In the UK, given the similarities[27] between the General Medical Council's ''principles of professional practice''[28] and the Royal College of Veterinary Surgeons' ''10 guiding principles,'' it seems that the OSCE has as much relevance to

the assessment of professional skills in veterinary education as it does in medical education.

Shown below are examples of OSCE stations for veterinary students at the University of Glasgow, first introduced in the 2003/2004 academic session. Each example has four parts: instructions to the candidate; instructions to the examiner; checklist; and marking scheme. The second example also includes an equipment list, an essential component when equipment is required at a station.

The first example (Figure 2) assesses communication skills related to a clinical scenario. The second example (Figure 3) assesses candidate competence in a practical procedure.

When?

The OSCE can be used as a pre-test, in-course test, or post-test.

The pre-test assesses baseline student competence before the course begins and can provide a student profile. Courses can then be customized to meet individual student needs. Comparing the results of the pre-test with those of subsequent tests provides information about the course, the student, and the teaching.

The OSCE has been a useful in-course assessment, from the standpoint of both formative assessment (i.e., providing feedback to the student) and course evaluation (i.e., providing feedback to the instructor). OSCE checklists can be used by students for peer and self-assessment (i.e., formative assessment). Involving students in developing OSCE checklists may be one way of helping them learn and encouraging them to engage in self-and peer assessment. A mid-course OSCE will also provide feedback to instructors as to how successful their teaching has been and what areas that they should concentrate on in future.

The OSCE has been used mostly as a post-test in medical education. Over the years its objective and structured nature has ensured its appropriateness for summative assessment purposes (i.e., where passing or failing the exam has consequences for the candidate).

Within the continuum of medical education, the OSCE has been used in undergraduate,[29] post-graduate,[30] and continuing[31] medical education.

In health professional education, a variety of professions such as medicine, dentistry,[32,33] veterinary medicine, nursing,[34] midwifery,[35] para-medical services,[36] medical laboratory technology, pharmacy,[37] and radiography have used the OSCE framework for their assessment purposes.

Relevant articles in this issue demonstrate the use of the OSCE mainly as a post-test, with in-course (mock) tests used to prepare students at various undergraduate levels in veterinary medicine for their end-of-year examination.

Where?

Initially, OSCEs were held in hospital wards. However, experiences such as patient cardiac arrests during the exam have moved the OSCE away from the wards to Clinical Skills Centres, empty outpatient departments (OPDs), or specially designed test centers. What all these venues have in common is that they can accommodate several stations, such that candidates can rotate around the different stations in sequence without overhearing the candidates at adjacent stations. If the stations are set up within small cubicles, they can simulate the real-life environment of a clinic or OPD and ensure privacy for intimate procedures. Some test centers have simulated emergency rooms or patient home environments.

One UK veterinary school, the Royal Veterinary College in London, already has its own clinical skills facility for students to practice their skills, which doubles as an OSCE site.[28,38] Other UK veterinary schools are following this example.

By whom?

Test designers, on-site examiners, site organizer(s), timekeeper(s), secretarial staff for computerized collation of results (e.g., data entry, handling optical mark reader), and portering staff are all involved in the OSCE process.

Depending on the content tested at the station, OSCE examiners may be clinicians, pre-clinical instructors, standardized or simulated patients, or other health care professionals (e.g., nurses, paramedics, social workers). While clinicians are needed for OSCE stations assessing clinical skills, patients and other health professionals are often used for stations assessing outcomes such as communication skills, empathy, attitudes, and professionalism.

There are two important prerequisites for all examiners: they need to be trained in using the checklist or rating scale and familiar with the topic assessed at the station.

How?

Box 1 outlines the steps to be followed in designing an OSCE station. The guidelines for implementing an OSCE are shown in Box 2.

BOX 1: A GUIDE TO DEVELOPING AN OSCE STATION

Selecting a Topic for an OSCE Station

- Clearly define the ''clinical task'' (e.g., interpreting an x-ray) that is to be assessed by the station. Have a clear idea of its place in the assessment blueprint (i.e., what are the content area(s) and outcome(s) that the ''exam task'' is assessing?).
- Identify a clinical scenario that will provide sufficient information for the candidate to carry out the clinical task, within the stipulated time limit.
- Identify the different assessment tools (e.g., checklist, rating scale, global rating) that can be used to assess the candidate and choose the most suitable tool.

Developing an OSCE Station

- Document the layout of the station (if needed with clear diagrams).
- Construct the question(s) that the candidate will be asked.
- Develop instructions to the candidate to explain what the candidate is required to do at the station.
- Develop the checklist/rating scale and validate it, with the help of one or more colleagues.

Instructions to candidate

Read this before entering the consulting room.
Scenario: *You have been employed by the practice.*

1. The **Bennet's** 8 month old bitch, **Bess**, has just been spayed today.
2. Before the dog is walked from the kennels you are to give verbal discharge instructions.
3. These are also detailed in discharge sheet, which has also contact numbers.
   The discharge nurse will give the sheet to the owner.
4. The examiner will not engage you in conversation, but may ask a question or two.

Instructions to examiner

1. Indicate that this is name of skill station.
2. Read scenario and instructions to the student.

Checklist

Action/Response	Maximum	Actual
Introduce themselves to you by giving their **name**, checking that you are **Bennett**, and the dog is **Bess**		
States that Bess has a had a spay, which involves removing the ovaries and uterus through a laparotomy or midline midline incision		
She is able to walk, but should be lifted into and out of the car		
Tonight at home keep an eye on her, if she is difficult to rouse, reluctant to go out to toilet or vomits, or abdomen swollen then **contact immediately**		
Offer water tonight		
Start light diet this evening		
Short lead exercise for next 7 days		
Check the wound daily, it will normally look slightly swollen and red		
If the wound starts to discharge or sutures appear to be cutting into skin or dog paying excessive attention to wound then **contact**		
Bring dog back in 10 days for sutures to be removed		
Once stitches are removed avoid vigorous exercise for next 14-30 days		
TOTAL		

Checklist with marking scheme

Action/Response	Maximum	Actual
Introduce themselves to you by giving their **name**, checking that you are **Bennett**, and the dog is **Bess**	½	
States that Bess has a had a spay, which involves removing the ovaries and uterus through a laparotomy or midline midline incision	½ ½	
She is able to walk, but should be lifted into and out of the car	½	
Tonight at home keep an eye on her, if she is difficult to rouse, reluctant to go out to toilet or vomits, or abdomen swollen then **contact immediately**	½ ½ ½ ½ 1	
Offer water tonight	½	
Start light diet this evening	½	
Short lead exercise for next 7 days	½	
Check the wound daily, it will normally look slightly swollen and red	½	
If the wound starts to discharge or sutures appear to be cutting into skin or dog paying excessive attention to wound then **contact**	½ ½ ½ ½	
Bring dog back in 10 days for sutures to be removed	½	
Once stitches are removed avoid vigorous exercise for next 14-30 days	½	
TOTAL		

Figure 2: Example OSCE Station 1, from a fourth-year companion-animal studies examination

Instructions to candidate

1. Using this model an ovary has been exteriorized.
2. Choose an appropriate suture material
3. Use the 3 clamp technique to crush the tissue.
4. Using a two handed tie please complete one ligation of the ovarian artery.
5. Ask the assistant to remove the clamp when appropriate
6. Trim the ligature but do not cut the model.

Instructions to Assessor

1. Indicate that this is a practical skill station.
2. The ovary has been exteriorized.
3. Ask the candidate to choose an appropriate ligating material
4. Instruct them to use a 3 clamp method to crush the tissue.
5. Ask the candidate to complete one ligation of the ovarian artery using a two handed tie.
6. You will release a clamp on the candidates instruction
7. The candidate is to trim the ligature but not to cut the model.

Equipment needed

- Ovary model
- Variety of suture material
- Curved scalpel blade.
- Clamp

Checklist

Action/response	Maximum	Actual
2/0 (3M) vicryl or 0 (2M) vicryl		
Apply 2 clamps beneath ovary abutting each other		
Apply one clamp above ovary		
1st throw placed neatly but not tightened		
Candidate asks for clamp to be released		
Throw is slid into crush		
2 more throws, the third may have 2 turns if the first had 1 turn		
Ends trimmed to approx 0.5cm (i.e. not too long to have much FB and not too short to allow for slippage)		
Two handed throw done in a fluid motion without hesitation indicating dexterity and practice		
Marks (10 maximum)	10	

Checklist with marking scheme

Action/response	Maximum	Actual
2/0 (3M) vicryl or 0 (2M) vicryl	1	
Apply 2 clamps beneath ovary abutting each other	1 ½	
Apply one clamp above ovary	½	
1st throw placed neatly but not tightened	1	
Candidate asks for clamp to be released	1	
Throw is slid into crush	1	
2 more throws, the third may have 2 turns if the first had 1 turn	1	
Ends trimmed to approx 0.5cm (i.e. not too long to have much FB and not too short to allow for slippage)	1	
Two handed throw done in a fluid motion without hesitation indicating dexterity and practice	2	
Marks (10 maximum)	10	

Figure 3: Example OSCE Station 2, from a final-year small-animal clinical-studies examination

- Develop a script for the patient/standardized patient/actor (if necessary).
- Develop instructions to the patient/standardized patient/actor.
- Construct a marking scheme for the checklist, with itemized marks for each step.
- Design a marking sheet, paying attention to ease of use.
- Develop instructions to the examiner(s).
- List the equipment needed for the station (e.g., mannequin, IV drip set, ophthalmoscope).
- Test-run (pilot) the station.

Before the Exam

These are mainly responsibilities of the central examination unit, in consultation with the examiners.

- Agree the question weightings and pass mark with the exam board (i.e., set standards).
- Develop instructions to the supervisors, invigilators, or exam implementers to
  - sequence the station (i.e., the station number; e.g., it may be convenient to place a hand-washing and rest station after a station involving intimate examination; and if two stations are linked, one station should immediately follow the other numerically).
  - configure the equipment/furniture.
  - identify how the arrows to and from the exam station should be positioned. It is important that the stations form a circuit, with no crossover points.
  - identify linked and double stations that require a staggered start.
  - decide when to distribute answer books, candidate instructions, and examiner checklists/ratings scales and when to transport patients to the exam venue.
  - decide how and when the marking sheets will be collected. It is sometimes useful to collect checklists from examiners during the exam to facilitate data entry.
- Draw up a map of the examination venue, indicating the position of the exam station, with arrows indicating the direction in which candidates should proceed.
- Draw up a timetable for the whole exam.

BOX 2: A GUIDE TO ORGANIZING AND IMPLEMENTING THE OSCE

Before the OSCE

- Start early.
- Design a blueprint.
- Identify topics.
- Identify the number of candidates to be assessed and the number of venues and runs; allocate candidates to venues/runs.
- Fix time and date.
- Book venues.
- Route the exam.
- Notify the candidates: when and where to turn up; nature of the exam.
- Appoint examiners and brief them (remember to appoint stand-by examiners).
- Brief support staff.
- Appoint venue coordinators/site managers and brief them.
- Arrange resources for cases within stations and portering the resources (equipment, real or standardized patients, radiographs, etc.).
- Prepare documentation – note the format of the exam material within stations, draw up the exam site plan, copy and collate paperwork, label candidate details.
- Provide a complete set of exam material for site coordinators and brief them.
- Set up the stations well in advance of the exam.
- Remember to order refreshments for examiners, candidates, and patients.

On the Day of the OSCE (Tasks for the Site Coordinator)

- Arrive at least one hour before the exam is due to start.
- Check each station for completeness.
- Note candidate absentees.
- Brief candidates.
- If there is a second run, sequester the second-run candidates by taking them in for briefing before the end of the first run to prevent contamination.
- Start exam and timer.
- Oversee conduct of exam.
- Collect scoring sheets.
- Gather preliminary examiner feedback.
- Oversee dismantling of exam and safe return of patients.

ADVANTAGES AND DISADVANTAGES

The main advantages of the OSCE over other clinical exams are that it provides

- a framework to assess a representative sample of the curriculum, in terms of content and outcomes, within a reasonable period of time;
- the same assessment material to all candidates;

- an opportunity to score all candidates using the same assessment criteria (i.e., the same pre-validated and structured checklists and/or rating scales);
- an assessment that uses trained examiners.

These advantages make the OSCE high in validity and reliability.[39] Thus, it is suitable for high-stakes summative examinations.

The main disadvantage of the OSCE over the traditional long case is that the OSCE does not allow assessment of the candidate's holistic approach to a clinical case or patient.[7] The OSCE is thus criticized for fragmentation of skills. It is important that a learner's ability to carry out a full history and physical examination is assessed and that the trainee be given feedback. The Clinical Evaluation Exercise (CEX) or mini-CEX[40] provides an instrument for such assessment.

The other main disadvantage is the cost of organizing an OSCE. These costs mainly relate to the examiners' and test designers' time and that of the simulated patients (SPs), if paid SPs are used. If the rental of a test centre is necessary, these costs may also be substantial. Organizing the examination involves considerable effort. Studies on the OSCE have shown, however, that the logistics are achievable, even for national examinations.[41] Although the exam is costly, its cost effectiveness is high in terms of the information it provides.

SUMMARY

Van der Vleuten's formula[42] can be used to evaluate the utility of the OSCE. The formula suggests that the utility of an assessment is the function of its validity; reliability; acceptability; educational impact; cost effectiveness; and practicability.

If suitably designed to test candidate competence in a range of curriculum outcomes, the OSCE is a *valid* assessment. However, since it is conducted under simulated examination conditions, it does not provide valid information on the candidate's ability to *perform* the skill in real-life situations. The performance level of Dutch general practitioners, for example, has been shown to be lower than their competence level as assessed via OSCE.[43]

The *reliability* of an exam tends to be related to the length of testing time.[44] The structured examination format, with wide sampling, lasting approximately one-and-a-half to two-and-a-half hours, makes the OSCE more reliable than the long and short case formats.

Owing to its structured nature, which allows every candidate to be tested under the same conditions, the OSCE is highly *acceptable* to students, who appreciate its fairness.[45] It therefore has high face validity.

The OSCE requires the examiners to directly observe the candidate carrying out clinical skills. Thus, the examination highlights the importance of clinical skills to students. Since the exam material represents a wide sample of the curriculum and a vast range of skills can potentially be assessed, students cannot risk ignoring clinical skills. It thus has a positive *educational impact*.

The resources needed to conduct an OSCE are demanding. The high cost, however, is justified by the information it provides about the clinical competence of the candidate, making the exam *cost effective*.

Designing an OSCE station is a skilled activity, and organizing the examination involves considerable effort. The returns, however, have proved the OSCE to be a worthwhile exercise, as judged by the many institutions from Europe, North and South America, Asia, Australasia, and Africa reporting their OSCEs in the literature.

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