In 1995, recommendations for training in adult cardiovascular medicine were published in the *Journal of the American College of Cardiology* as a consensus statement emanating from the Core Cardiology Training Symposium (COCATS) held at Heart House in Bethesda, Maryland, in June 1994 (1). Since publication of that consensus statement, the term “COCATS” has been used when referring to the American College of Cardiology (ACC) training recommendations for fellowship programs. To keep abreast of the significant advances in cardiovascular science and emerging new technologies, the training recommendations were revised extensively in 2002 and published as the “COCATS 2” recommendations (2).

The 1995 COCATS recommendations contained 10 Task Force reports pertaining to overall training in clinical cardiology and training in specific specialized areas of cardiovascular medicine (e.g., echocardiography, nuclear cardiology, cardiac catheterization, and electrophysiology). In the 2002 COCATS 2 recommendations, these 10 Task Force reports were updated, and 2 new additional Task Force reports were drafted to provide training recommendations in vascular medicine and peripheral catheter-based interventions (Task Force 11) and cardiovascular magnetic resonance (CMR) (Task Force 12). The rapid evolution of noninvasive imaging and cardiac electrophysiology subsequent to the 2002 COCATS 2 report necessitated further revision of the training recommendations in cardiac electrophysiology, nuclear cardiology, and advanced cardiac imaging, which were published in 2006 as a focused update to the COCATS 2 recommendations (3). The 2006 update for the first time provided recommendations for training in cardiac computed tomography (CCT), which were included with the updated CMR recommendations in the Task Force 12 report on advanced cardiovascular imaging.

The knowledge base in cardiovascular medicine continues to grow at an accelerating pace, and training in virtually all aspects of cardiology must keep up with this progress. Hence, the training recommendations have been revised in the current 2007 COCATS 3 report. This report represents a consensus document, created using the format of the previous recommendations. Small task forces were created that included representatives from the subspecialty societies, where appropriate. These task forces reviewed the 2002 COCATS 2 Task Force reports and made revisions, additions, and deletions based on data from the literature and their expert opinion. Major changes were most often related to maturing of new subspecialty areas in cardiology or the emergence of new technology into accepted practice. The updated 2006 recommendations from Task Forces 5 (nuclear cardiology), 6 (cardiac electrophysiology), and 12 (advanced cardiovascular imaging) have been incorporated into the current document, with additional modifications in the current Task Force 6 report. The numbers of procedures to be performed, interpreted, or both have been developed consistent with volume recommendations found in the ACC/American Heart Association (AHA) practice guidelines, ACC/AHA/American College of Physicians (ACP) clinical competence statements, or other relevant consensus documents.

The Task Force reports were peer reviewed by the following ACC committees: Cardiac Catheterization and Intervention Committee (Task Force 3); Clinical Electrophysiology Committee (Task Force 6); Heart Failure and Transplant Committee (Task Force 8); Prevention of Cardiovascular Disease Committee (Task Force 10); and Peripheral Vascular Committee (Task Force 11), as well as by 7 members of the ACC Board of Governors and by 6 members of the Cardiology Training and Workforce Committee. Several organizations also reviewed the document including the AHA (entire document); Society for Cardiovascular Angiography and Interventions (Task Forces 3, 11, and 13); American Society of Echocardiography (Task Force 4); American Society of Nuclear Cardiology (Task Forces 5 and 13); Heart Rhythm Society (Task Force 6); Heart Failure Society of America (Task Force 8); Society for Vascular Medicine (Task Force 11); Society for Cardio-
vascular Magnetic Resonance (Task Force 12); and Society of Cardiovascular Computed Tomography and Society of Atherosclerosis Imaging & Prevention (Task Force 13).

The American Board of Internal Medicine (ABIM) subspecialty board on cardiovascular disease still requires 3 years of cardiology fellowship training. One additional year of training is required by the ABIM to sit for the certification examinations in clinical cardiac electrophysiology or interventional cardiology. As outlined in this document, additional years of training are also recommended for those trainees who desire advanced expertise in specialized areas, those who want dedicated time for basic and/or clinical research training, or both. Throughout this revision of COCATS, recommendations for such advanced training experiences are proposed relative to the discipline of cardiovascular medicine being addressed.

The need for a clinical core of 24 months with a minimum of 9 months in nonlaboratory clinical practice activities has been carried forward from the previous COCATS documents in the current report from Task Force 1, which deals with overall training in clinical cardiology. These time requirements should be considered the minimum time periods. The need for core training in long-standing procedural techniques, such as electrocardiography, ambulatory monitoring, and conventional stress testing, is clearly defined, and volumes of tests that must be performed and/or interpreted to achieve competence are again given. Given the complexity and time constraints of a training program, it is understood that many of the requirements in time and case number in various procedures may be obtained concurrently. Examples include training in stress testing during rotations in echocardiography or nuclear cardiology and experience in CMR or CCT interpretation during other imaging rotations. The importance of active participation in research activities is again emphasized in this COCATS revision, and the Task Force 7 report outlines various approaches that can be pursued to fulfill this important academic requirement for cardiology trainees. The research training should include biostatistics, epidemiology, and design and conduct of clinical research trials.

Training in interventional cardiology as described in the Task Force 3 report is now limited to formal training programs in the United States that satisfy the basic standards developed by the American Council for Graduate Medical Education (ACGME) and are accredited by the ACGME. This Level 3 training must be achieved during a fourth year of dedicated fellowship experience. As described in the echocardiography (Task Force 4) report, competence in transesophageal echocardiography and contrast echocardiography is necessary to achieve Level 2 training; basic competence in stress echocardiography can be achieved in Level 2 training, but additional training beyond Level 2 is recommended for full competence and independence in this technique. The Task Force 6 report indicates more specific procedural time and case volume to gain expertise in cardiac implantable electronic device (CIED) management. Training in heart failure and transplantation as outlined in the Task Force 8 report has been revised relative to the 1995 and 2002 reports. Level 3 training in heart failure is now designed to prepare cardiologists to become United Network for Organ Sharing (UNOS)–qualified heart transplant physicians. In addition, Level 3 heart failure training can be individualized to provide specified expertise in electrophysiology, cardiac imaging, and interventional cardiology. This would then require at least 1 additional year of training in advanced heart failure and transplantation for trainees to be eligible to sit for this examination. Level 3 heart failure training will require at least 1 additional year of training in advanced heart failure and transplantation.

This revision of COCATS incorporates the training recommendations for the 4 imaging modalities, which include nuclear cardiology (Task Force 5), echocardiography (Task Force 4), CMR (Task Force 12), and a new section on CCT (Task Force 13). Each was written by individual writing groups and represents a revision of a previously published document. In the present training paradigm, fellows often rotate through these individual silos of imaging technologies, with individual conferences and separate didactic teaching offerings attached to each modality. It is rare to observe multimodality conferences or didactic teaching that is comprehensive, as with lectures on instrumentation and physics of imaging, principles of image processing and display, or lectures on clinical indications (such as detection of coronary artery disease, assessment of prognosis, and assessment of viability) where all the imaging techniques used for these indications are discussed as appropriate to the clinical application. In recent years, the concept of multimodality imaging has emerged coincident with advances in the newer technologies of CMR and CCT. It has become clear that the field of cardiovascular imaging, in general, is enjoying major growth and technological advances. Multimodality and hybrid imaging yielding fused images of the heart and blood vessels uses several of the imaging technologies simultaneously, such as with positron emission tomography and single-photon emission computed tomography. In addition, the time commitment to obtain Level 2 and Level 3 training in multiple imaging modalities during the standard fellowship training experience is becoming greater. A growing number of fellows desire advanced training in all 4 imaging technologies to prepare for a career as a comprehensive cardiovascular imaging specialist (4).

In order to streamline the training of fellows in imaging and allow for the opportunity for advanced training, the ACC has established a Multimodality Imaging Training Task Force composed of broad-based imaging specialists who will develop multimodality training recommendations within the next year. It is anticipated that a new training paradigm will emerge in which the cumulative months of training for Level 2 and Level 3 training could be shortened with an innovative curriculum in which many elements of training in cardiovascular imaging could be combined.
Furthermore, the individual “silos” designated for separate months of additive training would then be transformed. While some months would be dedicated to learning an individual modality particularly in the early stages, other months may be shared with another modality during more advanced training for increased efficiency, still maintaining the volume and case requirements for competency. For example, CCT training could be undertaken simultaneously with training in other imaging disciplines, such as CMR or nuclear cardiology. The multimodality document will not render the imaging sections of COCATS obsolete, its major impact being guidance towards more efficient and comprehensive training. The ACC Task Force on Multimodality Imaging will issue an interim report in 2008 but will continue to meet to address the complexities of transitioning to a multimodality model, the evolving needs of cardiovascular imaging training, and the development of supplemental materials to enable access to multimodality imaging training at all ACGME fellowships to ensure stakeholder engagement (imaging societies, program directors, and so on) in this 5-year process.

As part of its deliberations, the Multimodality Imaging Training Task Force is considering recommending a fourth year of training in advanced cardiovascular imaging that could lead to certification by the Cardiovascular Board of the ABIM, if approved by that organization.

As with the original COCATS document (1), the terms ‘fellow’ and ‘trainee’ are used interchangeably in the current COCATS 3 document, as are the terms ‘cardiovascular medicine’ and ‘cardiology.’ Although numbers of procedures that should be completed to achieve levels of training are provided, the mere accomplishment of such numbers of procedures is not synonymous with excellence in their performance and interpretation. It is vital to the excellence of a training program that dedicated faculty members be available to supervise and critique performance and interpretation of procedures.

Throughout these Task Force reports, training is suggested at 3 levels:

**Level 1**—Basic training required of all trainees to be competent consultant cardiologists.

**Level 2**—Additional training in 1 or more specialized areas that enables the cardiologist to perform or interpret (or both) specific procedures at an intermediate skill level or engage in rendering cardiovascular care in specialized areas.

**Level 3**—Advanced training in a specialized area that enables a cardiologist to perform, interpret, and train others to perform and interpret specific procedures at a high skill level.

The ever-expanding knowledge base in basic cardiovascular science and cardiovascular medicine requires that all training programs have a rich assortment of didactic offerings for fellows. Case-based conferences, such as the traditional catheterization laboratory conference, are vital to train fellows and to develop their skills in evidence-based decision-making. Self-learning needs to be emphasized, and Internet-based, online educational programs, many of which are interactive, will play a greater role in a fellow’s overall learning experience during fellowship and after training. Such didactic activities are outlined throughout the Task Force reports.

**Acknowledgment**

The Steering Committee is most appreciative of the time and effort given to this COCATS revision by the Task Force members and reviewers who provided valuable input into the process. Staff of the American College of Cardiology Foundation provided superb support to the COCATS 3 effort, and their contributions are appreciated and recognized.

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**REFERENCES**


**Key Words:** ACCF Training Statement • COCATS 3.
APPENDIX 1. CO-CHAIR RELATIONSHIPS WITH INDUSTRY—ACCF 2008 RECOMMENDATIONS FOR TRAINING IN ADULT CARDIOVASCULAR MEDICINE CORE CARDIOLOGY TRAINING (COCATS 3)—INTRODUCTION

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APPENDIX 2. PEER REVIEWER RELATIONSHIPS WITH INDUSTRY—ACCF 2008 RECOMMENDATIONS FOR TRAINING IN ADULT CARDIOVASCULAR MEDICINE CORE CARDIOLOGY TRAINING (COCATS 3)—INTRODUCTION

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