The Cardiovascular In-Training Examination

Development, Implementation, Results, and Future Directions

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ABSTRACT

BACKGROUND The American College of Cardiology (ACC), in collaboration with the National Board of Medical Examiners (NBME), developed the first standardized in-training examination (ITE) for cardiovascular disease fellows-in-training (FITs). In addition to testing knowledge, this examination uses the newly developed ACC Curricular Milestones to provide specific, competency-based feedback to program directors and FITs. The ACC ITE has been administered more than 5,000 times since 2011.

OBJECTIVES This analysis sought to report the initial experience with the ITE, including feasibility and reliability of test development and implementation, as well as the ability of this process to provide useful feedback in key content areas.

METHODS The annual ACC ITE has been available to cardiovascular disease fellowship programs in the United States since 2011. Questions for this Web-based, secure, multiple-choice examination were developed by a group of cardiovascular disease specialists and each question was analyzed by the NBME to ensure quality. Scores were equated and standardized to allow for comparability. Trainees and program directors were provided detailed feedback, including a list of the curricular competencies tested by those questions answered incorrectly.

RESULTS The ITE was administered 5,118 times. In 2013, the examination was taken by 1,969 fellows, representing 194 training programs. Among the 3 training years, there was consistency in the examination scores. Total test scores and scores within each of the content areas increased with each FIT year (there was a statistically significant difference in each cohort's average scale score across administration years). There was also significant improvement in examination scores across the fellowship years.

CONCLUSIONS The ACC ITE is a powerful tool available to all training programs to assess medical knowledge. This examination also delivers robust and timely feedback addressing individual knowledge gaps, and thus, may serve as a basis for improving training curricula. (J Am Coll Cardiol 2015;65:1218–28) © 2015 by the American College of Cardiology Foundation.

A ssessment of medical knowledge is an essential part of graduate medical education. An in-training examination (ITE) is a formal method for the evaluation of medical knowledge, and many specialty and subspecialty post-graduate training programs incorporate ITEs into their curricula. In fact, formal validated assessment of medical knowledge, such as an ITE, is a key component of the Accreditation Council for Graduate Medical Education (ACGME) program requirements (1,2). Internal

Medicine training programs have incorporated a national ITE since 1988 (3). In recent years, medicine subspecialties, such as nephrology (4) and oncology (5), have developed computer-based ITEs in association with the National Board of Medical Examiners (NBME).

In 2011, the American College of Cardiology (ACC) developed and implemented the first standardized ITE for cardiology fellows-in-training (FITs). This secure examination is executed by the NBME and serves as a benchmark for trainees as they progress through training and prepare for the American Board of Internal Medicine (ABIM) certification examination. The goal of the cardiology ITE, like most ITEs, is to assess trainee medical knowledge through multiple-choice questions in the content areas specified by the ABIM. Moreover, the ACC ITE incorporates a unique feedback process whereby each examination question is tagged to the recently developed, competency-based ACC Curricular Milestones. Thus, after examination completion, program directors and FITs receive information that identifies knowledge gaps and areas in need of further curricular emphasis. During the past 3 years, the ITE has become the standard in-training examination in adult cardiology fellowship programs across the United States. This paper offers an analysis of the data accrued thus far, and outlines future directions for the ITE examination.

METHODS

The cardiology ITE was developed by a test-writing committee consisting of a chair and 11 members (Online Appendix). Eight members of the test writing committee were fellowship training program directors and all committee members underwent instructional training for test question writing provided by the NBME. Questions were developed specifically for this examination and were reviewed in face-to-face committee meetings. Each question was designed to begin with a clinical stem and incorporate a single-best-answer, multiple-choice format. Many questions were accompanied by high-resolution still or video images. The NBME editors and psychometricians analyzed all questions for structure, content, and statistical performance.

The ITE was designed to assess the knowledge of general cardiovascular disease FITs. Each year's examination consisted of 150 questions, separated into 5 equal sections of 30 questions apiece. FITs were allotted 1 h per session, with breaks after each session. The examination blueprint mirrors the ABIM certifying cardiovascular disease examination in terms of the percent of questions dedicated to each content area (Table 1).

The ACC provides information to cardiology fellowship training program directors and coordinators regarding the ITE via an internet listserv and FITs are registered for the examination online. The examinations are scheduled on 2 consecutive days in October, with a makeup date 1 week later. FITs take the examinations online via a secure website provided by the NBME. Neither test takers nor program directors are allowed access to the questions after the examination.

The goal of the ITE is to test medical knowledge across the six core ACGME competencies (1,2). Each examination question is linked to an ACC Curricular Milestone (6), which allows for direct feedback to fellows and program directors. Thus, after the examination responses are scored, fellows receive a detailed assessment of scores along with a list of curricular milestones associated with core clinical diagnoses (Figure 1) for each question answered incorrectly, with the objective of providing insight into knowledge gaps. In addition, each FIT receives an analysis of his or her own performance on the total test, represented by a score for the proportion of the 150 test questions answered correctly. FITs additionally receive scores for the proportion of items answered correctly in each of the major content areas, as well as the mean proportion answered correctly in each area by fellows in each year of training.

FIT scores are equated using Item Response Theory (7) and are placed on a standardized score scale set

ABBREVIATIONS AND ACRONYMS

ABIM = American Board of Internal Medicine

ACC = American College of Cardiology

ACGME = Accreditation Council for Graduate Medical Education

FIT = fellow-in-training

ITE = in-training examination

NBME = National Board of Medical Examiners

TABLE 1 American College of Cardiology In-Training Examination Blueprint

Medical Content Category	Relative Percentage
Arrhythmias	12.0
Coronary artery disease	12.5
Acute coronary syndromes	12.0
Valvular disorders	12.0
Congenital disorders	7.0
Pericardial disease	3.0
Aorta/peripheral vascular disease	9.0
Hypertension/Pulmonary disorders	7.0
Pharmacology	5.0
Congestive heart failure	13.0
Physiology/biochemistry	6.0
Miscellaneous	1.5