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Abstract

With its first administration of an Objective Structured Clinical Examination (OSCE) in 2018, the American Board of Anesthesiology (ABA) became the first U.S. medical specialty certifying board to incorporate this type of assessment into its high-stakes certification examination system. The fundamental rationale for the ABA's introduction of the OSCE is to include an assessment that allows candidates for board certification to demonstrate what they actually "do" in domains relevant to clinical practice. Inherent in this rationale is that the OSCE will capture competencies not well assessed in the current written and oral examinations – competencies that will allow the ABA to judge whether a candidate meets the standards expected for board certification more properly. This special article describes the ABA's journey from initial conceptualization through first administration of the OSCE, including the format of the OSCE, the process for scenario development, the standardized patient program that supports OSCE administration, examiner training, scoring, and future assessment of validity and impact of the OSCE. This information will be beneficial to both those involved in the initial certification process, such as residency graduate candidates and program directors, and others contemplating the use of high-stakes summative OSCE assessments.

Glossary of Terms

ABA: American Board of Anesthesiology

ABMS: American Board of Medical Specialties

ACGME: Accreditation Council for Graduate Medical Education

OSCE: Objective Structured Clinical Examination

SOE: Standardized Oral Examination

Introduction

The American Board of Anesthesiology (ABA; Raleigh, North Carolina) is one of 24 Member Boards of the American Board of Medical Specialties (ABMS; Chicago, Illinois). Fourteen of these Boards, including the ABA, require an oral examination as a component of their initial certification process, in addition to written examinations. The ABA oral examination includes structured case-based discussions between candidates and examiners. With continued evolution of examination format since its first administration in 1939,[1] this oral examination is now formally referred to as the Standardized Oral Examination (SOE).

In 2018, the Objective Structured Clinical Examination (OSCE) was added to the anesthesiology initial certification process. The OSCE and the SOE are collectively denoted as the APPLIED Examination, and successful completion of each is required for anesthesiology residency graduates to become Board Certified by the ABA. The ABA was the first U.S. medical specialty certifying board to incorporate this type of assessment into its high-stakes certification examination system (i.e., a system with examinations that have major consequences).

The purpose of this report is to describe the rationale, conceptualization, examination format, scenario development, standardized patient program, examiner training, scoring, and planned assessment of validity and impact of the OSCE component of the APPLIED Examination.

Rationale

Miller's pyramid, a framework for the assessment of clinical skills, defines four stages of competence: "knows", "knows how", "shows how", and "does" (Figure 1).[2] Ideally, certification assessments would evaluate the skills of candidates in their actual clinical practice ("does"). However, this is logistically challenging as part of a certification process for a specialty such as anesthesiology, which trains approximately 2000 physicians each year. Rather, learners acquire skills through a process that is amenable to staged assessments. Written examinations are designed to assess factual knowledge, the "knows" (knowledge). Oral examinations such as the SOE aim to assess more complex skills and abilities including clinical reasoning, judgment, and application of knowledge, which are elements of the "knows how" (competency). The ABA SOE has demonstrated both internal and external validity, including the evidence that it measures constructs different than those assessed by written examinations and that it has predictive validity for physician performance in practice.[3] What then was the rationale for the ABA to pursue an additional component of the OSCE for its initial certification examination?

First introduced to medical education in the late 1970s, the OSCE aims to assess "shows how" (performance): can the physician demonstrate what he or she would do in a clinical situation as simulated in an OSCE scenario? Indeed, a large portion of Miller's original paper was devoted to this assessment, both its perils and promise.[2] Over four decades of evidence have supported the use of the OSCE, including assessments of its validity

and reliability in various settings.[4,5] The OSCE has been adopted both as a formative process (i.e., as an assessment for learning) and as a summative assessment (i.e., as an assessment of learning) in medical schools and residency programs,[4,6-10] and thus is familiar to recent graduates of anesthesiology training programs. Although the ABA is the only ABMS Member Board that employs an OSCE component in the certification process, OSCEs are currently used in high-stakes licensing examinations such as the United States Medical Licensing Examination administered by the National Board of Medical Examiners[11] and high-stakes anesthesiology certification examinations in other countries, including the Primary Examination of the Diploma of Fellowship by the Royal College of Anaesthetists in the United Kingdom[12] and the Israeli National Board Examination in Anesthesiology.[13]

Anesthesiology residency graduates are eligible to take the APPLIED Examination (i.e., the SOE and the OSCE) after successfully completing the Accreditation Council for Graduate Medical Education (ACGME; Chicago, Illinois)-accredited residency training and passing two written examinations (the BASIC and ADVANCED examinations). The fundamental rationale for the ABA's introduction of the OSCE is to take advantage of the fidelity, standardization, and reproducibility that OSCEs provide to allow candidates for board certification in anesthesiology to "show how" they actually "do" in clinical practice for the domains tested. Inherent in this rationale is that the OSCE captures competencies important to the practice of anesthesiology that are not assessed well in the current written and oral examinations.

These competencies better assessed by the OSCE will allow the ABA to judge whether a candidate meets the standards expected for a Board-certified anesthesiologist more properly.

Conceptualization of the OSCE as a Component of Initial Certification

The idea of adding an OSCE component to the anesthesiology initial certification examination system was initiated in 2005. After discussions and deliberations, the ABA Board of Directors committed to incorporate the OSCE into the APPLIED Examination, along with the decision to build a dedicated assessment center.

To learn from those who had already included the OSCE in their assessment processes, ABA Directors and staff consulted with the Israeli Board of Anesthesiology, the Royal College of Anaesthetists in the United Kingdom, and the National Board of Medical Examiners, and conducted site visits to the latter two entities.

An initial OSCE Advisory Panel was convened, with members drawn largely from the anesthesiology simulation community. The Advisory Panel constructed an initial content outline composed of three domains: Communication & Professionalism, Monitoring & Data Interpretation, and Resuscitation & Management of Critical Illness. The advisory panel also created a scenario template to guide development. Three scenarios were developed and pilot tested at the ABA offices in the fall of 2014. These scenarios were ultimately deemed as being overly complex, somewhat duplicative of domains tested in the SOE, and impracticable to reliably

deliver and score with almost 2000 candidates seeking initial board certification in anesthesiology every year.

Based on this initial experience, the ABA defined a set of design parameters as follows:

- The OSCE should test domains relevant to clinical practice not readily assessed in the written or oral examinations.
- Each OSCE scenario should map to one or more of the six core competencies endorsed by the ACGME and the ABMS: Patient Care and Procedural Skills, Medical Knowledge, Practice-based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, and System-Based Practice.[14]
- Any equipment or simulators employed in the OSCE should be routinely available to all candidates at their training programs. Candidates should not require extensive specialized preparation to succeed and pass the examination, but rather demonstrate behaviors integral to the clinical practice of anesthesiology.
- Both components of the APPLIED Examination (the OSCE and the SOE) must be completed by a candidate in half a day (one morning or one afternoon). To accomplish this, the total OSCE duration is limited to approximately 90 minutes.
- Testing must accommodate approximately 2000 candidates annually across 9 weeks of examinations within no more than 14 examination rooms each session, the physical limit of the testing facility.

- For reasons of practicality, each OSCE station should require no more than ~~a single~~one standardized patient and/or no more than one examiner.

In 2015 the ABA appointed a newn OSCE ~~Development Task Force~~Committee to continue development within the above parameters. The original content outline was modified through extensive pilot testing of scenario concepts using standardized patients. This iterative process balanced the desire to test relevant behaviors, the need to be able to assess candidate performance fairly, and the feasibility of testing a large volume of candidates within a reasonable timeframe. The ~~Task Force~~ Committee also addressed issues regarding examination scoring, examiner training, and timely communications to candidates and residency program directors to allow them to prepare for the first OSCE administration.

To allow for systematic scenario development and thorough testing in the appropriate scope and depth of the OSCE, the ABA postponed the original implementation time of March 2017 to March 2018. In the summer of 2016, the ABA initiated an extensive communication plan directed towards both candidates and program directors to ensure they had ample information to prepare for this new assessment effectively. Communications included the content outline, sample scenario stems, video enactments using actors to highlight various scenario components, and other explanatory materials, which were all made available on the ABA website.[15] Prior to the implementation, a full-scale trial was conducted in November 2017, utilizing

recently board-certified anesthesiologists who volunteered as “candidates” to test the OSCE delivery and scoring systems.

Examination Format

The OSCE content outline includes a total of 9 skills in two content domains (Supplemental Material 1): Communication & Professionalism (Informed Consent, Treatment Options, Peri-procedural Complications, Ethical Issues, Communication with Other Professionals, and Practice-based Learning and Improvement) and Technical Skills (Interpretation of Monitors, Interpretation of Echocardiograms, and Application of Ultrasonography).

Each candidate participates in a 7-station circuit that assesses 7 of the 9 skills in the OSCE content outline. The examination blueprint determines the skill stations evaluated in a given examination week (Supplemental Material 2). Candidates have a maximum of 8 minutes to complete each station, with 4 minutes between stations for candidates to review the upcoming scenario on a sheet of paper, which allows for notes. In the Communication & Professionalism stations, candidates interact with a standardized patient actor, and their performance is video recorded for asynchronous evaluation by an examiner. In the Technical Skills stations, candidates interact directly with an examiner, and the examiner scores their performance contemporaneously. The Interpretation of Monitors and the Interpretation of Echocardiograms stations present video clips of relevant materials to candidates. The Application of Ultrasonography station requires candidates to manipulate an ultrasound probe on a standardized patient to

demonstrate normal anatomy relevant to vascular cannulation and peripheral nerve blocks.

The OSCE is administered at a dedicated assessment center in Raleigh, North Carolina, which includes two circuits of 7 OSCE stations concurrently (i.e., each station is duplicated to allow a maximum of 14 candidates to be evaluated in one examination session). Four groups of up to 14 candidates are examined each day – 2 groups in the morning and 2 groups in the afternoon – with approximately 2000 candidates examined annually over 9 four-day examination weeks.

Candidates take the APPLIED Exam during either a morning or afternoon period (Supplemental Material 3). During each examination period, half of the candidates take the SOE first followed by the OSCE; the other half take the OSCE first followed by the SOE. The duration of the OSCE and SOE sessions are equal, with intervening break and orientation times.

Scenario Development

The OSCE Committee is currently~~,~~ composed of approximately 36 ABA board-certified anesthesiologists including ABA Directors, examiners, and simulation experts, develops the scenarios. Two meetings of the full committee are held annually, with work also accomplished between meetings. The Committee is divided into 5 groups to cover the 9 skill areas. Members come to each full committee meeting with ideas for draft scenarios suitable to assess relevant skills, using content-specific templates prototyped with standardized patients via an iterative process. Each scenario is

comprised of 4 components: case stem, room setup guide, standard patient information, and scoring rubric. Refined versions of scenarios are edited by the Committee Chair and Vice-Chairs before being finalized, as well as copyedited by an ABA staff editor. Scenarios are assembled into examination forms for each week based on the blueprint, with scenarios drawn from the available bank. The Committee is also charged with the responsibility of ensuring that scenarios will remain clinically relevant as practice changes (e.g., by updating the OSCE content outline and scenarios to reflect any future advances in technical skills).

Standardized Patients

The ABA connected with several North Carolina local universities with existing standardized patient programs to build its own program. Approximately 30 standardized patients (who may portray either patients or clinicians), including some with over 20 years of experience, cover the 9 OSCE administration weeks. These standardized patients are trained to follow the script and to display the same level of emotionality/affect for each repetition of the scenario throughout the examination administration. In preparation for an examination week, the ABA Standardized Patient Coordinator typically provides scenarios and scripts to the standardized patients 1 to 2 weeks in advance to allow ample time for review and rehearsal. The scripts specify the physical characteristics, past medical history, expected emotionality of the patient/clinician, background information of the scenario, phrases for opening a conversation, acceptable

and unacceptable responses, and phrases to close a conversation. These standardized patients then participate in 2 training sessions the week before an examination. Initial training occurs on the Monday prior to the examination week, during which the standardized patients can engage in extensive role-play and seek clarification on any questions regarding the scenario or script. On the subsequent Friday, dress rehearsals take place in the specific examination rooms. The standardized patients dress as they will for the examination and participate in standardization exercises with their peers playing the same scenario in the other examination room suite. Partners work to match body language, tone, and level of affect. If any deviation in actor performance is observed during the examination week, the Standardized Patient Coordinator and/or Lead Standardized Patients provide feedback. Examiners are instructed to provide feedback on SP performance during their scoring sessions. Leaders of the OSCE Committee also observe SP performances during examination weeks and provide feedback, especially regarding how well performances mimic actual patient behavior. In addition, ~~Examiners are also instructed to provide feedback on SP performance during their scoring sessions.~~ S~~Evaluations of s~~tandardized patients are ~~done~~ evaluated via self-assessment and viewing examination video clips with peers within one week after the examination. Leaders of the OSCE Committee also observe SP performances during examination weeks and provide feedback, especially regarding how well performances mimic actual

patient behavior. Examiners are also instructed to provide feedback on SP performance during their scoring sessions.

Examiners

The ABA maintains a pool of approximately 400 volunteer examiners, who are ABA board-certified anesthesiologists participating in the Maintenance of Certification in Anesthesiology™ program. The same pool of examiners participates in both the SOE and OSCE administrations. Every two years the ABA requests nominations from across the country for new examiners. Once appointed, examiners typically commit to 1 week of examination administration each year. Examiners move through a graduated classification system, during which they progress from New Examiner (Years 1-2) to Associate Examiner (Years 3-6) to Full Examiner (Years 7 +).[1]

Examiners participate in an orientation session held on the Sunday afternoon before each examination week, where the purpose of the APPLIED Examination as a component of the initial certification is discussed and examiners are refreshed on the standard protocols for administering the examination and rating the candidates. Each examiner is assigned to score one of the 7 skill areas for the examination week. Separate training sessions, led by experienced examiners from the OSCE Committee, are conducted for each skill to train examiners on that week's scenarios.

Scoring

OSCEs may be scored by several methods, broadly categorized as checklist and global rating methods, each with its advantages and disadvantages.[4] With scenario-specific guidance being provided to examiners on a standard set of criteria to evaluate candidates for each specific scenario, the ABA decides to use an overall global rating of candidate performance on a given station for the OSCE, which is the same rating system as the SOE. The rationale for this decision include: 1) it is not practical to develop and validate a checklist for each individual OSCE scenario, and 2) this approach takes advantage of examiner familiarity and longstanding experience with the global rating method.

The global rating rubric has four levels: “consistently”, “often”, “occasionally”, and “rarely”. Examiners use this global rating rubric to rate how frequently the candidate demonstrated the qualities expected of an ABA Diplomate in each station. These global ratings from the 7 stations are used to determine the pass/fail examination result.

Like the SOE, the OSCE is scored using the many-facet Rasch model,[16] which estimates candidate ability, examiner severity, and station difficulty. Each of these three facets may influence the ratings that examiners give to candidates on each station. The Rasch model calibrates all three facets of candidate ability, examiner severity, and station difficulty onto the same scale. The unit of measurement of the Rasch model is a logit. Higher logit measures represent more able candidates, more severe examiners, and

more difficult stations. Further details of the Rasch model as implemented by the ABA are described elsewhere.[1]

For the Communication & Professionalism stations, examiners score recorded performances asynchronously, using a proprietary and secure system developed by the ABA. For the Technical Skills stations, examiners are in the examination rooms with the candidates and score their performance contemporaneously. Each station for each candidate is initially rated by a single examiner, and these initial ratings are tabulated (a total of 7 ratings from 7 examiners). For those candidates whose initial total ratings are in the lower range of the distribution, their performances on all Communication & Professionalism stations are rated by a second examiner independently, so that these individuals have a total of 12 ratings from 12 examiners. Examiners are unaware whether they are providing the first or the second rating of the candidate-station. The Technical Skills stations are not double scored for any candidate, as “correct” behaviors and answers are more clearly defined (e.g., candidates either recognize a specific diagnostic feature on an echocardiogram or monitor, or not), reducing the potential for inter-rater variability. Obtaining more than a single rating per station only for selected candidates improves the efficiency of the scoring process (by not requiring additional examiner ratings of higher-performing individuals in little danger of failing) while assuring that marginal performers have the benefit of additional ratings of their Communication & Professionalism skills.

The standard for passing the OSCE was set by the ABA Board of Directors based on the expectation that minimally competent candidates would, on average, “often” demonstrate the qualities expected of an ABA Diplomate. The many-facet Rasch model calculates the lowest logit measure that corresponds to the fair average of “often” based on the ABA’s four-point global rating scale, which accounts for the examiner severity and station difficulty. To reduce the chance of “false negatives” (i.e., candidates who should have passed), the standard is adjusted down by a fraction of the standard error of measurement determined by the ABA. This adjustment gives the candidate the “benefit of the doubt” due to measurement error. Independent pass/fail decisions are made for the SOE and the OSCE. Candidates who pass one component but fail the other are required to retake only the component they have failed. The physician is awarded ABA certification after passing both components.

Evaluation of Validity and Impact

The ABA is committed to rigorous and transparent evaluations of its systems and processes. A series of research analyses is being planned to address several questions regarding the validity and potential impact of the OSCE. In addition to standard analyses such as inter-rater reliability, ~~E~~examples of these questions include:

1. Is there evidence that the OSCE measures domains distinct from those assessed by other examinations in the initial certification process (especially the SOE)? If not, the rationale for the administration of the

OSCE would be weakened as it would be redundant with existing examinations.

2. Does the OSCE have predictive ability that adds to the other examinations used in the initial certification process? For example, evidence suggests that lower performance on initial certification examinations predicts subsequent adverse actions against the licenses of anesthesiologists[3] – does the OSCE add to this predictive ability?
3. What is the impact of the addition of the OSCE on residency training?[17] For example, have programs changed their curricula such as to further emphasize the importance of communication skills?

Summary

Although OSCEs are used for assessment as part of the licensing process for physicians in the United States,[11] the ABA's implementation of OSCE is the first use of this assessment method in the U.S. for physicians' initial board certification for a medical specialty. Candidates, program directors, and others contemplating the use of high-stakes summative OSCE assessments may benefit from this description of the development, administration and scoring of the ABA's OSCE. As experiences are gained through careful evaluations, the ABA is committed to further refining and improving the OSCE if indicated. Future reports will provide the results of planned analyses to determine whether the OSCE fulfills its promise to allow the ABA to better judge whether a candidate meets the standards for a diplomate anesthesiologist.

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Figure Legend

Figure 1. The American Board of Anesthesiology’s Initial Certification Examinations in the Framework of Miller’s Pyramid for Clinical Assessment