

Assessing Clinical Competence of Graduating Medical Students at the Warren Alpert Medical School of Brown University

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AN OBJECTIVE STRUCTURED CLINICAL Examination (OSCE) is a performance assessment that enables medical educators to evaluate the clinical skills and professionalism of future physicians. At the Warren Alpert Medical School of Brown University (AMS), there are multiple OSCEs in the first two years of the Doctoring course, in the Clinical Skills Clerkship and in three specialty-specific clerkships: Internal Medicine, Obstetrics and Gynecology and Pediatrics. In this paper, we focus on the fourth-year OSCE, a summative clinical examination which is administered at the start of our students' final year of medical school.

Harden and colleagues first described an OSCE in 1975 as students rotating "round a series of stations... At one station they are asked to carry out a procedure, such as take a history, undertake one aspect of physical examination, or interpret laboratory investigations... Students may be observed and scored at some stations by examiners using a check list."¹

OSCEs are now commonplace in undergraduate medical education. Approximately 80% of US allopathic medical schools currently require students to pass a summative fourth-year OSCE prior to graduating from medical school.² In addition to medical students, other types of health professional students, including pharmacy and nursing, are now evaluated using OSCEs.^{3,4}

An OSCE is best used to evaluate a learner's competence in clinical skills such as taking a patient history, performing a physical examination and professionalism.⁵ There is evidence that OSCEs also effectively evaluate a student's ability to use information technology in patient encounters, to understand patient interactions within a large health care system and to advocate for patients within the health care system.⁶

An OSCE can be used as a teaching tool, specifically to give students feedback on their patient care skills.^{7,8} OSCEs have also been shown to predict future real life

performance of students. In one study, over 90% of individuals who passed a medical school-based OSCE also passed subsequent licensing examinations.⁹ Fewer than 70% of those who did not pass the same school-based OSCE passed a subsequent licensing exam.

Perhaps most importantly, OSCEs can predict residency performance.¹⁰ A major driving force behind requiring the passing of the fourth-year OSCE as a graduation requirement is to ensure that AMS students are ready to enter residency with proficiency in data gathering including taking a history and performing a physical examination, patient counseling and clinical decision making. The secondary force behind the OSCE as a graduation requirement is that students need to pass a national board examination, USMLE Step 2 Clinical Skills (CS) as part of a three-step, four test sequence in order to become fully licensed in the United States.

To create a summative OSCE for a medical school, medical education experts such as clerkship directors usually write cases, often based in part on real life patient care experiences.¹¹ OSCEs typically use

standardized patients (actors hired to portray real patients) in place of actual patients. At AMS, over the years, several clerkship directors have contributed to writing cases. The Office of Medical Education staff train approximately 40 **standardized patients (SPs)** per year to participate in the fourth-year OSCE. This training encompasses both portraying a specific case and giving written feedback to students.

AMS students take the fourth-year OSCE in June immediately following the completion of third-year clerkships. Students are graded on their performance on individual stations. The overall OSCE is graded on a pass/fail basis. Students receive their grade and detailed written feedback within two weeks of taking the examination. Students who do not pass the fourth-year OSCE are required to remediate. Successful performance on the exam is a graduation requirement. Results of the fourth-year OSCE are reported in the Medical Student Performance Evaluation (or Dean's letter), the summative narrative every allopathic medical school in the US sends out as part of a medical student's application to residency programs.

Table 1: Sample Fourth-Year OSCE Blueprint.

OSCE Case	Specialty	Ability Assessed*
Pregnancy	Obstetrics and Gynecology	I, II, III, IV, VI, IX
Depression	Psychiatry	I, II, III, IV, VI, IX
Domestic Violence	Family Medicine	I, IV, VI, VII, VIII
Chronic Liver Disease	Surgery	I, II, III, IV, VI, IX
Joint Pain	Orthopedics	I, II, III, IV, VI, IX
Fever	Pediatrics	I, III, IV, VI, IX
Hypertension	Internal Medicine	I, II, III, IV, VI, IX
Vision Changes	Neurology	I, II, III, IV, VI, IX

*** The Nine Abilities**

- I. Effective Communication
- II. Basic Clinical Skills
- III. Using Basic Science in the Practice of Medicine
- IV. Diagnosis, Prevention and Treatment
- V. Lifelong Learning
- VI. Professionalism
- VII. Community Health Promotion and Advocacy
- VIII. Moral Reasoning and Clinical Ethics
- IX. Clinical Decision Making

Table 2: Student Performance on AMS's Fourth-Year OSCE in June, 2012 (n=100).

OSCE Component	Mean Score (Range)
History	83% (67%-93%)
Physical Examination	84% (61%-97%)
Counseling	87% (72%-100%)
Inter-station Exercises*	87% (64%-98%)
Overall Performance	85% (69%-96%)

*Examples of inter-station exercises: Write a progress note, develop a differential diagnosis, describe an appropriate therapeutic treatment regimen for a patient, interpret an EKG, interpret a chest x-ray, write a brief essay dealing with an ethical issue, or answer a clinical question in real time using available information technology.

In order to ensure that our graduates are both proficient in crucial skills necessary for residency and are optimally prepared to pass USMLE Step 2 CS, key personnel in the Office of Medical Education systematically studied student performance on the fourth-year OSCE at AMS, the national board examination, USMLE Step 2 CS, and our graduates' first year of residency training.

METHODS

We conducted our study at the Warren Alpert Medical School of Brown University in Providence, Rhode Island. We required all medical students who plan to graduate in 2013 to take the fourth-year OSCE. The four-hour exam has ten stations, each of which lasts 22 minutes and includes two parts:

- A direct patient encounter in which students are asked to take a history, perform a physical examination or counsel a patient. This portion of each station typically lasts 15 minutes.
- An inter-station exercise. This portion of each station typically lasts seven minutes.

The patients whom students encounter deliberately represent the breadth of clinical experiences addressed in third-year clerkships at AMS. Every fourth-year OSCE contains one case each from following specialty areas: Family Medicine, Internal Medicine, Neurology, Obstetrics and Gynecology, Orthopedics, Pediatrics, Psychiatry and Surgery. An example OSCE blueprint is shown in Table 1. This exam blueprint is determined by medical and education staff in AMS's Office of Medical Education prior to the exam.

The exam evaluation criteria are directly linked to AMS's Nine Abilities, or

competencies, in which all Brown students are assessed during their entire four year education. All of the Nine Abilities are assessed during the fourth-year OSCE (Table 1). For the first time in the school's history, using the new evaluation management software system in the AMS clinical suites,¹² we were able to mine student performance data from the fourth-year OSCE that was administered in June of 2012. We also compared passing data from the fourth-year OSCE during its administrations from 2009 through 2011 with passing data from USMLE Step 2 CS over this same time interval.

Finally, to triangulate our results further, for the AMS Class of 2010, we surveyed all residency program directors through a single conventional mailing at programs to which our graduates matched to assess the perception of our graduates' competencies in relation to the Nine Abilities after they finish their intern year. Residency directors are asked to evaluate each of our graduates' competencies. The survey data helped us to evaluate to what degree the prior assessment of our graduates' residency competency matched the perception of residency program directors.

RESULTS

In June 2012, 100 medical students completed the fourth-year OSCE at AMS over 13 examination sessions. The overall pass rate on the first attempt was 96%. The average score on the fourth-year OSCE was 85% with a standard deviation of 6%. Results for individual components of the fourth-year OSCE are given in Table 2. One student failed the entire OSCE and was required to remediate. Three students failed one or two individual stations on the

Table 3: Receiving Residency Program Directors' Assessment of AMS Class of 2010 (Class size = 94, Response rate = 66%).

Skill (Ability assessed on survey)	Unsatisfactory (%)	Below Average (%)	Average (%)	Above Average (%)	Superior (%)
Communication (Ability I)	0	3.1	17.1	40.8	39.0
Clinical Skills (Ability II)	0	1.8	24.1	55.0	19.1
Basic Science Knowledge (Ability III)	0	0	28.0	52.5	19.6
Diagnosis, Management and Prevention (Ability IV)	0	1.6	14.3	52.5	31.5
Lifelong Learning (Ability V)	0	3.1	12.2	36.7	47.9
Personal Growth (Ability VI)	0	4.5	13.7	35.4	46.3
Social and Community Health Skills (Ability VII)	0	1.7	18.0	37.7	42.7
Ethics and Professionalism (Ability VIII)	0	2.8	7.2	33.4	56.6
Problem Solving (Ability IX)	0	3.2	12.5	48.4	35.9
Fund of Knowledge	0	1.6	19.0	39.7	39.7

fourth-year OSCE and were required to remediate only the failed stations.

We then compared the percentages of students passing the fourth-year OSCE with the percentages of students passing the USMLE Step 2 CS examination. Over a three-year period from 2009 to 2011, the passing rate for the AMS students on the fourth-year OSCE has averaged 98% with a range of 96% to 98% while the passing rate for AMS students on USMLE Step 2 CS has averaged 96% with a range of 94% to 97%.

Finally, for the AMS Class of 2010, we examined residency program directors' perception of our fourth-year students' competence in their first year of internship. Sixty-six percent of programs directors responded to our survey (N=62). Nearly all of our students are rated as competent to outstanding residents by residency program directors (Table 3).

CONCLUSIONS

Based on our data, AMS students perform well on the summative fourth-year OSCE. These senior students also perform well on the individual components of the OSCE in regards to history taking, physical examination and communication skills. In addition, the passing rates on the fourth-year OSCE very closely parallel those of USMLE Step 2 CS. Triangulating these results with our residency program director survey indicates that our fourth-year OSCE is a valid method of assessment for our students.

The implications of our study for AMS are significant. First, as medical educators, it is our goal to train medical students in preparation for residency, where they often will be the first physician contact for patients in the medical system. Therefore, ensuring competency in crucial skills such as history taking, physical examination and counseling is vital and is a focus of both our preclinical and clinical curriculum. Additionally, students need to be able to write progress notes, develop differential diagnoses, and propose reasonable, cost effective therapeutic plans for patients. The results on our inter-station exercises indicate that the vast majority of senior students are able to do just that demonstrating the effectiveness of our curriculum.

We should not understate the importance of correlating fourth-year OSCE performance with that on USMLE Step 2

CS. The stakes of USMLE Step 2 CS are high. The cost of the examination is now over \$1,000, and it is only offered at five sites in the United States (the closest location to Providence is Philadelphia). It is not unusual for examination slots on USMLE Step 2 CS to be filled six months or more in advance. In addition to the obvious logistical and financial implications, failing the USMLE Step 2 CS has the potential to delay the start of residency. We believe the fourth-year OSCE is a predictor of success on USMLE Step 2 CS, allowing students to predict readiness for this licensing examination.

Our study has several limitations. It was conducted at only one medical school and parts of our data were for only one academic year, limiting our study's generalizability to other institutions. However, the new information management systems in the Clinical Skills Suite will allow us to determine the reliability of our examination going forward, providing further validity evidence for the AMS fourth-year OSCE and enhancing its generalizability. The exam itself lacked complete predictive validity as those students who failed the fourth-year OSCE were not necessarily the same as those who failed USMLE Step 2 CS. In addition, we could not do a thorough statistical analysis linking individual performances of students on the fourth-year OSCE and USMLE Step 2 CS because the National Board of Medical Examiners, the organization that develops and administers the USMLE examinations, reports only whether a student passed or failed USMLE Step 2 CS and does not give numerical data on performance.

In conclusion, our results demonstrate an association between AMS student performance on the fourth-year OSCE and on USMLE CS Step 2. In addition, our results indicate that AMS students are acquiring skills and competencies that make them well prepared for residency, as indicated by our fourth-year OSCE data, results on USMLE Step 2 CS and residency directors' assessments. In the future, we will continue to refine the currently effective summative exam to assess the preparedness of our graduating students for subsequent training and their future roles as licensed physicians.

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