

**Task Force 8: Training in Heart Failure: Endorsed by the Heart Failure
Society of America**

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APPENDIX 1. AUTHOR RELATIONSHIPS WITH INDUSTRY—ACCF 2008 RECOMMENDATIONS FOR TRAINING IN ADULT CARDIOVASCULAR MEDICINE CORE CARDIOLOGY TRAINING (COCATS 3)—TASK FORCE 7: TRAINING IN CARDIOVASCULAR RESEARCH

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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)—TASK FORCE 7: TRAINING IN CARDIOVASCULAR RESEARCH

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This table represents the relationships of peer reviewers with industry that were reported by the authors as relevant to this topic. It does not necessarily reflect relationships with industry at the time of publication.

Task Force 8: Training in Heart Failure

Endorsed by the Heart Failure Society of America

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Recognition, evaluation, and treatment of heart failure are essential components of clinical cardiology practice. In order to achieve competency in this subject, 3 distinct training levels are defined, with curriculum outlined, in this section (1–4). All cardiology fellowship training programs will provide, at the least, a Level 1 curriculum in heart failure. More specifically, Level 1 training will provide an understanding of the depth and breadth of the heart failure syndrome, as well as nuances of therapy including the important topic of heart failure prevention. Level 2 training will be for those individuals who wish to broaden their experience with heart failure patients, particularly those with more advanced and challenging syndromes. This curriculum can, in particular, provide the opportunity to learn to manage devices (other than circulatory support systems)

implanted for heart failure therapy and arrhythmia or hemodynamic monitoring. Level 2 will also emphasize more detailed hemodynamic assessment of these patients. Level 3 training will be for those who anticipate focusing the majority of their subsequent clinical or research activities on the syndrome of heart failure with a curriculum requiring an additional 12 months of fellowship training above and beyond that required for cardiology specialization board examination. It is recognized that not all cardiology fellowship training programs will be capable of providing the most intense Level 3 training curriculum. Level 3 training will offer a range of programs that might, for example, include heart transplantation, mechanical circulatory support devices, and advanced heart failure electrophysiology, although not necessarily all of these.

This training scheme recognizes the fact that today, there is an ever-increasing number of treatments and interventions that improve outcomes and significantly alter the course of the heart failure syndrome. These treatments have generally increased the complexity of care, and it has become clear that there is a need for additional and special expertise to best effect and improve utilization of many heart failure evaluation and treatment strategies. It is also recognized that a significant portion of initial and follow-up care for heart failure patients will continue to be under the purview of general cardiologists and primary care clinicians; however, the more advanced Level 2 and 3 programs will provide increased sophistication and more skills necessary to manage advanced heart failure syndromes.

It is important to point out that Level 3 training and subsequent competency does not necessarily require the same level of experience with cardiac transplantation required for qualification as a heart transplant physician under United Network of Organ Sharing (UNOS) criteria (5). It is anticipated that a much broader group of individuals will be interested in establishing competency in advanced heart failure cardiology than will be directly managing patients undergoing cardiac transplantation. Nonetheless, many programs will offer an experience within the Level 3 curriculum that can establish heart transplant physician competency according to UNOS criteria. Furthermore, in developing Level 3 heart failure training criteria there was an expectation that, at some point in time, a secondary subspecialty of advanced heart failure management would likely evolve. Although timing for such a proposal moving forward is unclear, it is desirable to anticipate a curriculum that would qualify individuals for this distinction. The cumulative duration for training in heart failure will then be 1 month for Level 1 taken as part of 9 months of required nonlaboratory clinical practice rotation, and it is assumed that trainees will obtain additional training in heart failure preventive cardiovascular medicine beyond the 1-month core training as part of the experience during other clinical months such as consult services and the coronary care unit. Level 2 will require 6 months of dedicated rotations during the 36-month clinical cardiology training period, and Level

3 will require 12 months beyond the basic 36-month core training program (Table 1).

Training in Heart Failure

Level 1: General Training

The fundamental concepts of heart failure's pathophysiology and its treatment should be understood by all trainees in cardiovascular medicine as part of the core Level 1 training curriculum. Training in the clinical management of heart failure should include supervised experience in both inpatient and outpatient settings, and will expose the trainee to a broad spectrum of underlying causes of heart failure. Trainees should be well acquainted with the nuances of therapy for heart failure that are specific to different etiologies and should be well informed about the pharmacology of standard cardiovascular drugs used to treat heart failure. Trainees should be equally aware of the treatment strategies for patients with both chronic disease and acute exacerbations. An important element of the curriculum will be to train clinicians to appropriately refer heart failure patients for pacemaker, defibrillator, and percutaneous cardiovascular interventions; surgical procedures (including insertion of mechanical circulatory support devices); and cardiac transplantation.

Heart Failure Level 1 Training Curriculum: Core Curriculum

The heart failure training Level 1 curriculum must include the following to ensure that trainees have formal instruction and clinical experience in the evaluation and management of patients from each of the following categories (it is anticipated that training programs will provide that experience in a creative combination of emergency department, inpatient, and outpatient settings):

1. Neurohormonal activation and its importance in the development of cardiovascular pathology and the syndrome of heart failure
2. The concept and significance of ventricular remodeling

Table 1 Summary of Training Requirements for Heart Failure

Task Force	Area	Level	Minimal Number of Procedures	Cumulative Duration of Training (Months)	Minimal Cumulative Number of Cases	Comments
8	Heart failure and transplantation	1		1*†		*Can be taken as part of 9 months of required nonlaboratory clinical practice rotation. †It is assumed that trainees will obtain additional training in heart failure and preventive cardiovascular medicine beyond the 1-month core training as part of the experience during other clinical months, such as consult services and coronary care unit.
		2		6		
		3		12		

3. Cardiomyocyte biology as it applies to heart failure, focusing on the underlying abnormalities in the myocytes of the failing heart
4. Patients with heart failure with dilated or nondilated ventricles
5. Patients with new onset heart failure
6. Patients with acute decompensation of chronic heart failure
7. Geriatric patients with heart failure
8. Patients with heart failure associated with cancer chemotherapy
9. Patients with heart failure who are pregnant or recently post-partum
10. Patients with heart failure and congenital heart disease
11. Patients with heart failure representing diverse ethnic groups, with attention to specific diagnostic and therapeutic issues within these groups
12. Men and women with heart failure
13. Patients with heart failure before and after cardiac and noncardiac surgery
14. Patients with inherited forms of cardiomyopathy
15. Patients with hypertrophic cardiomyopathy
16. Patients with infiltrative and inflammatory cardiomyopathies
17. Patients with heart failure and atrial and ventricular arrhythmias
18. Patients with heart failure due to pulmonary pathology

These scenarios represent a broad and basic spectrum of clinical heart failure, and it is anticipated that most cardiology fellowship training programs will have the ability to meet this criteria. However, it is accepted that for some specific situations (i.e., heart failure patients with congenital heart disease or pregnancy-related heart failure states) clinical material may not be readily available. In those specific situations didactic training would be an acceptable substitute for formal inpatient or outpatient clinical exposure.

EVALUATION OF HEART FAILURE

With respect to evaluation of patients with heart failure, trainees must have formal instruction and clinical experience in the following specific areas:

1. Clinical trial evidence with respect to the diagnosis of heart failure
2. Clinical features (history and physical exam) in all forms and etiologies of heart failure
3. Application and interpretation of approaches to evaluating symptom severity, functional capacity, and health-related quality of life in patients with heart failure
4. Exercise physiology, including the role and interpretation of maximal and submaximal exercise testing and cardiopulmonary exercise testing
5. Indications for, and interpretation of, results of all diagnostic tests and modalities relevant to evaluation and management of patients with, or suspected of having, heart failure or cardiac dysfunction; in particu-

- lar, the impact of such testing on the management of these patients
6. Evaluation of the patient presenting with new onset heart failure and with acute exacerbation of chronic heart failure, including differential diagnosis, specific etiologies, and exacerbating factors
7. Role and interpretation of hemodynamic monitoring and its use in managing patients with new onset heart failure or exacerbation of chronic heart failure
8. Indications for referral of patients for mechanical circulatory support and cardiac transplantation
9. Indications for and evaluation of patients for implantation of left ventricular assist devices as destination therapy

HEART FAILURE MANAGEMENT

With respect to managing patients with heart failure, fellows must have formal instruction and clinical experience in the following specific areas:

1. Clinical trial evidence relevant to the management of heart failure
2. Indication, prescription, pharmacology, adverse effects, and appropriate monitoring of all classes of drugs relevant to the heart failure patient, including those known to benefit patients with heart failure, those suspected of benefiting patients with heart failure, and those known or suspected of adversely affecting patients with heart failure, in both the acute and chronic setting
3. Indication and prescription of nonpharmacologic/non-device treatment modalities in heart failure, including diet and exercise
4. Indications for cardiac transplant
5. Evidence for differences in appropriate management and response to therapy based on differences in etiology, cardiac structure and function, age, gender, ethnic background, and comorbidity
6. Impact of psychosocial factors on the manifestations, expression, and management of heart failure

PREVENTION OF HEART FAILURE

With respect to heart failure prevention, trainees must have formal instruction regarding conditions and factors known to predispose to, or exacerbate, heart failure syndromes. Specifically, a curriculum that emphasizes comprehensive cardiovascular risk factor modification more generally (e.g., prevention of atherosclerosis), and with respect to the heart failure syndrome, specifically, will be required.

Level 2: Intensified Experience in Heart Failure

Trainees who wish to have more training in advanced heart failure should be enrolled in programs that include specific outpatient clinics and inpatient services designed for patients requiring therapy for heart failure, as described for Level 1. However, such programs, in addition to ensuring a curriculum that satisfies the specifics of Level 1 training, also must offer a greater intensity and exposure to a broader spectrum of heart failure therapy modalities. Level 2 train-

ing can be accomplished within the scope of the 3 years of initial cardiology training. Trainees in a Level 2 curriculum should actively participate in didactic activities relating more specifically to heart failure, including research conferences, seminars, and journal clubs with the heart failure syndrome their primary focus.

Heart Failure Level 2 Training Curriculum: Additional Elements

In addition to satisfying all Level 1 curriculum requirements outlined in the previous text, trainees will be required to have additional experiences in the interpretation of advanced heart failure patient hemodynamic data during both acute and chronic interventions and during the assessment of prognosis. One example of an additional curriculum at the Level 2 stage would be trainee rotations through outpatient electrophysiology clinics to focus on the interrogation, evaluation, and programming of implantable electrophysiologic devices used to treat and manage heart failure patients.

Level 3: Advanced Training in Heart Failure

In addition to demonstrating proficiency in the specified and required Level 1 and elective Level 2 curriculum, advanced Level 3 training requires further demonstration of proficiency in additional arenas that include exposure to patients with more advanced or challenging heart failure conditions. Level 3 curriculum training will require an additional 12 months of training above and beyond that required for basic cardiology fellowship. A variety of curriculums can be created to satisfy Level 3 training requirements, but at the core of all will be the following required components:

Basic Mechanisms of Heart Failure

In addition to the curriculum specified in Level 1 training, fellows should have formal instruction and attain understanding of the following to be considered a more advanced Level 3 clinician:

1. More advanced training in cardiomyocyte and extracellular matrix biology, including calcium dysregulation; mechanisms of arrhythmia generation; beta-receptor abnormalities; mechanisms of apoptosis; metabolic abnormalities of the failing myocyte; and the roles of matrix remodeling in the progression of heart failure
2. Genetics, including a) common mutations leading to hypertrophic and dilated cardiomyopathies and b) an understanding of genetic polymorphisms related to myocardial disease and to targeted heart failure treatment

Heart Failure Disease Management

To qualify for heart failure Level 3 training, fellows must have a more in-depth and formal instruction in heart failure disease management, have clinical experience, and demonstrate proficiency as part of a multidisciplinary care team in

a clinical setting dedicated to heart failure. Managing multidisciplinary heart failure clinics and home-based care services is envisioned as a primary role of the advanced heart failure cardiologist, who should achieve proficiency in:

1. Specific behavioral strategies to enhance adherence to a heart failure therapeutic regimen
2. Supervision of home-based titration and monitoring of diuretics and neurohormonal antagonists with surveillance for renal dysfunction and electrolyte disturbances
3. The comprehensive education and counseling needs of heart failure patients and family members
4. Education and counseling strategies
5. The importance of nonpharmacologic, as well as pharmacologic, management
6. End-of-life care, including care options and participation in a multidisciplinary palliative care team
7. Assessment for quality of life, psychological problems (e.g., anxiety and depression), cognitive impairment, literacy problems, social isolation, financial problems, and other barriers to adherence and risk factors for rehospitalization
8. Management of heart failure with multiple comorbidities
9. Collaboration with nurses, dietitians, social workers, pharmacists, and other health professionals in the management of patients to stabilize or improve health status and prevent hospitalization
10. Transitional care principles, that is, facilitating communication between caregivers and physician extenders

Clinical Research

The heart failure Level 3 training assumes a more in-depth understanding of research in the heart failure field. Trainees at this level, therefore, should have a thorough knowledge and understanding of the principles of clinical research, sufficient to fully evaluate the validity and relevance of clinical research findings. This understanding should come from both didactic instruction and participation in clinical research projects as a trainee. Level 3 curriculum should ensure that training includes insight into:

1. Principles of informed consent and the ethical conduct of clinical research
2. Basic statistical methodologies, including sample size estimation and evaluation of significance
3. An understanding of the advantages and disadvantages of various clinical trial designs
4. Understanding of the various end points employed in clinical investigation in heart failure, including those employed for the measurement of clinical outcomes, functional status, and symptoms, as well as use of surrogate and composite end points
5. An understanding of the impact and interpretation of testing multiple end points simultaneously

Expanded Heart Failure Populations

Advanced training further requires demonstration of proficiency in the management of additional more challenging cohorts of heart failure patients (with the specified levels of exposure listed in parentheses if meeting UNOS criteria as a “heart transplant physician” is desired). It is recognized that not all programs offering Level 3 training will have heart transplant or mechanical circulatory support programs that will satisfy UNOS criteria for heart transplant physician designation.

1. Patients requiring end-of-life hospice-based care
2. Patients with hemodynamic compromise severe enough to warrant chronic inotropic drug infusion support
3. Patients with heart failure and noncardiac organ transplants
4. Patients who are being evaluated for cardiac transplant or mechanical assist devices (at least 30)
5. Patients who have undergone cardiac transplant (at least 30, of whom at least 5 are seen during initial transplant hospitalization)
6. Patients with heart failure on mechanical circulatory assist devices (at least 5, of whom at least 2 are being managed during perioperative hospitalization)
7. Patients with heart failure being evaluated for implantable cardioverter-defibrillators (ICDs) (at least 50) and patients with heart failure being evaluated for cardiac resynchronization therapy (CRT) (at least 50)
8. Device interrogation and interpretation in patients with implanted ICD or ICD-CRT devices (at least 100)

Additional Training Within a Level 3 Curriculum

For select individuals trained in advanced heart failure cardiology, it may be desirable to achieve additional training and credentialing. Examples of this include areas such as cardiac transplantation and mechanical circulatory support devices (as previously discussed), electrophysiologic device implants, and more sophisticated cardiovascular imaging. It is recognized that training programs may choose to incorporate opportunities for achieving competencies in these areas, either concurrently or consecutively with the 12-month Level 3 requirements, which are consistent with those training requirements specified elsewhere in this document. Further, as these fields evolve, combination programs may be established that are specifically designed to provide for joint competencies in these and other areas.

Summary

Training in heart failure can be segregated into 3 distinct and ascending or tiered levels of intensity. Level 1 represents the basic training and competency that every cardiology fellowship trainee must experience and demonstrate. Level 2 training represents a significant intensification of training, so that a trainee can subsequently focus some of his or her subsequent clinical activities on heart failure patients or research. Level 3 training offers competencies required for individuals specializing in advanced heart failure cardiology. Such competency includes advanced training in such areas as cardiac transplantation, ventricular assist devices, and heart failure disease management. Many programs will offer exposure sufficient to qualify the trainee for the UNOS designation of heart transplant physician in the Level 3 curriculum. Within this rapidly evolving field, in which new diagnostic and treatment modalities are emerging, over time, additional competencies may be warranted to supplement present training and competency standards.

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Key Words: ACCF Training Statement ■ COCATS 3 ■ heart failure ■ heart transplantation.

APPENDIX 1. AUTHOR RELATIONSHIPS WITH INDUSTRY—ACCF 2008 RECOMMENDATIONS FOR TRAINING IN ADULT CARDIOVASCULAR MEDICINE CORE CARDIOLOGY TRAINING (COCATS 3)—TASK FORCE 8: TRAINING IN HEART FAILURE

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Dr. Robert C. Bourge	<ul style="list-style-type: none"> • Medtronic • Orqis • Remon Technologies • United Therapeutics • Vasogen 	<ul style="list-style-type: none"> • Medtronic • Orqis • Scios • United Therapeutics • Vasogen 	<ul style="list-style-type: none"> • Medtronic • Orqis • United Therapeutics • Remon Technologies • Vasogen 	None	<ul style="list-style-type: none"> • Medtronic • Orqis • Scios • Vasogen 	None	<ul style="list-style-type: none"> • Stock options: Remon Technologies 	
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Name*	Affiliation	Consultant	Research Grant	Scientific Advisory Board	Speakers' Bureau	Steering Committee	Stock Holder	Other
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Dr. Barry Greenberg	• Organizational—Heart Failure Society of America	• AstraZeneca • Boston Scientific • GlaxoSmithKline • Merck • NitroMed • Novartis • Scios	None	None	None	None	None	None
Dr. James A. Hill	• Content—Electrophysiology Committee	None	None	None	None	None	None	None
Dr. Maryl Johnson	• Content—Heart Failure Committee	• Astellas • CareMark	None	None	None	None	None	• Defense witness-2005
Dr. Mitchell T. Saltzberg	• Content—Heart Failure Committee	• CHF Solutions • Medtronic	None	None	• Guidant • Medtronic • Scios	None	None	• Institutional-CHF Solutions • Guidant • Medtronic • Scios
Dr. Richard J. Shemin	• Content—Heart Failure Committee	• Edwards Lifesciences • St. Jude Medical	None	None	None	None	None	None

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Task Force 9: Training in the Care of Adult Patients With Congenital Heart Disease

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 Michael D. Freed, MD, FACC, Constantine Mavroudis, MD, FACC,
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Remarkable advances in surgical and catheter management of congenital heart disease (CHD) over the last half century have allowed greater than 85% of children with CHD to survive to adulthood (1). It is estimated that there are now over 1 million adult survivors with CHD in North America alone; thus, there are now more adults than children with CHD in the United States, and the number appears to be growing by about 5% per year (2). Adults with CHD have special health care needs and often present complex combinations of problems that are generally unrecognized by those in a traditional internal medicine-based cardiology training program (3). Medical cardiologists are experts in

the care of adult-acquired diseases that affect the heart and circulation, but currently most have little or no training in CHD, particularly in complex disorders. Adult CHD and clinical experiences for cardiology fellows vary widely (4). Many adults with CHD continue to be cared for by pediatric cardiologists because the numbers of medical cardiologists specializing in this complicated field are few and insufficient (5,6). This report suggests an approach to more systematic training of medical cardiologists in the recognition and care of adults with CHD based upon previous Bethesda Conference descriptions of workforce needs and educational requirements (6).

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