## APPENDIX 2. PEER REVIEWER RELATIONSHIPS WITH INDUSTRY—ACCF 2008 RECOMMENDATIONS FOR TRAINING IN ADULT CARDIOVASCULAR MEDICINE CORE CARDIOLOGY TRAINING (COCATS 3)—TASK FORCE 8: TRAINING IN HEART FAILURE

| Name* | Affiliation | Consultant | Research Grant | Scientific Advisory Board | Speakers' Bureau | Steering Committee | Stock Holder | Other |
|---|---|---|---|---|---|---|---|---|
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| Dr. James A. Hill | • Content–Electrophysiology Committee | None | None | None | None | None | None | None |
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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. *Names are listed in alphabetical order with each category of review.

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

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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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## Levels of Training

We differentiate 3 levels of training and expected expertise in the care of adult patients with CHD:

**Level 1 training** represents the level of knowledge appropriate for all trainees in medical cardiology and indicates the knowledge content that each graduate of such a program should acquire (6). This level of training should allow for sufficient knowledge to manage simple adult CHD and to recognize the moderate or complex diseases and obtain the appropriate consultations or referrals for proper care. This level of knowledge should be tested in the Subspecialty Certification Examination in Cardiovascular Diseases and will provide the graduate with sufficient expertise to recognize and evaluate common congenital heart disorders in adults. This expertise should include knowledge of the outcomes, residua, sequelae, and complications of medical management, of invasive catheter-based therapy, and of surgical palliation, correction, or repair. Specific disease categories of commonly treated disorders should be emphasized (see Post-operative residua/sequelae, Table 1). However, for trainees with Level 1 expertise, consultation with a pediatric cardiologist or Level 2- or Level 3-trained adult CHD cardiologist is advisable when major management decisions are made concerning patients with moderately to severely complex cardiac disease.

**Level 2 training** represents additional training for fellows who plan to care for adult patients with CHD so that they may acquire expertise in the clinical evaluation and management of such patients. Some exposure to pediatric cardiology is recommended. Level 2 training generally requires 1 year of training in adult CHD: either a 1-year formal program at a regional or tertiary care adult CHD center or cumulative experience of 12 months through repetitive rotations or electives as a cardiology fellow with experienced adult CHD cardiologists (6). Some consideration can be given to those months spent learning CHD in general, be it in pediatric, adolescent, or adult CHD programs. This training should prepare the individual to be well-equipped for the routine care of even moderate to complex adult CHD and to recognize when more advanced consultation or referral is advisable.

**Level 3 training** represents the level of knowledge needed by those graduates who wish to make a clinical and academic/research commitment to this field and not only become competent in the care of the entire spectrum of adult patients with CHD but also participate in teaching and research of adult CHD (6). Some exposure to pediatric cardiology is recommended. Level 3 trainees generally require 2 years of training. These 24 months may either be contiguous or cumulative experience, and some recognition can be given to overall experience in CHD, be it pediatric, adolescent, or adult (e.g., prior pediatric cardiology training or rotations). It is probably preferable that at least 12 months of this training be contiguous in order to obtain both the maximum clinical continuity of care as well as sufficient time to dedicate to clinical research in the field. Such Level 3 training would be sufficient to clinically manage the most complex adult CHD in a regional or tertiary center, to pursue an academic career, to train others in the field, or to direct an adult CHD center program.

**Table 1** Level 1 Training in Congenital Heart Disease in Adults

| Core Curriculum | Knowledge Areas |
|---|---|
| Basic science | Basic embryology, anatomy, pathology, physiology, genetics |
| Natural history/ management | Clinical recognition and management of patients with common defects presenting in adulthood to include genetic counseling, care of pregnancy, and management during noncardiac surgery |
| Post-operative residua/ sequelae | Includes but is not limited to specific diagnoses such as tetralogy of Fallot, atrial septal defects, ventricular septal defects, transposition of the great arteries (e.g., atrial baffle and arterial switch operations), single ventricle (e.g., Fontan operation), and ventricular outflow tract lesions (all levels of aortic and pulmonic stenosis and coarctation of the aorta) |
| Other | Indications for and access to local or regional expert consultation |

### Level 1: Basic Training for All Medical Cardiology Fellows

All medical cardiology trainees should be exposed to a core of information regarding adults with CHD. The goal of Level 1 training is for all graduates to be able to recognize and evaluate common, simple congenital heart lesions and the sequelae of the more commonly repaired congenital heart defects. These graduates should always consider consultation and collaborative patient management with a Level 2- or 3-trained specialist or pediatric cardiologist when major management decisions are made for adults with CHD and for periodic discussions of ongoing care.

We suggest that at least 6 h of formal lectures within the core curriculum of the training program be devoted to CHD in adults. Table 1 indicates the content suggested for these 6 h, covering key basic and clinical aspects of these disorders. A proposed curriculum is as follows: Hour 1 = basic embryology, anatomy, pathology, and physiology and known genetics of common lesions; Hour 2 = clinical diagnosis (history, exam, electrocardiogram, x-ray) and management of at least 6 common lesions expected to be encountered in adults, operated or not; Hour 3 = specific issues relevant to cyanotic CHD and Eisenmenger syndrome; Hour 4 = explanation of methods and outcomes of at least 6 usual surgical and catheter palliative and reparative techniques for CHD; Hour 5 = common echocardiographic features in operated and unoperated adult CHD; and Hour 6 = various topics which could include management during pregnancy, endocarditis prophylaxis, counseling on genetics and contraception, employment, and exer-

cise. Within those 6 h of core curriculum, the trainees should be taught about the major outpatient management issues in adult CHD and when to consult or refer for more specialized advice. Current available modes of supplementing this education include readily available American College of Cardiology educational products (adult CHD section of the Adult Clinical Cardiology Self-Assessment Program and the Echocardiography Self-Assessment Program) or Web-based sites specific to CHD.

In addition to the didactic material in the core curriculum, trainees ideally should be exposed to adult patients with CHD on a regular basis. This could be done in the context of ongoing weekly case conferences usually already present in the medical cardiology training program. For example, at least 1 of the patients discussed in case conferences each month could be an adult with CHD. In addition, trainees are encouraged to become involved in an ongoing CHD outpatient clinic, to see older children or adolescents with a pediatric cardiology colleague, or both. If the training program does not have expertise in CHD or have access to CHD locally, partnering with an expert regional adult CHD facility for an elective rotation of 1 to 4 weeks total may be a valuable supplement.

Trainees should be exposed to the evaluation of CHD with various diagnostic modalities during usual clinical rotations (electrocardiography, electrophysiology, transthoracic and transesophageal echocardiography, nuclear cardiology, and the cardiac catheterization laboratory [including invasive transcatheter techniques]). Exposure to other advanced imaging techniques now commonly utilized in CHD (e.g., magnetic resonance imaging [MRI] and computed tomography [CT]) is highly desirable. Didactic material for these rotations should include materials on diagnosis and management of the adult with CHD.

## Level 2: Special Expertise in Adults With Congenital Heart Disease

At least 1 year of concentrated exposure is generally necessary for those trainees who have little or only basic prior knowledge of CHD and who wish to care independently for adult CHD patients. Table 2 indicates the knowledge areas that should be covered during this year's period.

In addition to didactic materials, the training should include the following activities and aims:

1. Participation in a regular (preferably one that meets more than once a week) outpatient clinic organized for the care of adults with CHD. The Level 2 trainee should be involved with the care of a minimum of 10 patients per week.
2. Participation in formal rotations in pediatric cardiology for either a total block of or cumulative equivalent of 1 to 2 months, including exposure to neonates and children with CHD via conferences, outpatient clinics, diagnostic laboratories (e.g., echocardiography, catheterization laboratory, and so on), and inpatient services including consultations and exposure to children with post-operative CHD in the intensive care unit. Given that such fellows will not likely be experienced in the critical care of pediatric patients, all inpatient participation should be observed and supervised by experienced pediatric cardiologists.
3. Acquisition of familiarity with the range of diagnostic and therapeutic methods, including direct experience in echocardiography, cardiac catheterization, and advanced imaging techniques (MRI and CT), and understanding of the applications of catheter-based techniques both for electrophysiologic mapping and arrhythmia ablation and for anatomic-hemodynamic intervention.
4. Participation in the perioperative care of patients with CHD (preferably in adults), including direct observation of surgical repair.
5. Engagement in the perioperative care of in-hospital patients with CHD with both cardiac and noncardiac medical and surgical issues.

**Table 2 Level 2 Training in Congenital Heart Disease in Adults**

| |
|---|
| Anatomy, physiology, clinical presentation, and natural history of specific lesions |
| Diagnostic methods |
| Physical examination |
| Electrocardiography |
| Significance of arrhythmias/electrophysiologic testing |
| Chest roentgenogram |
| Echocardiography, both transthoracic and transesophageal |
| Catheterization/angiography |
| Radionuclide angiography |
| Other advanced imaging methods; specifically CMR/CT |
| Therapeutic methods |
| Pharmacologic management |
| Surgical procedures |
| Catheter interventional procedures |
| Residua and sequelae of interventions (surgical and catheter) |
| Introduction to appropriate outpatient management |
| Reproduction issues |
| Counseling for pregnancy and management during pregnancy and delivery |
| Contraception |
| Evaluation for noncardiac surgery |
| Palliative care (e.g., management of pulmonary vascular obstructive disease) |
| Athletic and other activity counseling |
| Employment counseling and socioeconomic issues |
| Insurability |
| Psychosocial issues |

CT = computed tomography; CMR = cardiovascular magnetic resonance.

### Program Requirements

Two basic requirements are indicated for a program to train effectively at Level 2: 1) the presence of associated formal programs in pediatric cardiology and cardiovascular surgery and 2) at least 1 faculty member with a career commitment to the care of adult patients with CHD (this faculty member should have achieved by either combined lifelong experience

**Table 3** Summary of Training Requirements for Care of Adult Patients With Congenital Heart Disease

| Task Force | Area | Level | Minimal Number of Procedures | Cumulative Duration of Training (Months) | Minimal Cumulative Number of Cases | Comments |
|---|---|---|---|---|---|---|
| 9 | Congenital heart disease | 1 | | Core lectures* | | *Can be taken as part of 9 months of required nonlaboratory clinical practice rotation. |
| | | 2 | | 12 | | |
| | | 3 | | 24 | 40 catheterizations<br>300 TTE cases<br>50 TEE cases | |

TEE = transesophageal echocardiography; TTE = transthoracic echocardiography.

of, or have been specifically trained in, the skills equivalent to Level 3 training).

### Level 3: Advanced Expertise in Adults With Congenital Heart Disease

To obtain a comprehensive understanding of all aspects of CHD, a 2-year program is recommended with continued participation in clinical practice relating to CHD. In addition to the aforementioned guidelines for Level 2 training, this training should include active participation in clinical and/or laboratory research in conjunction with clinical activities and direct participation in at least 40 diagnostic cardiac catheterization procedures in CHD, with trainees demonstrating a comprehensive understanding of the entire hemodynamic spectrum of anatomic abnormalities in CHD. Finally, trainees should interpret at least 300 transthoracic echocardiograms and 50 transesophageal echocardiographic examinations and have the ability to independently interpret such studies in a wide range of CHD (Table 3). The advanced trainee should also be trained in the interpretation of advanced imaging techniques (i.e., MRI and/or CT and angiography in CHD.

Because relatively few centers in the United States have amassed a sufficient number of adult CHD patients who have been followed up in an organized manner, regionalization of training in the care of the complex CHD patient is necessary (6).

## Trainee Evaluation and Documentation of Core Competence

For Level 1 training in CHD, the global Cardiology Fellowship Program Director shall: 1) either directly, or via an adult CHD faculty designee, attest to the clinical competence of each cardiology fellow; 2) administer a core competence written and/or oral exam at the finish or completion of the core 6 adult CHD lectures; 3) require patient care log documentation of at least 50 supervised inpatient or outpatient encounters with patients with a primary diagnosis of some form of CHD during the core 3-year fellowship; and 4) log interpretation of at least 50 supervised adult CHD advanced cardiac diagnostic studies (cardiac catheterization, echocardiography, and/or cardiac MRI/CT procedures) during the core 3-year fellowship.

*This is a revision of the 2002 document that was originally written by Carole A. Warnes, MD, MRCP, FACC—Chair; Michael D. Freed, MD, FACC; Richard R. Liberthson, MD; and Constantine Mavroudis, MD, FACC.*

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### TASK FORCE 9 REFERENCES

1. Perloff JK, Child JS. Congenital Heart Disease in Adults. 2nd edition. Philadelphia, PA: WB Saunders, 1998.
2. Warnes CA, Liberthson R, Danielson GK, et al. Task force 1: the changing profile of congenital heart disease in adult life. Care of the adult with congenital heart disease. Presented at the 32nd Bethesda Conference, Bethesda, Maryland, October 2–3, 2000. J Am Coll Cardiol 2001;37:1170–5.
3. Foster E, Graham TP Jr., Driscoll DJ, et al. Task force 2: special health care needs of adults with congenital heart disease. Care of the adult with congenital heart disease. Presented at the 32nd Bethesda Conference, Bethesda, Maryland, October 2–3, 2000. J Am Coll Cardiol 2001;37:1176–83.
4. Gurvitz MZ, Chang RK, Ramos FJ, Allada V, Child JS, Klitzner TS. Variations in adult congenital heart disease training in adult and pediatric cardiology fellowship programs. J Am Coll Cardiol 2005;46:893–8.
5. Murphy DJ Jr., Foster E. ACCF/AHA/AAP recommendations for training in pediatric cardiology. Task force 6: training in transition of adolescent care and care of the adult with congenital heart disease. J Am Coll Cardiol 2005;46:1399–401.
6. Child JS, Collins-Nakai RL, Alpert JS, et al. Task force 3: workforce description and educational requirements for the care of adults with congenital heart disease. Care of the adult with congenital heart disease. Presented at the 32nd Bethesda Conference, Bethesda, Maryland, October 2–3, 2000. J Am Coll Cardiol 2001;37:1183–7.

**Key Words:** ACCF Training Statement ■ COCATS 3 ■ adult congenital heart disease.

## APPENDIX 1. AUTHOR RELATIONSHIPS WITH INDUSTRY—ACCF 2008 RECOMMENDATIONS FOR TRAINING IN ADULT CARDIOVASCULAR MEDICINE CORE CARDIOLOGY TRAINING (COCATS 3)—TASK FORCE 9: TRAINING IN THE CARE OF ADULT PATIENTS WITH CONGENITAL HEART DISEASE

| Name | Consultant | Research Grant | Scientific Advisory Board | Speakers' Bureau | Steering Committee | Stock Holder | Other |
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| Name | Affiliation | Consultant | Research Grant | Scientific Advisory Board | Speakers' Bureau | Steering Committee | Stock Holder | Other |
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The missions of the American College of Cardiology and the American Heart Association have been to ensure optimal care to those with or at risk for developing cardiovascular disease (CVD). The cardiovascular specialist is expected to contribute significantly to the treatment and prevention of CVD in the setting of a rapidly growing field of knowledge ranging from molecular and cellular mechanisms to clinical outcomes. Over the past 2 decades, there have been dramatic increases in knowledge concerning specific risk factors in atherosclerosis, hypertension, thrombosis, and other forms of vascular dysfunction. Clinical trials have proven that strategies aimed at the appropriate detection and modification of risk factors can slow progression of atherosclerosis and hypertension and reduce the occurrence of clinical events in both primary and secondary prevention settings. More recently, it has been shown that atherosclerosis can be stabilized or even modestly reversed. Finally, the growing knowledge base of molecular genetics applied to the study of the cardiovascular system has a potentially great relevance to the future clinical practice of preventive cardiovascular medicine.

Despite the fact that clinical outcomes can be improved by promotion of favorable life habits and behaviors and by the proper use of drug treatment, the application of preventive interventions in the clinical practice of cardiovascular medicine is not optimal. Prevention of CVD, in both the primary and secondary prevention setting, must no longer be peripheral to the practice of the cardiovascular specialist.