AMERICAN COLLEGE *of* CARDIOLOGY

ACC 2015 Core Cardiovascular Training Statement (COCATS 4) Competency Tables

Revision Date: March 13, 2015

Task Force 1, Table 1. Core Competency Components and Curricular Milestones for Training in Ambulatory, Consultative, and Longitudinal Cardiovascular Care

Competency ID	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-AMB-MK1	Know the major cardiovascular risk stratification tools and the principles of primary and secondary cardiovascular disease prevention.	I			
M-AMB-MK2	Know the roles of genetics and family history and the environmental and lifestyle factors in the development and clinical course of cardiovascular disease.		I		
M-AMB-MK3	Know the effects of age on cardiovascular function, response to medications, and in the risks of diagnostic and therapeutic procedures.		I		
M-AMB-MK4	Know the differential diagnosis of chest pain and the distinguishing features of the various etiologies.	I			
M-AMB-MK5	Know the cardinal findings and differential diagnosis of palpitations, lightheadedness, and syncope, and the distinguishing features of the various etiologies.	I			
M-AMB-MK6	Know the cardinal findings and differential diagnosis of dyspnea.	I			
M-AMB-MK7	Know the differential diagnosis of peripheral edema and the distinguishing clinical features of the various etiologies.	I			
M-AMB-MK8	Know the roles of kidney, hepatic, pulmonary, hematologic, rheumatologic, and endocrine disorders in the development, manifestations, and responses to treatment in patients with cardiovascular disease.		I		
M-AMB-MK9	Know the clinical pharmacology of cardiovascular medications, and drug-drug interactions of cardiac and noncardiac medications, including in special populations and in patients with relevant comorbidities.		I		
M-AMB-MK10	Know the roles of lifestyle, activity level, body mass, nutrition, alcohol and/or drug use in cardiovascular risk and disease.	I			
M-AMB-MK11	Know the potential cardiovascular toxicity and side effects of major classes of drugs used for the management of patients with common medical conditions, including antimicrobial agents, immune system modulators, chemotherapeutic agents, and antiParkinsonian drugs.			I	
M-AMB-MK12	Know the roles of stress, anxiety, and depression in patients with suspected cardiovascular disease.	I			
M-AMB-MK13	Know the guideline recommendations for blood pressure, blood glucose, and lipid management in diverse patient populations with and without cardiovascular disease.		I		
M-AMB-MK14	Know the appropriate use indications for cardiovascular screening studies, including carotid and abdominal ultrasound (or other imaging) modalities.		I		
M-AMB-MK15	Know the differential diagnosis and distinguishing characteristics of heart murmurs and bruits.		I		
M-AMB-MK16	Know the characteristic clinical manifestations, differential diagnosis, and appropriate testing for peripheral vascular disease.		I		
M-AMB-MK17	Know the mechanisms and cardinal symptoms and findings of stroke, transient cerebral ischemia, and dementia.		I		
M-AMB-MK18	Know the principles, modalities, and appropriate indications for palliative care.	I			
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-AMB-PC1	Skill to effectively and efficiently perform an initial outpatient cardiovascular consultation, and establish a differential diagnosis.	I			
M-AMB-PC2	Skill to appropriately utilize diagnostic testing – both for initial diagnosis and for follow-up care.		I		
M-AMB-PC3	Skill to integrate clinical and testing results to establish diagnosis, assess cardiovascular risk, and formulate treatment and follow-up plans.		I		
M-AMB-PC4	Skill to appropriately obtain and integrate consultations from other healthcare professionals in a timely manner.		I		

M-AMB-PC5	Skill to recognize acute cardiovascular disorders or high-risk states that require immediate treatment and/or hospitalization, and prioritize management steps in patients with complex or multi-component illness.		I		
M-AMB-PC6	Skill to establish an effective medical regimen and monitor for side-effects, intolerance or noncompliance, and patient safety.		I		
M-AMB-PC7	Skill to assess the cardiovascular risks associated with recreational and/or competitive sports for individual patients and to counsel patients about levels of physical activity appropriate to their cardiovascular health in the context of disease prevention; rehabilitation; and promotion of longevity, functional capacity, and quality of life.		I		
M-AMB-PC8	Skill to effectively carry out chronic disease management in patients with chronic ischemic heart disease, hypertension, heart failure, and peripheral vascular disease.		I		
M-AMB-PC9	Skill to coordinate ambulatory and longitudinal follow-up care.			I	
M-AMB-PC10	Skill to effectively facilitate transition of care from hospital to ambulatory or intermediate care settings.		I		
M-AMB-PC11	Skill to perform preoperative assessments for noncardiac procedures in patients with cardiovascular disease.	I			
	***Evaluation Tools*:** chart-stimulated recall, conference presentation, direct observation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-AMB-SBP1	Effectively lead or participate in team-based care in patients with or at risk of developing cardiovascular disease.		I		
M-AMB-SBP2	Effectively facilitate transition of care.	I			
M-AMB-SBP3	Effectively utilize electronic medical record systems, including clinical protocols and treatment/evaluation prompts.	I			
M-AMB-SBP4	Effectively and appropriately use remote communication tools in the care of patients.	I			
M-AMB-SBP5	Appropriately utilize and work with cardiac rehabilitation and intermediate care facilities.		I		
M-AMB-SBP6	Recognize and address social, cultural, and financial barriers to patient compliance.	I			
	Evaluation Tools: direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-AMB-PBL1	Utilize point-of-care electronic resources to provide up-to-date clinical information and guideline-driven evaluation and treatment.	I			
M-AMB-PBL2	Identify gaps and carry out personalized education activities to address them.		I		
M-AMB-PBL3	Integrate validated performance and patient satisfaction measures into clinical practice to foster continuous quality improvement.		I		
	Evaluation Tools: chart-stimulated recall, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-AMB-PROF1	Practice patient-centered care with shared decision-making and appreciation of patients' values and preferences.	I			
M-AMB-PROF2	Incorporate appropriate use criteria and risk-benefit considerations in treatment decisions.		I		
M-AMB-PROF3	Practice in a manner that fosters patient benefit above self-interest and avoids conflict of interest.	I			
M-AMB-PROF4	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.	I			
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-AMB-ICS1	Communicate effectively with patients and families across a broad spectrum of ethnic, social, cultural, socioeconomic, and religious backgrounds.	I			
M-AMB-ICS2	Exhibit sensitivity and empathy in dealing with life-threatening and end-of-life issues.	I			
M-AMB-ICS3	Communicate effectively and in a timely manner with primary care and		I		

	other referring or collaborating members of the healthcare team.				
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 1, Table 2. Core Competency Components and Curricular Milestones for Training in Stable Ischemic Heart Disease

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-ISCHEM-MK1	Know the epidemiology, pathophysiology, and natural history of atherosclerotic vascular disease and the characteristic features of stable and unstable coronary artery plaque.	I			
M-ISCHEM-MK2	Know the determinants of coronary blood flow and myocardial oxygen consumption.	I			
M-ISCHEM-MK3	Know the differential diagnosis of chest pain syndromes and the characteristic clinical features of typical angina, atypical angina, and noncardiac chest pain.	I			
M-ISCHEM-MK4	Know the clinical features and natural history of angina pectoris in special populations: women, the elderly, and patients with diabetes.	I			
M-ISCHEM-MK5	Know the causes of angina pectoris not related to atherosclerotic coronary disease (including valvular heart disease, hypertrophic cardiomyopathy, cocaine, congenital coronary anomalies, vasculitis, and coronary artery spasm).	I			
M-ISCHEM-MK6	Know the medical conditions that can provoke or exacerbate angina pectoris.	I			
M-ISCHEM-MK7	Know the differential diagnosis and prognosis of myocardial ischemia in patients with nonobstructive coronary disease.	I			
M-ISCHEM-MK8	Know the characteristic electrocardiographic features of ischemia.	I			
M-ISCHEM-MK9	Know the indications, contraindications, and limitations of noninvasive testing in the context of the pre-test likelihood and predictive value for diagnosis of coronary artery disease.	I			
M-ISCHEM-MK10	Know the role of noninvasive testing in risk-assessment, including the clinical, functional capacity, ECG, and hemodynamic stress test findings indicative of advanced coronary disease or high-risk state.		I		
M-ISCHEM-MK11	Know the lifestyle, activity, and exercise guidelines and risk factor treatment targets in patients with stable ischemic heart disease.	I			
M-ISCHEM-MK12	Know the indications, contraindications, and the clinical pharmacology of medications used to improve symptoms and/or prognosis in patients with stable ischemic heart disease.	I			
M-ISCHEM-MK13	Know the role of left ventricular systolic function in clinical decision-making and in estimation of prognosis in patients with ischemia.	I			
M-ISCHEM-MK14	Know the indications, limitations, and risk of coronary angiography in patients with known or suspected ischemia.	I			
M-ISCHEM-MK15	Know the anatomic and physiologic catheterization findings indicating significant coronary artery obstruction and the coronary angiographic features indicative of a high-risk state.	I			
M-ISCHEM-MK16	Know the indications, risks, and benefits of percutaneous or surgical revascularization versus medical therapy in patients with stable ischemic heart disease.		I		
M-ISCHEM-MK17	Know the treatment options for refractory symptomatic stable ischemic heart disease.		I		
M-ISCHEM-MK18	Know the indications for noninvasive or invasive evaluation following revascularization procedures.	I			
	Evaluation Tools: direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-ISCHEM-PC1	Skill to obtain and utilize history, physical examination, and ECG findings in patients with chest pain syndromes to establish a clinical probability of the presence of symptomatic coronary artery disease.	I			
M-ISCHEM-PC2	Skill to distinguish stable versus unstable coronary syndromes.	I			
M-ISCHEM-PC3	Skill to select evidence-based and cost-effective noninvasive testing for diagnosis and/or risk assessment in patients with chest pain syndromes.	I			
M-ISCHEM-PC4	Skill to interpret and apply results of noninvasive testing in the management of patients with stable ischemic heart disease.		I		
M-ISCHEM-PC5	Skill to perform and interpret exercise electrocardiographic testing.		I		

M-ISCHEM-PC6	Skill to establish an effective anti-ischemic medical regimen for patients with ischemia.	I			
M-ISCHEM-PC7	Skill to identify appropriate candidates for coronary angiography and percutaneous or surgical revascularization.		I		
M-ISCHEM-PC8	Skill to interpret and integrate diagnostic cardiac catheterization findings into patient management.		I		
M-ISCHEM-PC9	Skill to implement lifestyle, physical activity guidelines, and pharmacologic interventions to safely control and achieve target levels of risk factors.	I			
M-ISCHEM-PC10	Skill to perform preoperative risk assessment in cardiovascular patients undergoing noncardiac surgery.	I			
M-ISCHEM-PC11	Skill to perform diagnostic cardiac catheterization.			II	
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, logbook				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-ISCHEM-SBP1	Incorporate risk-benefit analysis and cost considerations in treatment decisions.		I		
M-ISCHEM-SBP2	Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-ISCHEM-PBL1	Utilize decision and support tools for accessing guidelines and pharmacologic information at the point of care.	I			
M-ISCHEM-PBL2	Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.		I		
	Evaluation Tools: conference presentation, direct observation, in-training exam				
	Professionalism	**12**	**24**	**36**	**Add**
M-ISCHEM-PROF1	Exhibit sensitivity to patient preference and end-of-life issues.		I		
M-ISCHEM-PROF2	Identify and manage conflicts of interest.		I		
M-ISCHEM-PROF3	Practice within the scope of personal expertise or technical skills.		I		
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-ISCHEM-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.		I		
M-ISCHEM-ICS2	Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.		I		
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 1, Table 3. Core Competency Components and Curricular Milestones for Training in Acute Coronary Syndromes

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-ACS-MK1	Know the epidemiology, causes, pathophysiology, and natural history of ACS, including the roles of plaque rupture or erosion and platelet activation and thrombosis.	I			
M-ACS-MK2	Know the disorders that can simulate or mask acute coronary syndromes.	I			
M-ACS-MK3	Know the risk-assessment tools in acute coronary syndromes.	I			
M-ACS-MK4	Know the indications and clinical pharmacology of antiplatelet, anticoagulant, and other pharmacologic therapies.	I			
M-ACS-MK5	Know the post-acute coronary syndromes risk assessment, rehabilitation, and secondary prevention measures.	I			
	ST Elevation Myocardial Infarction:				
M-ACS-MK6	Know the characteristic symptoms, physical findings, electrocardiographic patterns, and biomarker findings.	I			
M-ACS-MK7	Know the effects and time course of ischemic injury on ventricular function and remodeling.	I			
M-ACS-MK8	Know the characteristic hemodynamic complications (including hypotension, low cardiac output, heart failure, and shock).		I		
M-ACS-MK9	Know the characteristic arrhythmia and conduction complications.		I		
M-ACS-MK10	Know the characteristic mechanical complications (including papillary muscle rupture and myocardial rupture).		I		
M-ACS-MK11	Know the characteristic findings and complications of right ventricular infarction.		I		
M-ACS-MK12	Know indications, contraindications, and risks of reperfusion therapies and the clinical, electrocardiographic, and angiographic signs of reperfusion.	I			
M-ACS-MK13	Know the relative benefits and risks of fibrinolysis and primary percutaneous coronary intervention as an initial reperfusion strategy.	I			
M-ACS-MK14	Know the indications for transfer, angiography, and revascularization in patients who did not receive primary percutaneous coronary intervention (including those who received fibrinolysis or did not receive initial reperfusion therapy).		I		
	Non–ST-Elevation Acute Coronary Syndromes:				
M-ACS-MK15	Know the differential diagnosis and the characteristic clinical, electrocardiographic, and biomarker features for diagnosis and risk stratification.		I		
M-ACS-MK16	Know the relative risks and benefits of an initial invasive versus an ischemia-guided strategy for angiography and revascularization.		I		
	***Evaluation Tools*:** chart-stimulated recall, conference presentation, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-ACS-PC1	Skill to evaluate and diagnose patients with ST-elevation myocardial infarction and initiate appropriate reperfusion therapy within guideline time limits.	I			
M-ACS-PC2	Skill to employ appropriate antiplatelet, anticoagulant, and other pharmacologic therapies.	I			
M-ACS-PC3	Skill to recognize and treat hemodynamic disturbances (including hypotension, low cardiac output, heart failure, acute pulmonary edema, and shock) and diagnose the cause.		I		
M-ACS-PC4	Skill to recognize and treat arrhythmias and conduction disturbances.		I		
M-ACS-PC5	Skill to recognize and treat mechanical complications (including papillary muscle rupture and myocardial rupture).		I		
M-ACS-PC6	Skill to recognize and treat patients with right ventricular infarction.		I		
M-ACS-PC7	Skill to assess ventricular function and utilize in treatment strategy decisions.		I		
M-ACS-PC8	Skill to interpret invasive hemodynamic data and angiographic findings and apply to treatment strategies.		I		
M-ACS-PC9	Skill to perform and interpret coronary angiography.			II	

M-ACS-PC10	Skill to insert intra-arterial and pulmonary artery catheters and interpret the findings.		I		
M-ACS-PC11	Skill to assess overall risk, identify candidates for invasive evaluation and treatment, and establish optimal medical regimen in non–ST-elevation acute coronary syndromes.		I		
M-ACS-PC12	Skill to identify patients who would benefit from mechanical circulatory support.		I		
M-ACS-PC13	Skill to achieve risk-factor target levels for secondary prevention.	I			
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-ACS-SBP1	Work with emergency medical systems, emergency departments, and hospital teams to establish effective first medical contact strategies for cardiovascular emergencies.		I		
M-ACS-SBP2	Identify and address financial, cultural, and social barriers to diagnostic and treatment recommendations.	I			
M-ACS-SBP3	Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.		I		
M-ACS-SBP4	Practice in a manner that fosters the balance of appropriate utilization of finite resources with the net clinical benefit for the individual patient.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource evaluation, record review				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-ACS-PBL1	Identify gaps in performance and knowledge and perform appropriate personal learning activities.		I		
M-ACS-PBL2	Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.	I			
	Evaluation Tools: chart-stimulated recall, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-ACS-PROF1	Exhibit sensitivity to patient preference and end-of-life issues.	I			
M-ACS-PROF2	Demonstrate sensitivity and responsiveness to diverse patient populations.	I			
M-ACS-PROF3	Demonstrate a commitment to carry out professional responsibilities, appropriately refer patients, and respond to patient needs in a way that supersedes self-interest.	I			
M-ACS-PROF4	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.	I			
	Evaluation Tools: direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-ACS-ICS1	Effectively communicate with acutely ill patients across a broad range of cultural, ethnic, and socioeconomic backgrounds.	I			
M-ACS-ICS2	Communicate with all healthcare providers involved in patient care.	I			
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 1, Table 4. Core Competency Components and Curricular Milestones for Training in Valvular Heart Disease

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-VALV-MK1	Know the characteristic features and natural history of congenital bicuspid aortic valve disease.	I			
M-VALV-MK2	Know the etiology, natural history, pathophysiology, and differential diagnosis of acquired aortic, mitral, pulmonic, and tricuspid valve diseases.		I		
M-VALV-MK3	Know the characteristic features and natural history of rheumatic valvular heart disease.	I			
M-VALV-MK4	Know the cardinal symptoms and physical findings of aortic and of mitral stenosis and their role in management decisions.	I			
M-VALV-MK5	Know the cardinal symptoms and physical findings of chronic aortic and chronic mitral regurgitation and their roles in management decisions.		I		
M-VALV-MK6	Know the causes and distinguishing characteristics of acute versus chronic mitral and aortic regurgitation.		I		
M-VALV-MK7	Know the natural history, clinical features, and complications of mitral valve prolapse.	I			
M-VALV-MK8	Know the appropriate indications for, and characteristic findings of, echocardiographic testing for diagnosis and assessment of severity during initial evaluation and upon follow-up.		I		
M-VALV-MK9	Know the role of stress testing in assessment of valvular heart disease.			I	
M-VALV-MK10	Know the indications for MRI and CT in the assessment of valvular heart disease.		I		
M-VALV-MK11	Know the indications for, and characteristic findings with, cardiac catheterization in patients with valvular heart disease.		I		
M-VALV-MK12	Know the indications for, and clinical pharmacology of, drugs used for the treatment of native and prosthetic valvular heart disease, including anticoagulation and antibiotic prophylaxis.	I			
M-VALV-MK13	Know the effects of arrhythmias on the clinical manifestations, risks of complications, and management of valvular heart disease.		I		
M-VALV-MK14	Know the indications and expected outcomes for surgical therapy in valvular heart disease, including valve selection and repair versus replacement.		I		
M-VALV-MK15	Know the indications and expected outcomes for transcatheter therapy in valvular heart disease.		I		
M-VALV-MK16	Know the etiology, natural history, physical findings, differential diagnosis, complications, and treatment of native valve and prosthetic valve endocarditis.		I		
M-VALV-MK17	Know the effects of pregnancy on the clinical manifestations and management of patients with valvular heart disease (native and prosthetic).		I		
	Evaluation Tools: chart-stimulated recall, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-VALV-PC1	Skill to identify cardinal physical findings and ECG abnormalities in patients with valvular heart disease.		I		
M-VALV-PC2	Skill to distinguish innocent from pathologic heart murmurs.		I		
M-VALV-PC3	Skill to manage patients with valvular heart disease and coronary artery disease.		I		
M-VALV-PC4	Skill to select appropriate testing and integrate results with clinical findings in the evaluation and management of patients with valvular heart disease.		I		
M-VALV-PC5	Skill to distinguish aortic stenosis from hypertrophic obstructive cardiomyopathy and other causes of LVOT obstruction.	I			
M-VALV-PC6	Skill to recognize bicuspid aortic valve disease and its associated abnormalities.	I			
M-VALV-PC7	Skill to recognize impact of ventricular dysfunction on clinical decision-making in valvular heart disease.	I			

M-VALV-PC8	Skill to recognize the cause and impact of pulmonary hypertension in management of valvular heart disease.		I		
M-VALV-PC9	Skill to determine candidacy and optimal timing of cardiac surgical or transcatheter treatments in patients with valvular heart disease.		I		
M-VALV-PC10	Skill to perform and interpret transesophageal echocardiography in patients with valvular heart disease.			II	
M-VALV-PC11	Skill to perform and interpret diagnostic catheterization in patients with valvular heart disease.			II	
	Evaluation Tools: chart-stimulated recall, direct observation, logbook, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-VALV-SBP1	Participate in interdisciplinary decision-making with regard to surgery and transcatheter therapy.		I		
M-VALV-SBP2	Practice in a manner that fosters the balance of appropriate utilization of finite resources with the net clinical benefit for the individual patient.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-VALV-PBL1	Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-VALV-PBL2	Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.		I		
	Evaluation Tools: in-training exam, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-VALV-PROF1	Exhibit sensitivity to patient preference and end-of-life issues.		I		
M-VALV-PROF2	Practice within the scope of personal expertise or technical skills.		I		
	Evaluation Tools: in-training exam, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-VALV-ICS1	Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.		I		
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 1, Table 5. Core Competency Components and Curricular Milestones for Training in Pericardial Disease

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-PERI-MK1	Know the pathophysiology, differential diagnosis, and natural history of acute and relapsing pericarditis.	I			
M-PERI-MK2	Know the pathophysiology, differential diagnosis, and natural history of pericardial effusion and pericardial tamponade.	I			
M-PERI-MK3	Know the pathophysiology, differential diagnosis, and natural history of constrictive pericarditis.		I		
M-PERI-MK4	Know the cardinal physical findings of acute pericarditis, pericardial tamponade, and constrictive pericarditis.		I		
M-PERI-MK5	Know the indications for pericardiocentesis.	I			
M-PERI-MK6	Know the indications for, and clinical pharmacology of, drugs used for the treatment of acute and relapsing pericarditis.	I			
M-PERI-MK7	Know the effects of pericardial disease on other organ systems.		I		
M-PERI-MK8	Know pericardial anatomy and structural abnormalities (pericardial cyst and congenital absence of the pericardium).		I		
M-PERI-MK9	Know the indications for, and characteristic findings in, imaging studies of pericardial diseases.		I		
M-PERI-MK10	Know the indications for surgical referral in pericardial diseases and the expected outcomes.		I		
	Evaluation Tools: chart-stimulated recall, global evaluation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-PERI-PC1	Skill to clinically evaluate, diagnose, and manage patients with acute pericarditis and with chronic relapsing pericarditis.		I		
M-PERI-PC2	Skill to identify cardinal physical findings and evaluate and manage patients with pericardial effusion, including tamponade.		I		
M-PERI-PC3	Skill to identify cardinal physical findings and evaluate and manage patients with constrictive pericarditis.		I		
M-PERI-PC4	Skill to appropriately select and incorporate data from laboratory testing and noninvasive imaging in the evaluation and management of patients with pericardial disease.		I		
M-PERI-PC5	Skill to perform pericardiocentesis.			II	
M-PERI-PC6	Skill to distinguish constrictive pericarditis from restrictive cardiac disease.		I		
M-PERI-PC7	Skill to identify patients who should be referred for cardiac catheterization in the evaluation of pericardial disease.		I		
M-PERI-PC8	Skill to identify patients with constrictive pericarditis who are candidates for referral for consideration of cardiac surgery.		I		
	Evaluation Tools: direct observation, global evaluation, logbook, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-PERI-SBP1	Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.		I		
M-PERI-SBP2	Incorporate risk-benefit analysis and cost considerations in diagnostic and treatment decisions.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-PERI-PBL1	Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.		I		
	Evaluation Tools: chart-stimulated recall, in-training exam, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-PERI-PROF1	Exhibit sensitivity to patient preference and end-of-life issues.		I		
M-PERI-PROF2	Practice within the scope of personal expertise or technical skills.		I		
	***Evaluation Tools*:** direct observation, global evaluation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-PERI-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.		I		

M-PERI-ICS2	Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.		I		
	Evaluation Tools: direct observation, global evaluation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 2, Table 1. Core Competency Components and Curricular Milestones for Training in Cardiovascular Disease Prevention

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-PREV-MK1	Know the structure of the normal artery and the basic vascular biology of atherosclerotic vascular disease.	I			
M-PREV-MK2	Know the principles of genetics as applied to cardiovascular disease and pharmacogenomics as applied to cardiovascular therapy.		I		
M-PREV-MK3	Know the impact of family history on disease risk and utility of family screening in cardiovascular disease prevention.	I			
M-PREV-MK4	Know the clinical epidemiology of cardiovascular disease, including incidence/prevalence, sex and ethnic differences, and the influence of traditional risk factors and demographics on outcomes.	I			
M-PREV-MK5	Know the principles for implementation both of individual and population-based cardiovascular disease prevention.	I			
M-PREV-MK6	Know the major tools to assess both lifetime and 10-year risks of a first cardiovascular event and influence primary prevention measures.	I			
M-PREV-MK7	Know the evidence for incremental benefit over a traditional risk-based approach, as well as the advantages, disadvantages, and limitations of screening methods to assess subclinical atherosclerosis (including biomarkers, coronary calcification, carotid intima-media thickness, and ankle-brachial index).		I		
M-PREV-MK8	Know the effects of diabetes mellitus, obesity, hypertension, lipid disorders, physical inactivity, and tobacco use on the development and progression of atherosclerosis, and their treatment strategies.	I			
M-PREV-MK9	Know the physiology and assessment of diabetes mellitus and principles of its management and comanagement in patients with cardiovascular disease.	I			
M-PREV-MK10	Know the physiology, assessment, and management of lipid disorders, including in special populations.	I			
M-PREV-MK11	Know the physiology, presentation, evaluation and management of hypertensive disorders, including refractory hypertension.	I			
M-PREV-MK12	Know the principles of nutrition and obesity assessment and management, including the roles of pharmacotherapy and bariatric surgery.	I			
M-PREV-MK13	Know the roles and management principles for behavioral and psychosocial contributions to cardiovascular disease.	I			
M-PREV-MK14	Know the principles and roles of exercise physiology, physical activity counseling, and cardiac rehabilitation.	I			
M-PREV-MK15	Know the tools and principles for managing and counseling regarding tobacco cessation.	I			
M-PREV-MK16	Know the effects of systemic diseases and their treatments (including renal, hepatic, inflammatory, and autoimmune-related disorders) on cardiovascular risk factors and their management.	I			
M-PREV-MK17	Know adverse effects of obstructive and central sleep apnea on the incidence and control of hypertension, atrial fibrillation and other arrhythmias, congestive heart failure, and atherosclerosis.	I			
M-PREV-MK18	Know the indications for noninvasive screening for carotid artery disease, abdominal aortic aneurysm, and peripheral vascular disease.	I			
M-PREV-MK19	Know the impact of reproductive stages, pregnancy, and of hormonal treatment for reproductive disorders on cardiovascular risk.	I			
M-PREV-MK20	Know the principles of antithrombotic therapy in cardiovascular disease.	I			
M-PREV-MK21	Know the pharmacology, indications, contraindications, and interactions of medications commonly used in cardiovascular disease prevention and therapy (e.g., antithrombotic agents, antihypertensive agents, lipid-lowering agents, agents used in diabetes management, and agents used in cessation of tobacco).	I			
	Evaluation Tools: chart-stimulated review, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**

M-PREV-PC1	Skill to perform global risk assessment and appropriately utilize diagnostic testing – both in patients at risk for and those with prior cardiovascular events or diagnoses.	I			
M-PREV-PC2	Skill to evaluate a patient's family history and appropriately recommend family screening.	I			
M-PREV-PC3	Skill to identify patients who may have common systemic disorders that affect cardiovascular disease diagnosis and treatment such as sleep apnea and thyroid disorders.	I			
M-PREV-PC4	Skill to implement and prescribe lifestyle approaches for the prevention and treatment of hypertension, dyslipidemia, tobacco use, obesity, and diabetes mellitus.	I			
M-PREV-PC5	Skill to assess physical activity patterns and exercise capacity and provide physical activity counseling and exercise prescription, as well as counseling on whether to return to sports.	I			
M-PREV-PC6	Skill to identify patients who will benefit from low-density lipoprotein apheresis.		I		
M-PREV-PC7	Skill to identify patients for whom antiplatelet therapy is indicated.	I			
M-PREV-PC8	Skill to identify and address factors that contribute to nonadherence to treatment regimen.	I			
M-PREV-PC9	Skill to utilize individualized risk-benefit assessment in the management of patients and adapt prevention strategies to patients with specific comorbidities (e.g., diabetes mellitus, chronic kidney disease, arthritis).	I			
M-PREV-PC10	Skill to appropriately integrate new medical information into patient care.	I			
	Evaluation Tools: chart-stimulated recall, direct observation, registry and/or hospital program quality data				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-PREV-SBP1	Practice in a manner that best balances appropriate utilization of finite resources with the net clinical benefit for the individual patient.	I			
M-PREV-SBP2	Utilize an interdisciplinary team approach for disease management.	I			
M-PREV-SBP3	Coordinate patient care among healthcare providers, including transfer of care.	I			
M-PREV-SBP4	Identify and address financial, cultural, and social barriers to treatment implementation and adherence.	I			
M-PREV-SBP5	Appropriately utilize specialty care for patients with advanced or complex diabetes mellitus, complex lipid disorders, refractory hypertension, obesity, depression, or sleep apnea.	I			
M-PREV-SBP6	Appropriately utilize disease management tools and protocols as an aid in the management of patients with high risk-factor burden and established chronic diseases.	I			
	Evaluation Tools: direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-PREV-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-PREV-PBL2	Utilize point-of-service resources to enhance adherence to guidelines and protocols and obtain new information from clinical trials and professional societies.		I		
	Evaluation Tools: chart-stimulated recall, direct observation, registry and/or hospital program quality data, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-PREV-PROF1	Know and promote adherence to guidelines and appropriate use criteria.		I		
M-PREV-PROF2	Demonstrate respect for individuals with lifestyle disorders such as obesity and tobacco use.	I			
M-PREV-PROF3	Practice prevention in your personal lifestyle and promote a culture of healthy lifestyle choices and physical activity in your work environment	I			

	and community.				
	Evaluation Tools: conference presentation, direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-PREV-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds regarding appropriate risk factor modification.		I		
M-PREV-ICS2	Communicate in ways that patients and families can understand the evidence on which recommendations are based.		I		
M-PREV-ICS3	Evaluate a patient's health literacy and appropriately adapt counseling strategies and tools.	I			
M-PREV-ICS4	Communicate effectively with patients, families, and referring physicians.	I			
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 3, Table 1. Core Competency Components and Curricular Milestones for Training in ECG/Ambulatory ECG

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-TEST-ECG-MK1	Know the basic principles of electrocardiography and the operation/use of the instruments to acquire, display, and store electrocardiograms. (See Appendix 3.)	I			
M-TEST-ECG-MK2	Know the underlying cellular and ionic mechanisms in the genesis of surface electrocardiograms and the effects of the autonomic nervous system. (See Appendix 3.)		I		
M-TEST-ECG-MK3	Know the normal values for electrical axis and electrocardiographic intervals, durations, and voltage.	I			
M-TEST-ECG-MK4	Know the anatomy of the specialized conducting tissue and the spread of excitation in conduction system and myocardium.	I			
M-TEST-ECG-MK5	Know reentry, automaticity, and triggered activity mechanisms for cardiac arrhythmias.		I		
M-TEST-ECG-MK6	Know the types and mechanisms of aberrancy.		I		
M-TEST-ECG-MK7	Know capture and fusion complexes and the electrocardiographic pattern criteria for distinguishing supraventricular arrhythmias with aberrancy, accessory pathway conduction, pacing, and artifact from ventricular arrhythmias.			I	
M-TEST-ECG-MK8	Know the concepts of concealed conduction and exit block and their manifestation on the electrocardiogram.			I	
M-TEST-ECG-MK9	Know the characteristic electrocardiographic patterns of key clinical diagnoses. (See Appendix 4.)			I	
M-TEST-ECG-MK10	Awareness of ECG changes that are commonly seen in highly trained athletes and the challenges in distinguishing normal from abnormal findings.		I		
M-TEST-ECG-MK11	Know the indications for, and limitations of, continuous (Holter) and intermittent (event) ambulatory electrocardiographic recording.	I			
	***Evaluation Tools**:* direct observation, ECG and rhythm interpretation during simulation training (e.g., mock codes), global evaluation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-TEST-ECG-PC1	Technical skills to perform and record high quality standard 12-lead electrocardiographic tracings.	I			
M-TEST-ECG-PC2	Skill to identify normal electrocardiographic patterns, normal variants, and artifacts (including incorrect lead placement).		I		
M-TEST-ECG-PC3	Skill to identify electrocardiographic signs of atrial abnormalities and right and left ventricular hypertrophy or enlargement.		I		
M-TEST-ECG-PC4	Skill to identify types and significance of intraventricular conduction delay or block (including functional or aberrant conduction abnormalities).			I	
M-TEST-ECG-PC5	Skill to identify types of atrioventricular dissociation.			I	
M-TEST-ECG-PC6	Skill to identify first-degree, second-degree (types I, II, 2:1, and high degree), and third-degree atrioventricular blocks.			I	
M-TEST-ECG-PC7	Skill to identify the electrocardiographic patterns and localization of cardiac ischemia and infarction.		I		
M-TEST-ECG-PC8	Skill to identify the electrocardiographic changes of electrolyte and metabolic abnormalities and drug effects.			I	
M-TEST-ECG-PC9	Skill to identify non-specific QRS and ST-T wave changes.		I		
M-TEST-ECG-PC10	Skill to identify atrial, atrioventricular, nodal, and ventricular arrhythmias.			I	
M-TEST-ECG-PC11	Skill to identify each of the specific patterns and rhythms in Appendix 4.			I	
M-TEST-ECG-PC12	Skill to integrate electrocardiographic findings into clinical and risk assessments and the management of patients.		I		
M-TEST-ECG-PC13	Skill to select and interpret ambulatory electrocardiographic recording studies.			I	
M-TEST-ECG-PC14	Skill to identify normal and abnormal pacemaker rhythms/functions, and when to seek consultation from an electrophysiologist for advanced			I	

	interpretation.				
	***Evaluation Tools**:* direct observation, ECG exam, in-training exam				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-TEST-ECG-SBP1	Skill to retrieve and utilize ECG tracings in electronic data systems.	I			
	Evaluation Tools conference presentation, direct observation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-TEST-ECG-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.			I	
	Evaluation Tools: conference presentation, ECG exam				
	Professionalism	**12**	**24**	**36**	**Add**
M-TEST-ECG-PROF1	Practice within the scope of expertise and technical skills.	I			
M-TEST-ECG-PROF2	Know and adhere to evidence-based and appropriate use criteria for ECG testing.			I	
	***Evaluation Tools**:* conference presentation, direct observation, multisource evaluation, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-TEST-ECG-ICS1	Communicate testing results to physicians and patients in an effective and timely manner.			I	
	***Evaluation Tool**:* multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 3, Table 2. Core Competency Components and Curricular Milestones for Training in Exercise ECG Testing

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-TEST-STRESS-MK1	Know the indications, risks, limitations, and contraindications for exercise stress testing both for diagnosis and risk stratification in patients with suspected or known coronary heart disease.		I		
M-TEST-STRESS-MK2	Know the principles and details of exercise testing, including the standard requirements of a safe testing laboratory, and technical requirements of proper lead placement and skin preparation.		I		
M-TEST-STRESS-MK3	Know the application of Bayes' theorem to interpret exercise test results.		I		
M-TEST-STRESS-MK4	Know the common exercise test protocols and targets.		I		
M-TEST-STRESS-MK5	Know the concept of metabolic equivalent (MET) and estimation of exercise intensity in different modes of exercise.		I		
M-TEST-STRESS-MK6	Know the electrocardiographic criteria for a positive test.		I		
M-TEST-STRESS-MK7	Know the normal and abnormal heart rhythm and blood pressure responses to graded exercise and in recovery.		I		
M-TEST-STRESS-MK8	Know the electrocardiographic, exercise capacity, and/or hemodynamic findings indicating a strongly positive test or adverse prognosis.		I		
M-TEST-STRESS-MK9	Know the changes in the electrocardiogram that may result from exercise, hyperventilation, ischemia, hypertrophy, conduction disorders, electrolytes, and drugs.			I	
M-TEST-STRESS-MK10	Know the criteria and indications for stopping a test before reaching the target heart rate.		I		
M-TEST-STRESS-MK11	Know the significance of exercise-associated arrhythmias.			I	
M-TEST-STRESS-MK12	Know the use of exercise testing in special groups (women, asymptomatic subjects, post-myocardial infarction, or recent acute coronary syndrome patients).			I	
M-TEST-STRESS-MK13	Know the use, precautions, and contraindications of exercise testing in patients with valvular and myocardial diseases.			I	
M-TEST-STRESS-MK14	Know the effects of baseline electrocardiographic abnormalities and medications on exercise testing.		I		
M-TEST-STRESS-MK15	Know clinical and baseline electrocardiographic findings that warrant the addition of imaging to the exercise electrocardiogram.		I		
M-TEST-STRESS-MK16	Know the indications for the selection of pharmacologic rather than exercise testing.		I		
M-TEST-STRESS-MK17	Know the indications for, and the sensitivity and specificity of, adding echocardiographic or nuclear perfusion imaging to stress ECG testing.			I	
M-TEST-STRESS-MK18	Known the indications for myocardial perfusion imaging and the appropriate selection of exercise versus pharmacologic stress testing.		I		
M-TEST-STRESS-MK19	Know the role of stress testing in assessment of valvular heart disease.			I	
M-TEST-STRESS-MK20	Know the role of exercise ECG testing in the evaluation of arrhythmias.			I	
M-TEST-STRESS-MK21	Know the role of exercise ECG testing in the evaluation of genetic cardiovascular conditions (e.g., long QT syndrome), including hypertrophic cardiomyopathy.			I	
M-TEST-STRESS-MK22	Know the role of cardiopulmonary exercise testing in the evaluation of dyspnea.		I		
M-TEST-STRESS-MK23	Know the role of exercise testing in physical activity and exercise prescription in patients with cardiovascular disease.		I		
M-TEST-STRESS-MK24	Know the role of exercise testing with measurement of ankle-brachial indices in the evaluation of patients with known or suspected peripheral arterial disease.			I	

	***Evaluation Tools**:* chart-stimulated recall, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-TEST-STRESS-PC1	Skill to select clinically-appropriate exercise test type and protocol for diverse patient types and clinical settings.			I	
M-TEST-STRESS-PC2	Skill to safely perform appropriate heart-rate limited and maximal or near-maximal treadmill exercise tests.		I		
M-TEST-STRESS-PC3	Skill to identify and effectively treat complications during and following stress testing.			I	
M-TEST-STRESS-PC4	Skill to utilize exercise symptoms and capacity, ECG findings, and hemodynamic response in the risk assessment and management of patients.			I	
M-TEST-STRESS-PC5	Skill to interpret limb segmental blood pressure measurements, pulse volume recordings, and treadmill vascular exercise tests.			I	
M-TEST-STRESS-PC6	Skill to utilize data from the exercise test in deriving an exercise prescription for patients with cardiovascular disease.			I	
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, logbook				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-TEST-STRESS-SBP1	Effectively lead and coordinate the exercise test inter-professional team (including nurses and technicians) to ensure safe and efficient care.			I	
M-TEST-STRESS-SBP2	Incorporate risk/benefit analysis and cost considerations in test selection.			I	
	***Evaluation Tools**:* conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-TEST-STRESS-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.			I	
M-TEST-STRESS-PBL2	Review practice alignment with guidelines.			I	
	***Evaluation Tools**:* conference presentation, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-TEST-STRESS-PROF1	Demonstrate sensitivity and responsiveness to diverse patient populations.			I	
M-TEST-STRESS-PROF2	Know and adhere to evidence-based and appropriate use criteria for utilizing stress testing.			I	
	***Evaluation Tools**:* conference presentation, direct observation, multisource evaluation, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-TEST-STRESS-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.			I	
M-TEST-STRESS-ICS2	Communicate testing results to physicians and patients in an effective and timely manner.			I	
	***Evaluation Tool**:* multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 5, Table 1. Core Competency Components and Curricular Milestones for Training in Echocardiography

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-IMAG-ECHO-MK1	Know the physical principles of ultrasound, and the instrumentation used to obtain images.	I			
M-IMAG-ECHO-MK2	Know the appropriate indications, including the AUC, for: M-mode, 2-dimensional, and 3-dimensional transthoracic echocardiography; Doppler echocardiography and color flow imaging; transesophageal echocardiography; tissue Doppler and strain imaging; and contrast echocardiography.		I		
M-IMAG-ECHO-MK3	Know the limitations and potential artifacts of the echocardiographic examination.	I			
M-IMAG-ECHO-MK4	Know the standard views included in a comprehensive transthoracic echocardiography.	I			
M-IMAG-ECHO-MK5	Know the standard views included in a comprehensive transesophageal echocardiography.		I		
M-IMAG-ECHO-MK6	Know the techniques to quantify cardiac chamber sizes and evaluate left and right ventricular systolic and diastolic function and hemodynamics.			II	
M-IMAG-ECHO-MK7	Know the characteristic findings of cardiomyopathies.		I		
M-IMAG-ECHO-MK8	Know the use of echocardiographic and Doppler data to evaluate native and prosthetic valve function and diseases.			II	
M-IMAG-ECHO-MK9	Know the echocardiographic and Doppler findings of cardiac ischemia and infarction, and the complications of myocardial infarction.		I		
M-IMAG-ECHO-MK10	Know the echocardiographic findings of pericardial disease, pericardial effusion, and pericardial constriction.		II		
M-IMAG-ECHO-MK11	Know the characteristic findings of basic adult congenital heart disease.			II	
M-IMAG-ECHO-MK12	Know the findings of complex/postoperative adult congenital heart disease.			III*†	III*
M-IMAG-ECHO-MK13	Know the techniques to evaluate cardiac masses and suspected endocarditis.		II		
M-IMAG-ECHO-MK14	Know the techniques to evaluate diseases of the aorta.		II		
M-IMAG-ECHO-MK15	Know the techniques to assess pulmonary artery pressure and diseases of the right heart.		II		
M-IMAG-ECHO-MK16	Know the use and characteristic findings in the evaluation of patients with systemic diseases involving the heart.		II		
M-IMAG-ECHO-MK17	Know the indications for, and the echocardiographic findings in, patients with known or suspected cardioembolic events.		II		
M-IMAG-ECHO-MK18	Know key aspects of contrast echocardiography including interpretation, administration techniques, and safety information.			II	
M-IMAG-ECHO-MK19	Understand the principles and applications of 3-dimensional echocardiography.		II		
M-IMAG-ECHO-MK20	Recognize and treat the potential complications of stress, contrast, and transesophageal echocardiography.		II		
	Evaluation Tools: conference presentation, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-IMAG-ECHO-PC1	Skill to perform and interpret a basic transthoracic echocardiography exam.		I		
M-IMAG-ECHO-PC2	Skill to perform and interpret comprehensive transthoracic echocardiography exam.			II	
M-IMAG-ECHO-PC3	Skill to perform and interpret comprehensive transesophageal echocardiography exam.			II	
M-IMAG-ECHO-PC4	Skill to recognize pathophysiology, quantify severity of disease, identify associated findings, and recognize artifacts in echocardiography.			II	
M-IMAG-ECHO-PC5	Skill to integrate echocardiographic findings with clinical and other		I		

	testing results in the evaluation and management of patients.				
M-IMAG-ECHO-PC6	Skill to interpret stress echocardiography.			II	
M-IMAG-ECHO-PC7	Skill to incorporate stress hemodynamic information in the management of complex valve disease or hypertrophic cardiomyopathy.			II	
M-IMAG-ECHO-PC8	Skill to utilize echocardiographic techniques during cardiac interventions, including intraoperative transesophageal echocardiography.			III†	III
M-IMAG-ECHO-PC9	Skill to perform and interpret basic 3-dimensional echocardiography.			II	
M-IMAG-ECHO-PC10	Skill to utilize advanced 3-dimensional echocardiography during guidance of procedures and/or surgery.			III†	III
M-IMAG-ECHO-PC11	Skill to perform and interpret contrast echocardiography studies.			II	
	Evaluation Tools: direct observation, logbook, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-IMAG-ECHO-SBP1	Work effectively and efficiently with the echocardiography laboratory staff.	I			
M-IMAG-ECHO-SBP2	Incorporate risk/benefit, safety, and cost considerations in the use of ultrasound techniques.			I	
M-IMAG-ECHO-SBP3	Participate in echocardiographic quality monitoring and initiatives.			II	
	Evaluation Tools: direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-IMAG-ECHO-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
	Evaluation Tools: conference presentation, direct observation				
	Professionalism	**12**	**24**	**36**	**Add**
M-IMAG-ECHO-PROF1	Know and promote adherence to guidelines and appropriate use criteria.		I		
M-IMAG-ECHO-PROF2	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.	I			
	Evaluation Tools: conference presentation, direct observation, multisource evaluation, reflection and self-assessment				
	Interpersonal and Communication Skills				
M-IMAG-ECHO-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.		II		
M-IMAG-ECHO-ICS2	Communicate testing results to physicians and patients in an effective and timely manner.		II		
M-IMAG-ECHO-ICS3	Communicate detailed information on cardiac anatomy for surgical planning or guidance of interventional procedures.			II	
	Evaluation Tools: direct observation, multisource evaluation				

*Because of its unique and specialized nature, competency in the interpretation of complex and postoperative congenital heart disease echocardiography studies will usually require training beyond Level II.
†See definition of Level III training in Section 1.2.
Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 6, Table 1. Core Competency Components and Curricular Milestones for Training in Nuclear Cardiology

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-IMAG-NC-MK1	Know the principles of single-photon emission computed tomography and radionuclide ventriculography image acquisition and display, including the standard tomographic planes and views.		I		
M-IMAG-NC-MK2	Know the properties and use of standard perfusion tracers.			I	
M-IMAG-NC-MK3	Know the principles of radiation safety and how to minimize radiation exposure.			II	
M-IMAG-NC-MK4	Know the indications for myocardial perfusion imaging and the appropriate selection of exercise versus pharmacologic stress testing.	I			
M-IMAG-NC-MK5	Know the principles and use of pretest probability and sequential probability analysis to assess posttest probability.	I			
M-IMAG-NC-MK6	Know the mechanism of pharmacologic stress agents, methods of their administration, and safety issues in using the agents.		I		
M-IMAG-NC-MK7	Know the protocols for administration of standard perfusion agents and the influence of the clinical situation on choice of imaging protocol.		I		
M-IMAG-NC-MK8	Know the quality control issues, how to review raw data, and recognize artifacts.			II	
M-IMAG-NC-MK9	Know the use of nuclear cardiology in the assessment of ventricular function.		I		
M-IMAG-NC-MK10	Know the protocols for the use of perfusion imaging to assess myocardial viability.		I		
M-IMAG-NC-MK11	Know the indications for positron emission testing imaging and use of positron emission testing tracers.			II	
	Evaluation Tools: direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-IMAG-NC-PC1	Skill to select the appropriate imaging study.		I		
M-IMAG-NC-PC2	Skill to integrate perfusion imaging findings with clinical and other test results in the evaluation and management of patients.		I		
M-IMAG-NC-PC3	Skill to identify results that indicate a high-risk state.		I		
M-IMAG-NC-PC4	Skill to perform and interpret gated stress-rest perfusion study.			II	
M-IMAG-NC-PC5	Skill to perform and interpret a radionuclide ventriculography study.			II	
M-IMAG-NC-PC6	Skill to perform and interpret hybrid SPECT/CT and PET/CT imaging.				III
M-IMAG-NC-PC7	Skill to perform and quantify PET absolute myocardial blood flow and metabolism.				III
M-IMAG-NC-PC8	Skill to perform and interpret cardiac innervation, first pass, and planar studies.				III
	Evaluation Tools: conference presentation, direct observation, logbook				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-IMAG-NC-SBP1	Work effectively and efficiently with the nuclear laboratory staff.			II	
M-IMAG-NC-SBP2	Incorporate risk/benefit and cost considerations in the use of radionuclide imaging techniques.			I	
M-IMAG-NC-SBP3	Participate in laboratory quality monitoring and initiatives.			II	
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-IMAG-NC-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.			I	
	Evaluation Tools: conference presentation, direct observation				
	Professionalism	**12**	**24**	**36**	**Add**
M-IMAG-NC-PROF1	Know and promote adherence to guidelines and appropriate use criteria.		I		
M-IMAG-NC-PROF2	Interact respectfully with patients, families, and all members of the health care teaM-including ancillary and support staff.	I			
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**

M-IMAG-NC-ICS1	Communicate effectively and timely with patients, families, and referring physicians.		I	II	
M-IMAG-NC-ICS2	Communicate test results in a comprehensive and user-friendly manner.			II	
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 7, Table 1. Core Competency Components and Curricular Milestones for Training in Cardiovascular Computed Tomography

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-IMAG-CCT-MK1	Know the principles of cardiovascular computed tomographic scanning and the scanning modes.		I		
M-IMAG-CCT-MK2	Know the risks and safety measures for cardiovascular computed tomographic scanning, including radiation reduction strategies.			I	
M-IMAG-CCT-MK3	Know the appropriate indications for cardiovascular computed tomography for screening or evaluating symptoms in patients with suspected cardiac disease.		I		
M-IMAG-CCT-MK4	Know the indications, potential adverse effects, prevention, and treatment of complications of iodinated contrast agent use in cardiovascular computed tomographic studies.		I		
M-IMAG-CCT-MK5	Know the indications and protocols for beta-adrenergic blocking drugs and nitroglycerin during cardiovascular computed tomographic studies.			II	
M-IMAG-CCT-MK6	Know the principles of cardiovascular computed tomographic scan collimation, temporal resolution, table speed, field of view, and window and level view settings.			II	
M-IMAG-CCT-MK7	Know the principles of post-processing methods for cardiovascular computed tomographic scanning.			II	
M-IMAG-CCT-MK8	Know the algorithms used for reconstruction, and recognize and isolate causes of artifacts.			II	
M-IMAG-CCT-MK9	Know the principles of quantitative coronary artery calcium scoring.			II	
M-IMAG-CCT-MK10	Know normal chest anatomy and common incidental extra cardiac findings.			II	
M-IMAG-CCT-MK11	Know the characteristic cardiovascular computed tomographic images of normal cardiac chambers and great vessels, normal coronary arteries and veins, and normal variants.			I	
M-IMAG-CCT-MK12	Know the characteristic cardiovascular computed tomographic findings of coronary atherosclerosis including plaque morphology and assessment of stenosis severity.			II	
M-IMAG-CCT-MK13	Know the characteristic cardiovascular computed tomographic findings of anomalous coronary arteries and other common congenital anomalies.			II	
M-IMAG-CCT-MK14	Know the characteristic cardiovascular computed tomographic findings in postoperative cardiac surgical patients including internal mammary artery and saphenous vein bypass grafts.			II	
M-IMAG-CCT-MK15	Know the characteristic cardiovascular computed tomographic findings of acquired and congenital valvular disease.			II	
M-IMAG-CCT-MK16	Know the characteristic cardiovascular computed tomographic findings of left atrial and pulmonary and coronary venous abnormalities.			II	
M-IMAG-CCT-MK17	Know the characteristic cardiovascular computed tomographic findings of pericardial disease.			II	
M-IMAG-CCT-MK18	Know the characteristic cardiovascular computed tomographic findings of cardiomyopathies and infiltrative myocardial diseases.			II	
M-IMAG-CCT-MK19	Know the differential diagnosis of cardiac masses identified by cardiovascular computed tomography.			II	
M-IMAG-CCT-MK20	Know the characteristic cardiovascular computed tomographic findings of common diseases of the aorta and great vessels.			II	
M-IMAG-CCT-MK21	Know the characteristic cardiovascular computed tomographic findings of pulmonary embolism and primary and acquired pulmonary vascular diseases.			II	
M-IMAG-CCT-MK22	Know when to request help with interpretation of difficult studies, such as patients with complex congenital heart disease.			I	
	***Evaluation Tools*:** conference presentation, direct observation, in-training exam				

	Patient Care and Procedural Skills	12	24	36	Add
M-IMAG-CCT-PC1	Skill to appropriately utilize cardiovascular computed tomography in the evaluation and management of patients with known or suspected cardiovascular disease.			I	
M-IMAG-CCT-PC2	Skill to integrate cardiovascular computed tomographic findings with other clinical information in patient evaluation and management.			I	
M-IMAG-CCT-PC3	Skill to recognize and treat contrast-related adverse reactions.	I			
M-IMAG-CCT-PC4	Skill to independently perform and interpret cardiovascular computed tomography.			II	
M-IMAG-CCT-PC5	Skill to perform and interpret hybrid CT/SPECT and CT/PET imaging.				III
	***Evaluation Tools*:** conference presentation, direct observation, logbook				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-IMAG-CCT-SBP1	Incorporate appropriate use criteria, risk/benefit, and cost considerations in the use of cardiovascular computed tomography and alternative imaging modalities.		I		
	***Evaluation Tools*:** conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-IMAG-CCT-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.			I	
M-IMAG-CCT-PBL2	Utilize point-of-care educational resources (e.g., guidelines, appropriate use criteria, and clinical trial results).			I	
	***Evaluation Tools*:** conference presentation, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-IMAG-CCT-PROF1	Work effectively in an interdisciplinary CCT environment.		I		
M-IMAG-CCT-PROF2	Reliably obtain patient informed consent, ensuring that patients understand the risks and benefits of—and alternatives to—cardiovascular computed tomographic testing.		I		
M-IMAG-CCT-PROF3	Know and promote adherence to clinical practice guidelines.		I		
	Evaluation Tools: conference presentation, direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-IMAG-CCT-ICS1	Communicate testing results to physicians and patients in an effective and timely manner.		I		
	***Evaluation Tools*:** direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 8, Table 1. Core Competency Components and Curricular Milestones for Training in Cardiovascular Magnetic Resonance

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-IMAG-CMR-MK1	Know the principles of cardiovascular magnetic resonance image acquisition.		I		
M-IMAG-CMR-MK2	Know the principles of safety and contraindications for cardiovascular magnetic resonance imaging.	I			
M-IMAG-CMR-MK3	Know the uses, potential side effects, and contraindications of using gadolinium-based contrast agents in cardiovascular magnetic resonance imaging.	I			
M-IMAG-CMR-MK4	Know the indications for cardiovascular magnetic resonance to assess left and right heart chamber sizes and function.		I		
M-IMAG-CMR-MK5	Know the cardiovascular magnetic resonance indications for assessment of myocardial viability.		I		
M-IMAG-CMR-MK6	Know the cardiovascular magnetic resonance indications and characteristic findings of myocardial ischemia.		I		
M-IMAG-CMR-MK7	Know the cardiovascular magnetic resonance indications and characteristic findings of acute myocardial infarction.		I		
M-IMAG-CMR-MK8	Know the cardiovascular magnetic resonance indications and characteristic findings of acute coronary syndromes and other causes of myocardial injury.		I		
M-IMAG-CMR-MK9	Know the cardiovascular magnetic resonance indications and differential findings in cardiomyopathies of uncertain cause.		I		
M-IMAG-CMR-MK10	Know the cardiovascular magnetic resonance indications to assess diseases of the pericardium.		I		
M-IMAG-CMR-MK11	Know the cardiovascular magnetic resonance indications to evaluate valvular heart disease.		I		
M-IMAG-CMR-MK12	Know the cardiovascular magnetic resonance indications and characteristic findings of myocardial masses and thrombi.			I	
M-IMAG-CMR-MK13	Know the cardiovascular magnetic resonance indications for left atrial and pulmonary vein mapping prior to ablation of atrial fibrillation.		I		
M-IMAG-CMR-MK14	Know the cardiovascular magnetic resonance indications for evaluation of adult congenital heart disease including identification of coronary artery anomalies.			I	
M-IMAG-CMR-MK15	Know the cardiovascular magnetic resonance indications to detect and evaluate diseases of the aorta and peripheral arteries.			I	
	Evaluation Tools: conference presentation, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-IMAG-CMR-PC1	Skill to appropriately order and integrate the results of cardiovascular magnetic resonance testing with other clinical findings in the evaluation and management of patients.			I	
M-IMAG-CMR-PC2	Skill to interpret cardiovascular magnetic resonance tissue characterization (late gadolinium enhancement) to distinguish the etiology of cardiomyopathy and acute myocardial injury.			I	
M-IMAG-CMR-PC3	Skill to interpret regional and global left and right ventricular wall motion and ejection fraction.			II	
M-IMAG-CMR-PC4	Skill to interpret vascular diseases of the aorta (e.g., intramural hematoma, dissection, coarctation, and aneurysm).			II	
M-IMAG-CMR-PC5	Skill to identify and characterize myocardial masses.			II	
M-IMAG-CMR-PC6	Skill to identify and characterize pericardial disease.			II	
M-IMAG-CMR-PC7	Skill to identify and diagnose basic congenital heart disease in adults.			II	
M-IMAG-CMR-PC8	Skill to identify and diagnose complex adult congenital heart disease, including quantification of intracardiac shunting, and anomalous coronary arteries.			II	
M-IMAG-CMR-PC9	Skill to perform and interpret cardiovascular magnetic resonance stress testing.			II	
M-IMAG-CMR-PC10	Skill to interpret vascular diseases of the peripheral arteries.				III

	***Evaluation Tools*:** conference presentation, direct observation, logbook				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-IMAG-CMR-SBP1	Incorporate risk/benefit and cost considerations in the use of cardiovascular magnetic resonance testing.		I		
M-IMAG-CMR-SBP2	Participate in cardiovascular magnetic resonance quality monitoring and initiatives.			II	
	***Evaluation Tools*:** chart-stimulated recall, conference presentations, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-IMAG-CMR-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.			I	
	Evaluation Tools: chart-stimulated recall, conference presentations, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-IMAG-CMR-PROF1	Practice within the scope of expertise and technical skills.			I	
M-IMAG-CMR-PROF2	Know and promote adherence to guidelines and appropriate use criteria.		I		
	***Evaluation Tools*:** chart-stimulated recall, conference presentations, direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-IMAG-CMR-ICS1	Communicate testing results to physicians and patients in an effective and timely manner.		II		
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 9, Table 1. Core Competency Components and Curricular Milestones for Training in Vascular Medicine

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-VASC-MK1	Know the anatomy of the peripheral arterial and venous systems.	I			
M-VASC-MK2	Know the causes and clinical epidemiology of atherosclerotic peripheral vascular disease, including the incidence and prevalence, sex and ethnic differences, role of genetics, and the influence of traditional risk factors and demographics on outcomes.	I			
M-VASC-MK3	Know the pathophysiology of peripheral artery disease, including atherosclerosis, thrombosis, embolism, entrapment, vasculitis, and vasospasm.		I		
M-VASC-MK4	Know the pathophysiology, causes and clinical epidemiology of aortic aneurysms.	I			
M-VASC-MK5	Know the pathophysiology, causes, and clinical epidemiology of acute aortic syndromes such as dissection and intramural hematoma.		I		
M-VASC-MK6	Know the pathophysiology, causes, and clinical epidemiology of deep vein thrombosis and pulmonary embolism.	I			
M-VASC-MK7	Know the pathophysiology, causes, and clinical epidemiology of cerebrovascular disease.		I		
M-VASC-MK8	Know the pathophysiology, causes, and clinical epidemiology of chronic venous insufficiency and varicose veins.		I		
M-VASC-MK9	Know the pathophysiology, causes, and clinical epidemiology of lymphedema.			II	
M-VASC-MK10	Know the cardinal symptoms and physical findings of peripheral atherosclerotic vascular diseases, including peripheral artery disease, renal and mesenteric artery disease, extracranial cerebrovascular disease, and abdominal aortic aneurysm.	I			
M-VASC-MK11	Know the cardinal symptoms and physical findings of venous diseases including venous thromboembolism, chronic venous insufficiency, and varicose veins.	I			
M-VASC-MK12	Know the differentiating characteristics between arterial, venous, and neurotrophic lower extremity ulcers.			II	
M-VASC-MK13	Know the natural history and prognosis of deep vein thrombosis and pulmonary embolism.	I			
M-VASC-MK14	Know the natural history and prognosis of peripheral atherosclerotic vascular diseases including peripheral artery disease, renal and mesenteric artery disease, extracranial carotid artery disease, and abdominal aortic aneurysm.		I		
M-VASC-MK15	Know the indications for noninvasive screening for abdominal aortic aneurysm.		I		
M-VASC-MK16	Know the indications for duplex ultrasound of the peripheral veins and carotid arteries and for duplex and physiological testing of the peripheral arteries.		I		
M-VASC-MK17	Know the indications for duplex ultrasonography of the renal and mesenteric arteries, arterial bypass grafts and stents, aortic endografts, and intracranial vessels (i.e., transcranial Doppler).			II	
M-VASC-MK18	Know the indications and contraindications for computed tomographic angiography and magnetic resonance angiography in patients with suspected vascular disease.		I		
M-VASC-MK19	Know the appropriate indications and laboratory tests to assess for inherited and acquired thrombophilia.		I		
M-VASC-MK20	Know the appropriate indications and laboratory tests to assess for vasculitis.		I		
M-VASC-MK21	Know the indications, contraindications, risks, clinical pharmacology, and interactions of drugs used to treat atherosclerotic vascular diseases.		I		
M-VASC-MK22	Know the indications, contraindications, risks, clinical pharmacology, and interactions of drugs used to treat thrombotic disorders.	I			

M-VASC-MK23	Know the indications, contraindications, risks, and expected outcomes for thrombolytic therapy for venous thromboembolism (pulmonary embolism and deep vein thrombosis).	I			
M-VASC-MK24	Know the indications and risks for surgical and endovascular treatments for acute aortic syndromes; and, the expected outcomes.		I		
M-VASC-MK25	Know the indications and risks for surgical and endovascular treatments for aortic aneurysm; and, the expected outcomes.		I		
M-VASC-MK26	Know the indications and risks for surgical and endovascular treatments for peripheral atherosclerotic vascular diseases, including peripheral artery disease, renal and mesenteric artery disease, and extracranial cerebrovascular disease; and the expected outcomes.		I		
	Evaluation Tools: chart-stimulated recall, global evaluation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-VASC-PC1	Skill to perform the comprehensive physical examination of the peripheral arteries, including palpation of the abdominal aorta and peripheral pulses and auscultation for bruits.	I			
M-VASC-PC2	Skill to perform physical examination for suspected peripheral venous disorders, including deep vein thrombosis, varicose veins, and chronic venous insufficiency.		I		
M-VASC-PC3	Skill to perform and interpret an ankle-brachial index measurement.		I		
M-VASC-PC4	Skill to perform physical examination maneuvers for arterial compression syndromes (e.g., thoracic outlet, median arcuate ligament, and popliteal artery entrapment syndromes).				III
M-VASC-PC5	Skill to interpret limb segmental blood pressure measurements, pulse volume recordings and Doppler waveforms, and treadmill vascular exercise tests.			II	
M-VASC-PC6	Skill to interpret duplex ultrasound examinations of the extracranial carotid arteries, peripheral arteries, abdominal aorta, renal and mesenteric arteries, and peripheral veins.			II	
M-VASC-PC7	Skill to evaluate and manage aortic aneurysms including identification of patients for whom surgical or endovascular repair is indicated.		I		
M-VASC-PC8	Skill to evaluate and manage acute aortic syndromes including identification of patients for whom surgical or endovascular therapy is indicated.		I		
M-VASC-PC9	Skill to evaluate and manage patients with deep venous thrombosis and pulmonary embolism, including identification of patients for whom thrombolytic therapy is indicated.		I		
M-VASC-PC10	Skill to perform preoperative risk assessment and manage patients undergoing vascular surgery.		I		
M-VASC-PC11	Skill to evaluate and manage lower extremity peripheral artery disease.		I		
M-VASC-PC12	Skill to evaluate and manage extracranial carotid artery disease.		I		
M-VASC-PC13	Skill to evaluate and manage patients with chronic venous insufficiency and varicose veins, including use of compression therapy and identification of patients for whom additional venous procedures are indicated (i.e., sclerotherapy, ablation, or surgery).				III
M-VASC-PC14	Skill to evaluate lymphedema.			II	
M-VASC-PC15	Skill to manage lymphedema.				III
M-VASC-PC16	Skill to diagnose and manage arterial access complications, including arteriovenous fistula and arterial pseudoaneurysms.				III
M-VASC-PC17	Skill to evaluate and manage lower extremity wounds, including indications for adjunctive imaging and biopsy, indications and techniques for debridement, and selection of appropriate dressings.				III

M-VASC-PC18	Skill to evaluate and manage Raynaud's phenomenon.				III
M-VASC-PC19	Skill to evaluate and manage other temperature related disorders, including acrocyanosis, pernio, and erythromelalgia.				III
M-VASC-PC20	Skill to evaluate and manage uncommon vascular disorders, including vascular compression syndromes (e.g., thoracic outlet, popliteal entrapment), fibromuscular dysplasia, arteriopathies associated with inherited disorders of connective tissue, and congenital vascular malformations.				III
M-VASC-PC21	Skill to evaluate and manage peripheral and visceral artery aneurysms including identification of patients for whom surgical or endovascular repair is indicated.				III
	Evaluation Tools: chart-stimulated recall, direct observation, global evaluation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-VASC-SBP1	Practice in a manner that balances appropriate utilization of finite resources with the net clinical benefit for the individual patient.		I		
M-VASC-SBP2	Utilize an interdisciplinary, coordinated approach for patient management.			II	
M-VASC-SBP3	Utilize a coordinated approach for patient management, including coordination with rehabilitation services, physical and occupational therapy, and consideration of employment-related issues.				III
M-VASC-SBP4	Know the components of quality assurance in the noninvasive vascular laboratory, including certification of technical and medical personnel, laboratory accreditation, and internal quality improvement initiatives.			II	
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-VASC-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-VASC-PBL2	Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, global evaluation				
	Professionalism	**12**	**24**	**36**	**Add**
M-VASC-PROF1	Forego recommending unvalidated diagnostic testing or treatments.		I		
M-VASC-PROF2	Demonstrate a commitment to carry out professional responsibilities, appropriately refer patients, and respond to patient needs in a way that supersedes self-interest.			II	
M-VASC-PROF3	Know and promote adherence to guidelines and appropriate use criteria.			I	
M-VASC-PROF4	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.	I			
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-VASC-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.	I			
M-VASC-ICS2	Communicate with other specialists for optimal interdisciplinary management of patients.			II	
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 10, Table 1. Core Competency Components and Curricular Milestones for Training in Invasive Cardiology

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-INV/INT-MK1	Know the indications/contraindications and potential complications of cardiac catheterization for assessment of coronary, valvular, myocardial, and basic adult congenital heart diseases.		I		
M-INV/INT-MK2	Know the principles of radiation safety.		I		
M-INV/INT-MK3	Know the use and complications of contrast media and the role of renal protection measures.		I		
M-INV/INT-MK4	Know the indications for, and clinical pharmacology of, antiplatelet and anticoagulant drugs, and vasopressor and vasodilator agents, used in the cardiac catheterization laboratory.		I		
M-INV/INT-MK5	Know normal cardiovascular hemodynamics and the principles and interpretation of waveforms, pressure, flow, resistance, and cardiac output measurements.		I		
M-INV/INT-MK6	Know the characteristic hemodynamic findings with myocardial, valvular, pericardial, and pulmonary vascular diseases.		I		
M-INV/INT-MK7	Know the methods to detect and estimate the magnitude of intracardiac and extracardiac shunts.		I		
M-INV/INT-MK8	Know coronary anatomy, its variations and congenital abnormalities, and its coronary blood flow physiology.		I		
M-INV/INT-MK9	Know the angiographic features of coronary artery disease and how to assess the anatomic and physiologic severity.		I		
M-INV/INT-MK10	Know the vascular anatomy and the indications and contraindications for, and complications of, peripheral vascular angiography.		I		
M-INV/INT-MK11	Know the indications and potential complications of percutaneous coronary, peripheral, valvular, and structural heart interventions.		I		
M-INV/INT-MK12	Know the indications and contraindications for, and complications of, endomyocardial biopsy and pericardiocentesis.		I		
M-INV/INT-MK13	Know the indications for, and the mechanisms of action of, mechanical circulatory support devices.		I		
M-INV/INT-MK14	Know the indications for, and complications of, vascular access and closure strategies and devices.		I		
	Evaluation Tools*:* conference presentation, direct observation, in-training exam, logbook, simulation				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-INV/INT-PC1	Skill to perform pre-procedural evaluation, assess appropriateness, obtain informed consent, and plan procedure strategy.		I		
M-INV/INT-PC2	Skill to perform venous and arterial access and obtain hemostasis.		I		
M-INV/INT-PC3	Skill to perform right heart catheterization.		I		
M-INV/INT-PC4	Skill to analyze hemodynamic, ventriculographic, and angiographic data, and to integrate with clinical findings for patient management.		I		
M-INV/INT-PC5	Skill to manage post-procedural patients, including complications and coordination of care.		I		
M-INV/INT-PC6	Skill to perform endomyocardial biopsy.			II	
M-INV/INT-PC7	Skill to perform pericardiocentesis.			II	
M-INV/INT-PC8	Skill to perform diagnostic left heart catheterization, ventriculography, and coronary angiography.			II	
M-INV/INT-PC9	Skill to place an intra-aortic balloon pump emergently.			II	
M-INV/INT-PC10	Skill to perform diagnostic peripheral (excluding carotid) angiography.			II	
M-INV/INT-PC11	Skill to perform percutaneous coronary interventions.				III

M-INV/INT-PC12	Skill to perform peripheral, carotid, valvular and structural heart interventions.				III
M-INV/INT-PC13	Skill to insert and manage percutaneous left ventricular support devices.				III
	***Evaluation Tools**:* chart-stimulated recall, conference presentation, direct observation, logbook, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-INV/INT-SBP1	Coordinate care in an interdisciplinary approach for patient management, including transition of care.		I		
M-INV/INT-SBP2	Utilize cost-awareness and risk/benefit analysis in patient care.		I		
	***Evaluation Tools**:* chart-stimulated recall, conference presentation, direct observation, logbook				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-INV/INT-PBL1	Locate, appraise, and assimilate information from scientific studies, guidelines, and registries in order to identify knowledge and performance gaps.		I		
M-INV/INT-PBL2	Document number and outcomes of diagnostic and therapeutic procedures.		I		
	***Evaluation Tools**:* conference presentation, direct observation, logbook, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-INV/INT-PROF1	Practice within the scope of expertise and technical skills.		I		
M-INV/INT-PROF2	Know and promote adherence to guidelines and appropriate use criteria.		I		
M-INV/INT-PROF3	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.	I			
	***Evaluation Tools**:* conference presentation, direct observation, multisource evaluation, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-INV/INT-ICS1	Communicate with and educate patients and families across a broad range of socioeconomic, ethnic, and cultural backgrounds, including obtaining informed consent.		I		
M-INV/INT-ICS2	Communicate and work effectively with physicians and other professionals on the healthcare team regarding procedure findings, treatment plans, and follow-up care coordination.		I		
M-INV/INT-ICS3	Complete procedure records and communicate testing results to physicians and patients in an effective and timely manner.		I		
	***Evaluation Tools**:* direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 11, Table 1. Core Competency Components and Curricular Milestones for Training in Cardiac Arrhythmias and Electrophysiology

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-ARR-MK1	Know the mechanism and characteristics of normal sinus rhythm and of s	I			
M-ARR-MK2	Know the pathophysiology, differential diagnosis, clinical significance, and approach to management of reentrant tachycardia (atrioventricular nodal re-entrant tachycardia; atrioventricular reciprocating tachycardia), ectopic atrial tachycardias, and accelerated atrioventricular junctional rhythm.		I		
M-ARR-MK3	Know the pathophysiology, differential diagnosis, clinical significance, and approach to management of atrial fibrillation and flutter, including the assessment of stroke and bleeding risk, indications of anticoagulation, and selection of anticoagulant medications.	I			
M-ARR-MK4	Know the risk factors for stroke and for bleeding in patients with atrial fibrillation or atrial flutter, as well as the indications for, and use of, anticoagulant medications.	I			
M-ARR-MK5	Know the pathophysiology, differential diagnosis, clinical significance, and approach to management of sustained and nonsustained ventricular tachyarrhythmias.		I		
M-ARR-MK6	Know the pathophysiology, differential diagnosis, and approaches to risk stratification and management of sudden cardiac death and cardiac arrest, including sudden cardiac death in athletes.		I		
M-ARR-MK7	Know the types, mechanisms, differential diagnosis, clinical significance, and approach to management of atrioventricular dissociation and atrioventricular heart blocks (first, second, and third degree).	I			
M-ARR-MK8	Know the physical examination characteristics of arrhythmias (e.g., findings of atrioventricular dissociation).		I		
M-ARR-MK9	Know the significance of underlying structural or congenital heart disease in the likelihood and significance of cardiac arrhythmias, including sudden death risk, and their impact in clinical management decisions.		I		
M-ARR-MK10	Know the indications, contraindications, and clinical pharmacology of antiarrhythmic medications, including drug-drug and drug-device interactions and proarrhythmia potential including acquired long QT syndrome.		I		
M-ARR-MK11	Know the indications and limitations of noninvasive testing in the diagnosis and management of patients with arrhythmias: electrocardiogram, ambulatory, event, implantable loop recorder, and tilt-table testing.		I		
M-ARR-MK12	Know the indications for, and limitations and complications of, invasive electrophysiologic testing, as well as catheter ablation for cardiac arrhythmias.		I		
M-ARR-MK13	Know the indications and contraindications for permanent pacemaker placement, cardiac resynchronization therapy, and implantable cardioverter-defibrillator placement.		I		
M-ARR-MK14	Know the pathophysiology, differential diagnosis, natural history, and approach to management of syncope, including neurocardiogenic causes and syncope in athletes.	I			
M-ARR-MK15	Know the mechanisms, findings, clinical significance, and approach to management of ventricular pre-excitation.		I		
M-ARR-MK16	Know the pathology, clinical significance, and approach to evaluation (including the role of genetic testing) and management of inherited diseases that may cause cardiac arrhythmias due to ion channel abnormalities or structural changes in the heart (including the long QT		I		

	syndrome, Brugada syndrome, arrhythmogenic right ventricular dysplasia, hypertrophic dilated cardiomyopathy, and myotonic dystrophy).				
M-ARR-MK17	Know the principles and practice of radiation safety as applied to the evaluation and management of cardiac electrical disorders.	I			
M-ARR-MK18	Know the basic principles of programming and interrogating implanted devices (permanent pacemakers, implantable cardioverter-defibrillators, cardiac resynchronization therapies, and implantable monitors)		I		
	Evaluation Tools: chart-stimulated recall, global evaluation, in-training exam				
	Patient Care and Procedural Skill	**12**	**24**	**36**	**Add**
M-ARR-PC1	Skill to evaluate and manage patients with palpitations.		I		
M-ARR-PC2	Skill to evaluate and manage patients with syncope.		I		
M-ARR-PC3	Skill to evaluate and manage patients with supraventricular tachyarrhythmias.		I		
M-ARR-PC4	Skill to evaluate and manage patients with atrial fibrillation and flutter (including rate and rhythm control and anticoagulation strategies).		I		
M-ARR-PC5	Skill to evaluate and manage patients with wide-QRS tachycardia.		I		
M-ARR-PC6	Skill to manage patients with nonsustained and sustained ventricular arrhythmias.		I		
M-ARR-PC7	Skill to evaluate and manage patients with bradycardia and/or heart block.		I		
M-ARR-PC8	Skill to perform electrical cardioversion.	I			
M-ARR-PC9	Skill to perform defibrillation.	I			
M-ARR-PC10	Skill to perform tilt-table testing.		II		
M-ARR-PC11	Skill to perform temporary pacemaker placement.		I		
M-ARR-PC12	Skill to select and manage patients requiring a permanent pacemaker, implantable cardioverter-defibrillator, or biventricular pacing.			I	
M-ARR-PC13	Skill to integrate the information provided in cardiac electrophysiology consultation, and reports of procedures and device interrogation, into the overall clinical assessment of the patient and plan of management.		I		
M-ARR-PC14	Skill to perform pacemaker and implantable cardioverter-defibrillator interrogation, programming, and surveillance.			II	
M-ARR-PC15	Skill to perform single- and dual-chamber permanent pacemaker implantation and manage complications including device infections and chronic lead failure.			II	
M-ARR-PC16	Skill to perform implantation of implantable loop recorders, interpret results to guide patient management, and manage complications.			II	
M-ARR-PC17	Skill to perform implantable cardioverter-defibrillator and biventricular device implantation and manage complications.				III
M-ARR-PC18	Skill to perform and interpret invasive electrophysiologic testing and carry out ablation therapy.				III
M-ARR-PC19	Skill to utilize magnetic resonance imaging, computed tomography, and intracardiac echocardiography in facilitating invasive electrophysiology and ablation therapies.				III
M-ARR-PC20	Skill to follow-up, interrogate, and troubleshoot patients with implanted devices (permanent pacemakers, implantable cardioverter-defibrillators, cardiac resynchronization therapies), including remote interrogation.			II	
M-ARR-PC21	Skill to evaluate and manage patients with cardiac arrest.		I		

M-ARR-PC22	Skill to prescribe and interpret the results of electrocardiographic recording devices.		I		
	Evaluation Tools: chart-stimulated recall, patient safety or quality improvement conference presentation, direct observation, global evaluation, logbook, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-ARR-SBP1	Utilize an interdisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.		I		
M-ARR-SBP2	Use technology and available registries to assess appropriateness, performance, and safety of implanted devices.		I		
M-ARR-SBP3	Incorporate risk/benefit analysis and cost considerations in diagnostic and treatment decisions.		I		
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-ARR-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-ARR-PBL2	Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, logbook				
	Professionalism	**12**	**24**	**36**	**Add**
M-ARR-PROF1	Demonstrate sensitivity to patient preferences and end-of-life issues.		I		
M-ARR-PROF2	Practice within the scope of expertise and technical skills.		I		
M-ARR-PROF3	Interact respectfully with patients, families, and all members of the health care teaM-including ancillary and support staff.	I			
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-ARR-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.		I		
M-ARR-ICS2	Engage in shared decision-making with patients, including options for diagnosis and treatment.		I		
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 12, Table 1. Core Competency Components and Curricular Milestones for Training in Heart Failure

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-HF-MK1	Know the pathophysiology, differential diagnosis, stages, and natural history of heart failure.		I		
M-HF-MK2	Know the characteristic history and physical exam findings, and their limitations, in evaluation of heart failure syndromes.	I			
M-HF-MK3	Know the pathophysiology of heart failure at the molecular, cellular, organ, and organismal levels, with emphasis on the roles of neurohormonal activation and left ventricular remodeling in disease progression.		I		
M-HF-MK4	Know the indications, contraindications, and clinical pharmacologyfor drugs used for treatment of heart failure, including adverse effects.	I			
M-HF-MK5	Know the indications, contraindications, and clinical pharmacology for the drugs used for the treatment of heart failure of all etiologies and degrees of severity and in special populations.			II	
M-HF-MK6	Know the indications and clinical rationale for the pharmacologic management of patients implanted with mechanical circulatory support.				III
M-HF-MK7	Know the indications, contraindications, and clinical pharmacology for intravenous, vasoactive, and inotropic drugs used for cardiovascular support in advanced/refractory heart failure.		I		
M-HF-MK8	Know the appropriate pharmacologic or nonpharmacologic treatment for the prevention of heart failure in patients with either “pre” or “established” heart failure.	I			
M-HF-MK9	Know the clinical pharmacology and use of immunosuppressive medications and other interventions in heart transplant patients in the treatment of acute rejection.			II	
M-HF-MK10	Know the types of and indications for mechanical circulatory support.			II	
M-HF-MK11	Know the effects and interactions of heart failure with other organ systems (kidney, nutritional, metabolic) and in the setting of other systemic disease.		I		
M-HF-MK12	Know the management of cardiac arrhythmias in heart failure patients, as well as the indications and risks of use of implantable cardioverter-defibrillator and cardiac resynchronization therapies.		I		
M-HF-MK13	Know the indications for referral for cardiac transplantation.		I		
M-HF-MK14	Know the late stage complications of heart failure in patients with congenital heart disease.				III
M-HF-MK15	Know the management and diagnostic strategies for populations with heart failure not due to ischemic heart disease, including infiltrative and restrictive cardiomyopathies, inherited cardiomyopathies, and those associated with pregnancy and chemotherapy.			II	
M-HF-MK16	Know the management strategies for highly specialized populations with heart failure, including those associated with congenital heart disease and chronic pulmonary disease.				III
	Evaluation Tools: chart-stimulated recall, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-HF-PC1	Skill to evaluate and manage patients with new-onset, chronic, and acute decompensated heart failure.	I			
M-HF-PC2	Skill to evaluate and manage patients with severe heart failure despite treatment.			II	
M-HF-PC3	Skill to evaluate and manage patients with mechanical circulatory support or after heart transplant.				III
M-HF-PC4	Skill to appropriately obtain and incorporate data from the history, laboratory studies, and imaging modalities in evaluation and management of heart failure patients.	I			
M-HF-PC5	Skill to interpret imaging results in the evaluation of heart failure patients.		I		

M-HF-PC6	Skill to interpret imaging results found in advanced, rare, or uncommon forms of heart failure.				III
M-HF-PC7	Skill to use history and physical examination findings to accurately assess volume status and perfusion in patients with heart failure.			II	
M-HF-PC8	Skill to perform invasive hemodynamic monitoring.		I		
M-HF-PC9	Skill to incorporate the results of hemodynamic measurements and monitoring to make appropriate management decisions in heart failure patients of all etiologies and severity.			II	
M-HF-PC10	Skill to incorporate results of hemodynamic measurements and monitoring to make appropriate management decisions in complex or advanced heart failure patients of all etiologies and severity or in patients with mechanical circulatory support.				III
M-HF-PC11	Skill to identify appropriate candidates for palliative care and hospice.		I		
M-HF-PC12	Skill to recognize and manage cardiac arrhythmias, including the identification of appropriate candidates for implantable cardioverter-defibrillators, cardiac resynchronization therapy, or arrhythmia ablation.		I		
M-HF-PC13	Skill to select and implement appropriate arrhythmia management, including utilization of implantable cardioverter-defibrillators, cardiac resynchronization therapy, and ablation of arrhythmias in patients with heart failure of all etiologies and severity.			II	
M-HF-PC14	Skill to manage patients with advanced heart failure and complex arrhythmias, including patients with mechanical circulatory support, in conjunction with clinical cardiac electrophysiologists.				III
M-HF-PC15	Skill to recognize and manage comorbidities in heart failure patients.		I		
M-HF-PC16	Skill to manage heart failure patients with complex contributing comorbidities.			II	
M-HF-PC17	Skill to identify and manage patients who require transition from hospital to home or to a care facility while on infusion of inotropic or vasoactive agents.			II	
M-HF-PC18	Skill to identify and manage patients who require transition from hospital to home or to a care facility after heart transplant or permanent mechanical circulatory support.				III
M-HF-PC19	Skill to appropriately utilize initial screening studies to determine patient eligibility for advanced therapies of individuals cared for at non-transplant / non-ventricular assist device facilities, in collaboration with Level III-trained individuals, who work at advanced therapy sites.			II	
M-HF-PC20	Skill to evaluate, order all appropriate testing, and determine the appropriateness of a patient for cardiac transplant or mechanical circulatory support.				III
M-HF-PC21	Skill to interpret and incorporate results of cardiopulmonary exercise testing into management of heart failure patients, including physical activity and exercise recommendations.			II	
M-HF-PC22	Skill to recognize, manage and seek appropriate consultation for depression or undue anxiety in heart failure patients as part of their overall care.		I		
	Evaluation Tools: chart-stimulated review, direct observation, multisource evaluation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-HF-SBP1	Utilize appropriate care settings and teams for various levels and stages of heart failure.		I		
M-HF-SBP2	Incorporate risk/benefit analysis and cost considerations in diagnostic and treatment decisions.		I		
M-HF-SBP3	Identify and address financial, cultural, and social barriers to diagnostic and treatment recommendations.	I			
M-HF-SBP4	Utilize an interdisciplinary, coordinated, team approach for patient management, including care transitions, palliative care, and employment-related issues.		I		
M-HF-SBP5	Effectively utilize an interdisciplinary approach to monitor the progress of ambulatory patients with heart failure to maintain stability			II	

	and avoid preventable hospitalization.				
M-HF-SBP6	Identify the financial, social, and emotional barriers to successful outcomes after surgery.				III
	Evaluation Tools: chart-stimulated recall, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-HF-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-HF-PBL2	Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.			II	
	Evaluation Tools: conference presentation, direct observation, global evaluation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-HF-PROF1	Show compassion and effective management of end-of-life issues, including family meetings across the spectrum of patients with heart failure.	I			
M-HF-PROF2	Clearly and objectively discuss the therapies available for advanced heart failure, including palliative care, transplant, or mechanical circulatory support.				III
M-HF-PROF3	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.	I			
	Evaluation Tools: conference presentation, direct observation, multisource evaluation, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-HF-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.	I			
M-HF-ICS2	Engage in shared decision-making with patients, including options for diagnosis and treatment.		I		
M-HF-ICS3	Effectively lead and communicate with the interdisciplinary team involved in heart transplant and mechanical circulatory support.				III
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 13, Table 1. Core Competency Components and Curricular Milestones for Training in Critical Care Cardiology

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-CCC-MK1	Know the pathophysiology, differential diagnosis, and characteristic clinical, hemodynamic, radiographic, and laboratory findings of cardiogenic, hypovolemic, septic, and mixed circulatory shock, and of the systemic inflammatory response syndrome.		I		
M-CCC-MK2	Know the indications for, and characteristic findings with, bedside invasive and noninvasive hemodynamic monitoring.		I		
M-CCC-MK3	Know the indications, contraindications, and clinical pharmacology for vasoactive and inotropic medications used in the treatment of patients with advanced heart failure, hypotension, or shock.		I		
M-CCC-MK4	Know the indications, contraindications, and clinical pharmacology for anticoagulant, antiplatelet and fibrinolytic agents.		I		
M-CCC-MK5	Know the indications for, contraindications to, and clinical pharmacology of agents used to treat hypertensive urgencies and emergencies.		I		
M-CCC-MK6	Know the indications, contraindications, and clinical pharmacology for agents used to treat pulmonary hypertension, including intravenous, inhalational and oral agents.		I		
M-CCC-MK7	Know the indications, contraindications, and clinical pharmacology for agents used to treat supraventricular and ventricular arrhythmias.		I		
M-CCC-MK8	Know the indications for, contraindications to, and risks of catheter-based techniques to treat supraventricular and ventricular arrhythmias.		I		
M-CCC-MK9	Know the characteristic clinical, electrocardiographic, echocardiographic, and radiographic findings with pulmonary embolism, aortic dissection, pericardial tamponade, acute decompensated severe heart failure, severe valvular heart disease, and myocardial infarction.		I		
M-CCC-MK10	Know the indications for oxygen supplementation, endotracheal intubation, and mechanical ventilator support for patients with hypoxia and/or respiratory failure.		I		
M-CCC-MK11	Know the differential diagnosis and characteristic laboratory findings of oliguria and acute kidney injury.		I		
M-CCC-MK12	Know the characteristic physical examination, echocardiographic, angiographic, and hemodynamic findings of mechanical complications of myocardial infarction (e.g., ventricular septal defect, mitral regurgitation, and right ventricular infarction).		I		
M-CCC-MK13	Know the types of, and indications for, mechanical circulatory support, including intra-aortic balloon counterpulsation, ventricular assist (both percutaneous and surgical) devices, and extracorporeal membrane oxygenation.		I		
M-CCC-MK14	Know the principles of treatment of hypotension in special populations, including patients with cardiogenic shock, hypertrophic obstructive cardiomyopathy, right ventricular infarction, massive pulmonary embolism, pericardial tamponade, and distributive shock.		I		
M-CCC-MK15	Know the indications for emergency surgery in patients with aortic dissection.		I		
M-CCC-MK16	Know the indications for emergent/urgent surgery and transcatheter valve replacement/repair in patients with severe valvular heart disease.		I		
M-CCC-MK17	Know the differential diagnosis of heart failure or shock in cardiac transplant patients.		I		
M-CCC-MK18	Know the elements of risk scoring systems for the assessment of prognosis in acute coronary syndrome, advanced heart failure, and pulmonary hypertension, including demographics and findings from the clinical examination, electrocardiogram, biomarker testing, angiography, echocardiography, and invasive hemodynamic assessment.		I		

M-CCC-MK19	Know the indications for use of hypothermia protocols and the principles of post-resuscitation bundled care.		I		
M-CCC-MK20	Know the elements of scoring systems for assessment of the risk of major bleeding in patients treated with antithrombotic medications.		I		
	Evaluation Tools: conference presentation, direct observation, in-training exam, simulation				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-CCC-PC1	Skill to manage patients with acute myocardial infarction and any associated rhythm, conduction, or mechanical complications.		I		
M-CCC-PC2	Skill to evaluate and manage acutely unstable cardiac patients by integrating the findings from clinical, electrocardiographic, telemetry, imaging, and hemodynamic assessment – and to develop a plan for bedside intervention.		I		
M-CCC-PC3	Skill to place arterial, central venous, and pulmonary artery catheters and temporary transvenous pacemakers in sequence with cardiac catheterization laboratory rotations.		I		
M-CCC-PC4	Skill to recognize when renal replacement therapy is indicated, and to manage in conjunction with nephrology consultants.		I		
M-CCC-PC5	Skill to utilize appropriately therapeutic hypothermia protocols in survivors of cardiac arrest in conjunction with neurologic consultants.		I		
M-CCC-PC6	Skill to evaluate and manage patients with hemodynamic instability following cardiac surgery.		I		
M-CCC-PC7	Skill to evaluate and manage patients with hemodynamic instability following transcatheter valve therapy.		I		
M-CCC-PC8	Skill to evaluate and manage supraventricular and ventricular arrhythmias and conduction disturbances in unstable patients in collaboration with electrophysiology specialists.		I		
M-CCC-PC9	Skill to use vasopressor and inotropic therapy appropriately in various types of shock.		I		
M-CCC-PC10	Skill to incorporate mechanical circulatory support in the management of critically ill patients.		I		
M-CCC-PC11	Skill to place intra-aortic balloon pump emergently.				III*
M-CCC-PC12	Skill to identify and manage pericardial tamponade, including emergency pericardiocentesis.		I		
M-CCC-PC13	Skill to participate in the perioperative care of heart transplant and ventricular assist device patients, in collaboration with heart failure experts, interventional cardiologists, and surgical consultants.		I		
M-CCC-PC14	Skill to monitor blood pressure and hemodynamic state in patients with continuous flow left ventricular assist devices, in collaboration with heart failure specialists, interventional cardiologists, and/or surgeons.		I		
M-CCC-PC15	Skill to manage hypertensive urgencies and emergencies.		I		
M-CCC-PC16	Skill to manage special populations of critically ill cardiovascular patients including those with aortic dissection, massive or submassive pulmonary embolism, acute severe valvular regurgitation, and advanced pulmonary hypertension with right ventricular dysfunction.		I		
M-CCC-PC17	Skill to manage patients with acute bleeding, including bleeding from vascular access or spontaneous bleeding.		I		
M-CCC-PC18	Skill to perform noninvasive ventilation and CO_2 monitoring.		I		
M-CCC-PC19	Skill to incorporate oxygen supplementation and mechanical ventilation in patient management.		I		
M-CCC-PC20	Skill to perform endotracheal intubation.				III
M-CCC-PC21	Skill to utilize risk assessment scoring systems when appropriate in patient management and counseling.		I		
M-CCC-PC22	Skill to identify when further medical care is futile and to counsel families on end-of-life care.		I		

M-CCC-PC23	Skill to coordinate safe and effective transitions of care in collaboration with other members of the care team.		I		
	Evaluation Tools: conference presentation, direct observation, logbook, simulation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-CCC-SBP1	Work effectively with all members of the critical care unit team including heart failure/transplant specialists, electrophysiologists, interventionalists, surgeons, pulmonary critical care physicians, nephrologists, neurologists, nurses, physician's assistants, pharmacists, social workers, and other team members as required.		I		
M-CCC-SBP2	Function effectively as team leader for the critical care unit team.				III
M-CCC-SBP3	Participate in hospital quality and safety initiatives in the critical care units.		I		
M-CCC-SBP4	Design quality and safety initiatives.				III
M-CCC-SBP5	Utilize interdisciplinary input and expertise in comanagement of critically ill patients, including transitions of care.		I		
	Evaluation Tools: conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-CCC-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-CCC-PBL2	Utilize point-of-service resources to enhance adherence to guidelines and protocols and obtain new information from trials and professional societies.		I		
M-CCC-PBL3	Incorporate appropriate use criteria, risk/benefit analysis, and cost considerations in the use of testing and treatment.		I		
	Evaluation Tools: conference presentation, direct observation				
	Professionalism	**12**	**24**	**36**	**Add**
M-CCC-PROF1	Work effectively in an interdisciplinary critical coronary care unit environment.		I		
M-CCC-PROF2	Demonstrate sensitivity to patient preferences and values and end-of-life issues.		I		
M-CCC-PROF3	Practice within the scope of expertise and technical skills.		I		
M-CCC-PROF4	Interact respectfully with patients, families, and all members of the healthcare team, including ancillary and support staff.		I		
	Evaluation Tools: conference presentation, direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-CCC-ICS1	Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.		I		
M-CCC-ICS2	Communicate and work effectively with physicians and other professionals on the healthcare team in the management of critically ill patients and their transition to other care environments.		I		
M-CCC-ICS3	Communicate with families with regard to end-of-life decisions with respect to programming of pacemakers and implantable cardioverter-defibrillators.		I		
	Evaluation Tools: direct observation, multisource evaluation				

*Fellows seeking to gain the skill to insert intra-aortic balloon pumps emergently may do so as part of Level II training in cardiac catheterization (see COCATS Task Force 10 report).

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 14, Table 1. Core Competency Components and Curricular Milestones for Training in Adults With Simple Congenital Heart Disease [Atrial septal defects, ventricular septal defects, patent ductus arteriosus, pulmonary stenosis, bicuspid aortic valve, coarctation]

	Medical Knowledge	**Milestones (Months)**			
		12	**24**	**36**	**Add**
M-ACHD(S)-MK1	Know the anatomy, pathophysiology, associated lesions, and natural histories of atrial septal defects (primum, secundum, and sinus venosus) and ventricular septal defects.		I		
M-ACHD(S)-MK2	Know the anatomy, pathophysiology, associated lesions, and natural histories of bicuspid aortic valve, pulmonic stenosis, coarctation of the aorta, and patent ductus arteriosus.		I		
M-ACHD(S)-MK3	Know the risk of development and pathophysiology of pulmonary arterial hypertension in adult patients with congenital heart disease, including issues related to noncardiac surgery, pregnancy, contraception, and exercise.		I		
M-ACHD(S-MK)4	Know the potential reproductive and genetic implications of basic adult congenital heart disease, both for patients and for potential offspring.			I	
M-ACHD(S)-MK5	Know the indications for patient referral to an adult congenital heart disease center.	I			
M-ACHD(S)-MK6	Know the cardinal symptoms, physical examination, electrocardiogram, and chest X-ray findings of patients with simple adult congenital heart disease.		I		
M-ACHD(S)-MK7	Know the indications for noninvasive and invasive testing for the evaluation of simple adult congenital heart disease.		I		
M-ACHD(S)-MK8	Know the indications and contraindications for surgical and percutaneous interventions in adult congenital heart disease.			I	
M-ACHD(S)-MK9	Know the indications for endocarditis prophylaxis based on current guidelines.	I			
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, in-training exam				
	Patient Care and Procedural Skill	**12**	**24**	**36**	**Add**
M-ACHD(S)-PC1	Skill to accurately perform a comprehensive history and physical examination in the patient with simple adult congenital heart disease.		I		
M-ACHD(S)-PC2	Skill to appropriately order and integrate the results of imaging with other clinical findings in the evaluation and management of simple adult congenital heart disease patients.		I		
M-ACHD(S)-PC3	Skill to evaluate and manage patients with simple adult congenital heart disease who have undergone reparative intervention.		I		
M-ACHD(S)-PC4	Skill to evaluate and manage the potential cardiovascular complications of pregnant women with simple adult congenital heart disease.			I	
M-ACHD(S)-PC5	Skill to detect the findings of pulmonary arterial hypertension.		I		
M-ACHD(S)-PC6	Skill to appropriately advise patients with simple congenital heart disease regarding exercise, sports participation, and return to play, including the use of testing to evaluate for safety.		I		
M-ACHD(S)-PC7	Skill to evaluate and manage patients with simple congenital heart disease including appropriate timing for surgical interventions.		I		
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-ACHD(S)-SBP1	Collaborate and coordinate patient care with an adult congenital heart disease center to provide optimal healthcare for appropriate patients with adult congenital heart disease.		I		
M-ACHD(S)-SBP2	Demonstrate the ability to provide primary cardiac longitudinal care for patients with simple adult congenital heart disease in association with an adult congenital heart disease center.			I	
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource				

	evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-ACHD(S)-PBL1	Locate, appraise, and assimilate evidence from scientific resources, such as adult congenital heart disease clinical practice guidelines.		I		
M-ACHD(S)-PBL2	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.			I	
	Evaluation Tools: chart-stimulated recall, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-ACHD(S)-PROF1	Demonstrate sensitivity and responsiveness to diverse patient populations.	I			
M-ACHD(S)-PROF2	Respond to patient needs in a way that supersedes self-interest, including referral of basic adult congenital heart disease patients when appropriate.	I			
	Evaluation Tools: direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-ACHD(S)-ICS1	Effectively educate patients and families across the range of socioeconomic and cultural backgrounds about adult congenital heart disease management, complications, and lifestyle issues.			I	
M-ACHD(S)-ICS2	Communicate testing results to physicians and patients in an effective and timely manner.	I			
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 14, Table 2. Core Competency Components and Curricular Milestones for Training in Adults With Complex Congenital Heart Disease [Ebstein's anomaly, Tetralogy of Fallot, complex cyanotic congenital heart disease, transposition of the great arteries, single ventricle physiology/Fontan]

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-ACHD(C)-MK1	Know the basic anatomy and pathophysiology of the cyanotic congenital heart diseases encountered in adolescents and adults.		I		
M-ACHD(C)-MK2	Know the natural history of cyanotic congenital heart diseases, particularly those with Eisenmenger Syndrome.		I		
M-ACHD(C)-MK3	Know the hematological complications and their management in patients with cyanotic heart disease.		I		
M-ACHD(C)-MK4	Know the risks of cardiac arrhythmias and their management in patients with adult congenital heart disease.		I		
M-ACHD(C)-MK5	Know the renal complications of cyanotic heart disease, including medications and procedures with the potential for precipitating renal failure.		I		
M-ACHD(C)-MK6	Know the other systemic complications of cyanotic heart disease: pulmonary, orthopedic, and neurological.		I		
M-ACHD(C)-MK7	Know the vulnerability these patients have for mortal complications from routine noncardiac surgical procedures and the risks of intravenous lines without air filters.		I		
M-ACHD(C)-MK8	Know the potential for mortal complications in cyanotic patients, particularly those with pulmonary hypertension, from pregnancy or the use of estrogen-based contraception.		I		
M-ACHD(C)-MK9	Transposition of the great arteries: know the basic anatomy, the types of surgical repair, and their complications in the adult patient.			I	
M-ACHD(C)-MK10	Single ventricle/Fontan: know the basic anatomy and hemodynamics both in patients with and without surgical repair, and that noncardiac surgery must be performed at an adult congenital heart disease center.			I	
M-ACHD(C)-MK11	Tetralogy of Fallot: know the basic anatomy, the types of surgical repair and the postoperative residua and sequelae including indications and timing of reoperation.			I	
M-ACHD(C)-MK12	Know the anatomy, pathophysiology and associated lesions of Ebstein's anomaly.			I	
M-ACHD(C)-MK13	Know the indications for patient referral to an adult congenital heart disease center.	I			
M-ACHD(C)-MK14	Know the appropriate indications for and timing of medical, surgical, and interventional therapies in all forms of congenital heart disease.				III
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, in-training exam				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-ACHD(C)-PC1	Skill to accurately interpret the physical examination, echocardiogram, and electrocardiogram findings in patients with repaired Tetralogy of Fallot.			I	
M-ACHD(C)-PC2	Skill to accurately interpret the physical examination, electrocardiogram, and chest X-ray findings in patients with Eisenmenger physiology.		I		
M-ACHD(C)-PC3	Skill to appropriately use electrocardiography, echocardiography, and other imaging modalities in diagnosis and management of complex adult congenital heart disease.		I		
M-ACHD(C)-PC4	Skill to assure that female patients have received appropriate contraceptive advice.			I	
M-ACHD(C)-PC5	Skill to collaborate with an adult congenital heart disease specialist before prescribing medications and procedures with the potential to affect hemodynamic stability in patients with cyanotic heart disease.		I		
M-ACHD(C)-PC6	Skill to urgently refer patients to an adult congenital heart disease center in the setting of hemoptysis, transient neurological disturbance, syncope, arrhythmia, pregnancy, or anticipated noncardiac surgery.		I		

M-ACHD(C)-PC7	Skill to interpret echocardiograms, including transesophageal echocardiograms, in all forms of complex congenital heart disease, and select other appropriate imaging modalities when necessary (magnetic resonance imaging, computed tomography).				III
M-ACHD(C)-PC8	Skill to interpret hemodynamic and angiographic data in all types of complex congenital heart disease.				III
M-ACHD(C)-PC9	Skill to appropriately treat complications of complex congenital heart disease including hemoptysis, arrhythmias, and heart failure.				III
M-ACHD(C)-PC10	Skill to evaluate and manage patients with all forms of complex congenital heart disease, both operated and unoperated, including appropriate timing for surgical interventions.				III
M-ACHD(C)-PC11	Skill to assess preconceptual risk and manage patients during pregnancy.				III
M-ACHD(C)-PC12	Skill to appropriately advise patients with all forms of complex congenital heart disease regarding exercise, sports participation and return to play, including the use of testing to evaluate for safety.				III
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-ACHD(C)-SBP1	Establish an ongoing collaborative relationship with an adult congenital heart disease team or center to facilitate prompt access to appropriate advice and urgent admission of cyanotic patients when necessary.	I			
M-ACHD(C)-SBP2	Utilize an interdisciplinary team approach with other subspecialists to optimize the care of all patients with moderate and complex congenital heart disease.				III
	Evaluation Tools: chart-stimulated recall, conference presentation, direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-ACHD(C)-PBL1	Identify strengths, deficiencies, and limits in one's knowledge and expertise in cyanotic heart disease and carry out personalized education to address them.			I	
M-ACHD(C)-PBL2	Locate, appraise, and assimilate evidence from scientific resources, such as adult congenital heart disease clinical practice guidelines, and apply that knowledge to the management and care of patients.		I		
M-ACHD(C)-PBL3	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.				III
	Evaluation Tools: chart-stimulated recall, direct observation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-ACHD(C)-PROF1	Demonstrate sensitivity and responsiveness to diverse patient populations.	I			
M-ACHD(C)-PROF2	Demonstrate a commitment to carry out professional responsibilities, appropriately refer patients, and respond to patient needs in a way that supersedes self-interest.	I			
	Evaluation Tools: direct observation, multisource evaluation				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-ACHD(C)-ICS1	Effectively educate patients and families across the range of socioeconomic and cultural backgrounds about adult congenital heart disease management, complications, and lifestyle issues.			I	
M-ACHD(C)-ICS2	Communicate and work effectively with physicians and other professionals on the healthcare team, including those at an adult congenital heart disease center.	I			
	Evaluation Tools: direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship.

Task Force 15, Table 1. Core Competency Components and Curricular Milestones for Training in Cardiovascular Research and Scholarly Activity

	Medical Knowledge	Milestones (Months)			
		12	24	36	Add
M-RES-MK1	Know the roles and functions of DNA, RNA and proteins.			I	
M-RES-MK2	Know the principles of genetics, genomics, proteomics, metabolomics and pha			I	
M-RES-MK3	Know the principles of epidemiological methods.			I	
M-RES-MK4	Know the principles of outcomes evaluation.			I	
M-RES-MK5	Know the basic principles of biostatistics.			I	
M-RES-MK6	Know the principles underlying hypothesis formation, specific goals definition, hypothesis testability, and statistical power achievable.			I	
	***Evaluation Tools**:* global evaluation, in-training exam, multisource evaluation				
	Patient Care and Procedural Skills	**12**	**24**	**36**	**Add**
M-RES-PC1	Skill to review published research data and assess the adequacy of research design, data analysis, and logical deduction.			I	
M-RES-PC2	Skill to integrate appropriately scientific concepts and research advances in routine clinical encounters.		I		
M-RES-PC3	Skill to routinely assess the quality of evidence in clinical decisions.		I		
M-RES-PC4	Skill to apply principles of biomedical ethics as they pertain to human subject research in the identification of patients as potential research subjects, presentation of alternatives, obtaining informed consent and assuring the security of clinical data used for research.		I		
	***Evaluation Tool**:* multisource evaluation				
	Systems-Based Practice	**12**	**24**	**36**	**Add**
M-RES-SBP1	Effectively access and utilize national registry data for research.		I		
M-RES-SBP2	Know the role of and how to interact with Institutional Review Boards.		I		
	***Evaluation Tools**:* direct observation, multisource evaluation				
	Practice-Based Learning and Improvement	**12**	**24**	**36**	**Add**
M-RES-PBL1	Identify knowledge and performance gaps and engage in opportunities to achieve focused education and performance improvement.		I		
M-RES-PBL2	Appropriately integrate new or emerging medical evidence.			I	
	***Evaluation Tools**:* multisource evaluation, reflection and self-assessment				
	Professionalism	**12**	**24**	**36**	**Add**
M-RES-PROF1	Demonstrate sensitivity to patient autonomy and safety in research.	I			
M-RES-PROF2	Practice with integrity in the conduct of research, including understanding issues relating to relationships with industry.		I		
M-RES-PROF3	Interact respectfully with ancillary and support staff.	I			
	***Evaluation Tools**:* conference presentation, direct observation, reflection and self-assessment				
	Interpersonal and Communication Skills	**12**	**24**	**36**	**Add**
M-RES-ICS1	Communicate with fellow trainees and faculty about cardiovascular science and how this might impact clinical care (for example, through journal clubs).		I		
M-RES-ICS2	Effectively communicate study results during presentations.		I		
	***Evaluation Tools**:* direct observation, multisource evaluation				

Add = additional months beyond the 3-year cardiovascular fellowship, DNA = deoxyribonucleic acid, and RNA = ribonucleic acid.