Triple-Jump Assessment Model for Use of Evidence-Based Medicine

Monica Bhutiani*, William M. Sullivan, MD, MEd, Sandra Moutsios, MD, Elizabeth Ann Yakes, MD, Jennifer K. Green, MD, MPH, Kimberly Lomis, MD, William B. Cutrer, MD, MEd

*Corresponding author: Monica.Bhutiani@vanderbilt.edu

Abstract

Introduction: A vital element of health care practice is evidence-based medicine, the explicit and judicious use of current, best-available evidence in making decisions about the individualized care of patients. With the use of evidence-based medicine continually increasing in clinical practice, medical schools are charged with ensuring graduates are prepared to appropriately access, appraise, and utilize clinical evidence, highlighting the need for a corresponding assessment tool. However, assessing evidence-based practice remains a challenging endeavor for medical educators. Few assessment tools capture students’ ability to apply information resources in order to answer a targeted question during a medical encounter. Methods: We describe a triple-jump assessment design where students access evidence, appraise information at hand, and apply it to formulate a treatment plan during an observed structured clinical encounter (OSCE). Results: One hundred and five clerkship students participated in one of two OSCE scenarios. Data from this exercise underwent descriptive statistical analysis, including mean performance scores and confidence scores, and showed that accuracy and confidence in providing evidence-based care improved after the search and appraisal period. Discussion: The addition of a modified triple-jump assessment to the end of the OSCE experience not only creates a more authentic experience but also allows for assessment and development of student metacognitive skills within the domain of knowledge gap assessment. The ease of integrating this assessment into the structure of an already-developed OSCE allows for different types of assessment to be achieved without writing entirely new OSCE cases, but rather by modifying existing scenarios.

Keywords

OSCE, Objective Structured Clinical Examination, Evidence-Based Medicine, Triple-Jump Assessment, Didactic Exams

Educational Objectives

Through use of this assessment tool, medical educators will be able to:

1. Adapt an assessment model based on the observed structured clinical encounter (OSCE) for evaluating students’ ability to use evidence-based medicine at the point of care in two independent clinical cases.
2. Implement the OSCE-based assessment within a medical school, with successful implementation indicated by student completion of the entirety of the simulation and postsimulation exercises.
3. Identify knowledge gaps of students around the use of evidence-based medicine at the point of care.

Introduction

Evidence-based medicine (EBM), the explicit and judicious use of current, best-available evidence in making decisions about the individualized care of patients, is a vital element of health care practice.1 With the use of EBM continually increasing in clinical practice, medical schools are charged with ensuring that graduates are prepared to appropriately access, appraise, and utilize clinical evidence. Assessments such as the Fresno test have been proposed as comprehensive methods to test knowledge and skills in EBM;
however, these tests are cumbersome and decontextualized from patient care and cannot rapidly produce feedback on clinical skills.2

Educators have demonstrated that different facets of a medical student’s use of EBM can be reliably assessed during a single observed structured clinical encounter (OSCE) station3; however, this method of assessment has not been promulgated in the literature. There is a continued call for increased assessment of medical students’ use of EBM using the OSCE.4 To date, no published assessment tools have examined how well students can search for and apply EBM at the point of care.5 Furthermore, denying students access to such resources during most OSCE stations is somewhat artificial because in real care-delivery settings they would be expected and encouraged to seek further information.

This need is highlighted by the timely work of the Association of American Medical Colleges (AAMC) on core entrustable professional activities (EPAs) for entering residency. The AAMC delineates core EPAs as the tasks and activities “all entering residents should be expected to perform on day one of residency without direct supervision.”6 EPAs constitute units of work and provide an opportunity for faculty to make decisions about trainee competency.7 Of the 13 core EPAs expected of incoming interns, EPA 7 focuses on the ability of students to form clinical questions and retrieve evidence to advance patient care.

At our medical school, medical students participate in a low-stakes, formative OSCE assessment that encompasses a number of presenting problems dictated by the curriculum at the conclusion of their clerkship year.8 Each student evaluates six standardized patients (SPs) with various presenting patient problems and, following the encounter, answers diagnosis and management questions (although students rotated through six OSCE cases during this event, only the two cases possessing the novel triple-jump assessment component are described in this resource). While OSCEs function as an extremely useful assessment tool, allowing students to receive a rich amount of feedback about their performance during a clinical encounter, OSCE encounters often differ from real-life encounters in which students also have access to clinical resources. By giving students access to clinical resources, the reformed OSCE experience becomes more authentic, allowing faculty to better understand and evaluate student performance as it more closely replicates clinical work. Additionally, students often struggle to accurately assess their own knowledge gaps as they have not developed this metacognitive skill.9 In order to facilitate improvement in this area, tools were needed to better understand both the student’s confidence in his or her assessment skills and ability to use just-in-time knowledge resources to rapidly find accurate, evidence-based guidance. Therefore, while not historically assessed during OSCE assessments, we incorporated a confidence assessment to help characterize students’ skills in this domain.

In an attempt to generate a more authentic OSCE experience and facilitate the metacognitive skill of knowledge gap self-assessment, we developed brief, unique additional questions for two of the six OSCE cases, a patient with a cough and a patient with back pain. During this formative assessment, students were evaluated on their ability to access evidence, appraise the information at hand, and apply it to formulate a treatment plan during an observed OSCE. These cases were chosen because of both the commonality of these chief complaints and the presence of clearly defined professional society evidence-based guidelines for the management of each final diagnosis.

Methods
The target audience was intermediate/advanced learners after completion of their clerkship year. At the end of their clerkship year, students participated in a low-stakes, formative OSCE assessment encompassing a number of presenting problems dictated by the curriculum. During this 4-hour event, students rotated through six 40-minute SP encounters during which they completed a focused history and physical examination, formulated a differential diagnosis, suggested a treatment regimen, and received feedback from a supervising faculty member. While students rotated through six OSCE cases during this event, only the two possessing the novel triple-jump assessment component are described in this resource.
The students moved through each encounter in the following manner. Students were given 15 minutes to read a door note on their SP and complete a focused history and physical examination in accordance with the information presented in the door note (see student preencounter instructions section, Appendices A & F). After the encounter, students exited the patient room and spent 14 minutes first answering a series of diagnosis and management questions and then completing a management checklist as part of the standard OSCE curricular assessment (see student postencounter assessment and checklist, Appendices C & H). After this exercise, faculty gave students feedback on their performance for 7 minutes. Half of the students participating in this event received the cough case, and the other half received the back-pain case. The remaining five OSCE cases were the same for all students.

The exam format was a modified triple-jump examination modeled in the Figure. Upon completion of all six cases in the traditional assessment, students relocated to a standard classroom. At this time, the correct diagnosis was disclosed to those students completing the cough case but not disclosed to students completing the back-pain case. Using a computer-based form, the students were then asked to answer new management questions (two questions in Appendix D, one in Appendix I) and to rate their confidence in their answers. After answering these questions, students had a period of open access to the Internet, including access to resources of the biomedical library, and were prompted to search for evidence to assist in managing the patient’s care. After the search period, students completed the same treatment questions and rated their confidence a second time. Students were then asked to indicate which search terms and resources they had used during their resource search and appraisal phases.

For the cough case, students were prompted to explicitly state the antibiotic, dose, frequency, route, and duration of treatment in free-text fields. We evaluated students using a previously developed scoring rubric based on the American Thoracic Society and Infectious Disease Society of America guidelines for cough. This scoring rubric took into account multiple acceptable evidence-based recommendations for the treatment of cough, including different antibiotic choices with different durations. The scoring rubric allowed for students to obtain scores from zero to five (Appendix E).

In contrast, for the back-pain case, students were asked to choose the single best next management step from a list of nine possible answers. The multiple-choice nature of the prompt limited our scoring, and point values were awarded to choices that were close to evidence-based recommendations, with 3 points given for the correct answer and 1 point for an answer that would be reasonable but not entirely correct. Correct answers were based on guidelines from the American College of Physicians (Appendix J).

We intentionally gave the diagnosis of cough to our initial pilot group in an effort to determine how students would search for management and how successful they would be when provided the correct diagnosis versus when they were not.

After the event, students received a numerical score of both pre- and post-Internet access answers as part of their larger score report from the entire OSCE event. While a few students reached out to faculty to...
discuss their performance on this assessment, the majority did not engage in further conversation with regard to these skills.

Preparation
For this event, three SPs for both the cough and back-pain scenarios and six SPs for each of the remaining five OSCE cases were trained on the case material. This training for each case took 9 hours and utilized the SP training materials (Appendices A, B, F, & G). This training was 3 hours longer than normal SP training at our institution due to the larger scale of this end-of-clerkship assessment but not as a result of the addition of the triple-jump assessment. During each OSCE, one SP participated in the clinical encounter student while another SP watched the encounter via a live feed and completed the general and physical exam components of the SP checklist. After the encounter, the SP who participated in the encounter reviewed the general and physical exam components of the SP checklist and completed the communication section.

Validity
Practicing clinicians often access current evidence at the point of care through utilizing preappraised evidence statements such as clinical practice guidelines (CPGs). In their ideal form, CPGs are statements and summaries of evidence that are carefully crafted and published by professional organizations or groups of experts based on an analysis and synthesis of primary data. CPGs provide easily accessible and distilled text to inform clinicians about current best practices given specific presenting problems or diagnoses in a particular patient population. Thus, in the creation of this assessment, cases with common chief complaints and clearly defined professional society evidence-based guidelines for management were utilized. Additionally, students were asked to complete the assessment as part of patient management during an OSCE case. While this is not completely authentic, it more closely mimics the activity practiced by physicians in a clinical setting. Finally, reliability and validity of the particular checklists used in this case were not explicitly assessed. However, subject matter experts rigorously vetted the checklists to ensure they met curriculum and assessment objectives, were clear and consistent, and were free of bias. Postevent item review has supported the final product with only minor adjustments.

Results
The assessments described here were created by a small group of faculty and implemented as part of medical students’ formative OSCE assessment at the conclusion of their clerkship year. One hundred and five clerkship students participated in one of two OSCE scenarios. Data from this exercise underwent descriptive statistical analysis including mean performance scores and confidence scores. Performance scores were both recorded in absolute point value and converted to a standard 100-point score. Times were recorded for answering before searching, during searching, and after searching. Mean performance scores and confidence scores, both before and after independent search time, were compared utilizing the Wilcoxon signed rank test. Search times were plotted against confidence scores using standard box plots.

Utilizing results of these data, medical student accuracy and confidence in providing evidence-based care improved after the search and appraisal period. This finding held true for both the cough and back-pain cases to different degrees. Students in the cough case showed an increase in standardized score of 55% (33% to 87%) and an increase in the percentage of students rating their answers as confident of 76% (14% to 90%). In comparison, students in the back-pain case showed an increase in standardized score of 14% (35% to 49%) and an increase in the percentage of students rating their answers as confident of 24% (70% to 94%). Furthermore, students in the back-pain case on average took significantly longer to search, with only 50% correctly identifying the EBM decision. We believe this discrepancy is due to the students’ uncertainty of diagnosis, as they were given the correct diagnosis in the cough case but not in the back-pain case. We were not able to ascertain a correlation between confidence and accuracy from these data. Students most frequently utilized UpToDate and professional society guidelines. They searched by
diagnosis when the etiology was known and by chief complaint, such as back pain, when the diagnosis was unclear. Finally, while there were no time limits imposed on students for any portion of this modified triple-jump assessment, the entire process took between 5 and 15 minutes for students to complete.

Discussion

Utilization of EBM at the point of care is a vital element of effective health care practice. Practicing clinicians often access current evidence through preappraised evidence statements such as CPGs, which provide an easily accessible and already distilled text to inform clinicians about current best practices given particular presenting problems or diagnoses in a specific patient population. With the AAMC’s work on EPAs, there is an increased call to both teach and assess students’ ability to use EBM at the point of care to ensure their readiness for residency. Traditionally, OSCE-based assessments have provided a rich environment for a clinical teacher to observe and provide feedback about each step of the clinical encounter, including patient history, physical exam, diagnosis formation, and treatment rationale and can be easily tailored to assess student use of treatment guidelines. However, they differ from real-life encounters in which students have access to clinical resources. The addition of a modified triple-jump assessment as described here to the end of the OSCE experience not only creates a more authentic experience but also allows for assessment and development of student metacognitive skills within the domain of knowledge gap assessment.

Limitations

The implementation of this triple-jump assessment model for the use of EBM occurred at a single institution. Successful implementation at our institution required facilities for holding OSCE assessments and therefore may not be possible at all other institutions. While not all institutions will have the necessary facilities, we hope our content will highlight a practical assessment for the use of EBM and provide tools that will be applicable in multiple settings. In addition, our cases contain specific content related to two common presenting complaints, and we understand that some students may already have expertise in these areas. Nevertheless, the principles and model presented here can easily be replicated to address many content areas.

Lessons Learned

We learned several important lessons during the design and implementation of these assessments. First, with regard to implementation, this assessment was easily integrated into the structure of an already-developed OSCE case. This ease of integration allows for a different type of assessment to be achieved without writing entirely new OSCE cases but rather by modifying existing scenarios. Second, the logistical flow of six OSCE cases became challenging when only two of the cases possessed this additional assessment. The additional assessment component increased the length of the cough and back-pain cases and would have disrupted the flow of the event. We were therefore unable to have students complete this component immediately after the live patient encounter. Instead, students completed the additional assessment after the conclusion of the entire OSCE event. Third, based on the cough case, in which students were provided the diagnosis, we observed that students very accurately searched and implemented evidence-based treatment for conditions when the diagnosis was known. When provided a clinical diagnosis, students were able to correctly identify EBM more quickly and accurately than during a case in which they were not provided the diagnosis (i.e., the back-pain case). Fourth, we learned that students’ search strategies differed based on whether or not they had a definitive diagnosis for the patient. Students who were provided the diagnosis (i.e., the cough case) used terms formed from the diagnosis. In contrast, when the diagnosis was unclear (i.e., back pain), two-thirds of students included the patient’s chief complaint in their searches for a management strategy (e.g., back pain or musculoskeletal back pain). These discrepancies highlight the idea that a definitive diagnosis greatly impacts a student’s ability to search for evidence appropriately and effectively. Furthermore, they emphasize the importance of pairing assessment tools for the use of EBM with tools that examine a student’s ability to generate a differential diagnosis after a patient encounter. In its present form, the assessment relies on student-reported data of search terms and tools utilized. While this provides some insight into students’ thought
processes and abilities, it does not completely depict the process of evidence retrieval. Live, real-time screen capture during the event would have provided a more robust picture of student search process. This would have improved the analysis of student searches and led to more personalized and specific feedback towards student development of this skill set. Finally, we learned that students’ confidence in their answers increases significantly after being given an open period to search the literature for assistance with management decisions. Interestingly and perhaps not surprisingly, accuracy did not seem to be correlated with confidence.

Monica Bhutiani: MD/MEd Candidate, Vanderbilt University School of Medicine
William M. Sullivan, MD, MEd: Internal Medicine and Pediatrics Resident, Vanderbilt University School of Medicine
Sandra Moutsios, MD: Assistant Professor of Internal Medicine and Pediatrics, Vanderbilt University School of Medicine
Elizabeth Ann Yakes, MD: Assistant Professor of Internal Medicine, Vanderbilt University School of Medicine
Jennifer K. Green, MD, MPH: Assistant Professor of Internal Medicine and Pediatrics, Vanderbilt University School of Medicine
Kimberly Lomis, MD: Associate Dean of Undergraduate Medical Education, Vanderbilt University School of Medicine
William B. Cutrer, MD, MEd: Assistant Professor of Pediatrics and Critical Care, Vanderbilt University School of Medicine

Disclosures
None to report.

Funding/Support
None to report.

Ethical Approval
This publication contains data obtained from human subjects and received ethical approval.

References