

Predicting Board Exam Success with Auto-Assigned Rotation-Specific Quizzes in MyEvaluations

Situation:

The infrequency of the In-Training Examinations (ITE) makes it difficult to evaluate each resident's real-time progress and eligibility to sit for the boards. Rotation-specific quizzes administered by the Internal Medicine Residency program at Meharry Medical College using MyEvaluations predicted passing the board examination with 83% sensitivity, and predicted failing the board examination with 100% specificity.

In current practice, trainee board examination readiness is determined using the annual In-Training Examination (ITE). Multiple studies have outlined the positive and negative predictive value of the ITE in passing the American Board of Internal Medicine Certifying Examination (Board Examination).^{i-iv}

In contrast to an annual assessment, monthly assessments allow the program director to determine each trainee's readiness for the board examination, as well as guiding milestone assessments, and aiding the resident to retain more information.

The ACGME Common Program Requirements mandate that 80% of graduating residents qualify for the Board Examination, when averaged over three years. 80% of the same group is expected to pass the Board Examination.^v Simultaneously, each program should monitor and report on each trainee's milestone achievements on the Medical Knowledge Sub-competencies; (e.g. Internal Medicine MK1: Clinical knowledge; MK2: Knowledge of diagnostic testing and procedures).

During each academic year, the ITE is used as a calibration tool to ascertain each trainee's readiness to sit for the Examination. The ITE is administered annually, allowing the residents to use their results to adjust their study habits, and the program director to adjust the board review curriculum.^{vi,vii} The ITE does not provide the resident or the program with a real-time gauge

“Quizzes have helped improve our board exam pass rate to 100%, from our previous rates of 56% and 85%.”

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of incremental progress and performance. Furthermore, the ITE is not a reliable predictor when scores are between 49 and 66.^{iv} However, monthly testing in MyEvaluations.com has shown to be a reliable predictor for passing or failing the Board Examination. The quiz data from MyEvaluations.com also serves as a real-time assessment tool for dynamic remediation that is relevant to the rotation, which is used to immediately help the resident.

Between July 2012 and June 2015, residents at Meharry Medical College Department of Internal Medicine were administered rotation-specific multiple choice quizzes in topics relevant to each rotation. Quizzes were designed with both context-rich and context-poor questions to gauge complex cognitive processes and factual knowledge respectively.^{viii} Quizzes were administered through MyEvaluations.com (the medical residency education management application). Using MyEvaluations.com, data from individual quizzes was directly linked to the ACGME Medical Knowledge sub-competencies, and overall quiz performance for each training year was compared to the ABIM Board Examination pass rates for 2013 through 2015.

Over the three-year period, 45 third-year residents took the Board Examination. In 2013 and 2014 residents were permitted to take the exam independent of their quiz performance. In that period 9 residents in total failed the exam and 21 residents in total passed. In 2014 there were 16 residents; 7 failed and 9 passed the Board Examination. These residents were required to take rotation-specific quizzes. The mean quiz score for the PGY-3 residents passing the Board Examination was 71.0 compared to 57.3 for the 7 residents who failed the Board Examination. The mean total correct values between the groups were compared using a Student's t-test and were significant ($p=0.001$). In 2015 there were 16 PGY-3 residents; 1 voluntarily withdrew and 15 passed the Board Examination. These residents were required to take rotation-specific quizzes in all three years of training. The mean quiz score for the PGY-3 residents passing the Board Examination was 71.5 compared to 46.0 for the 1 resident who did not take the Board Examination.

According to Dr. Olumuyiwa Esuruoso, the Associate Program Director for the Internal Medicine Program and Meharry Medical College, "In 2015 we required rotational quizzes for all 16 PGY-3 candidates. We required them to score 65% or higher and those scoring 60-65% were given warning letters and remediation. This resulted in 15 residents passing the Board Examination, with the exception of 1 who was not permitted to sit the exam based on his quiz performance."

Using a paired t-test, the PGY-2 and PGY-3 groups' quiz performance for 2014 and 2015 was compared, showing a linear relationship between the two; a significant correlation as high as 0.86. This confirms a significant improvement in quiz performance over the PGY-2 and PGY-3 years for the 15 residents passing the Board Examination. This also confirms a significant improvement in quiz performance for the entire group, not exclusively for those passing the Board Examination.

When the 2014 and 2015 PGY-3 groups were combined, there were 7 (Board Examination) failures and 1 abstaining with a mean quiz score of 55.9, as compared to 24 passes with a mean quiz score of 71.3. Based on this information, the best cut-point value of 65 in the quizzes was identified to predict success in passing the Board Examination. Residents scoring higher than 65 are predicted to pass the Board Examination, while those scoring lower are predicted to fail the Board Examination. The cut-point has a sensitivity of 83.3% in predicting success in passing the Board Examination and a specificity of 100% in predicting failure.

As of 2015, the Internal Medicine Program has implemented the predictive powers of these quizzes to recommend appropriate residents to sit for the Board Examination. The minimal goal is for 80% of the qualifying PGY-3 residents to sit and pass the Board Examination. The predictive nature of the quiz performance will facilitate the exclusion of residents performing below the cut-point of 65. As long as 12 of the 16 graduating residents meet or exceeded the cut-point, then with 83.3% probability they are expected to pass the Board Examination.

The predictive value of the quizzes is also useful in monitoring and assessing milestone progression in the ACGME Medical Knowledge sub-competencies. Using the Milestone Performance Mapping tool in MyEvaluations.com, each quiz question is mapped to specific milestone levels. Medical Knowledge assessment on a rotation evaluation is difficult, since most faculty have limited time and resources to perform a comprehensive review of each trainee. Therefore, the rotation evaluations provide a limited window into measuring medical knowledge milestone progression. The addition of quizzes into the Clinical Competency Committee's assessment process provides a wealth of data, both predicting pass rate on the Board Examination and guiding milestone assessments.

"The bi-weekly quizzes help to identify areas of deficiency where the residents have weak performance and needs improvement. They serve as a powerful predictor of future board exam performance. Frequent testing make it easy to measure the progress of each resident in real-time and for each training level; providing opportunities for remediation. The MyQuiz module itself has powerful for data analysis" Dr. Esuruoso.

Benefits

- **Real-time adjustments.** When a resident or group performs poorly on a quiz, then rotation-specific topics can be immediately addressed by either modifying the teaching strategy or spending more time covering the subject matter in a review session. The goal is to ensure residents have a mastery of the subject matter before moving on to the next rotation.
- **Flexibility.** Quizzes are mapped to rotations and automatically assigned as part of the curriculum. We have the option to change the frequency as needed. Residents can complete a quiz on their mobile phone using the MyEvals App or on any browser.
- **Milestone correlation.** Quiz performance is directly mapped to the sub-competencies and milestones. This provides additional information for the Clinical Competency Committee during the semi-annual milestone reviews.

References

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