MILESTONES FOR EACH LEVEL OF TRAINING

MILESTONES: Acute Coronary Syndromes (ACS)
FIRST YEAR

Medical Knowledge
Know the epidemiology, causes, pathophysiology, and natural history of ACS, including the roles of plaque rupture or erosion and platelet activation and thrombosis.
Know the disorders that can simulate or mask ACS.
Know how to use risk-assessment tools in ACS.
Know the indications and clinical pharmacology of antiplatelet, anticoagulant, and other pharmacologic therapies.
Know the post-ACS risk assessment, rehabilitation, and secondary prevention measures.

STEMI:
Know the characteristic symptoms, physical findings, ECG patterns and biomarker findings.
Know the effects and time course of ischemic injury on ventricular function and remodeling.
Learning vascular access
Know indications, contraindications, and risks of reperfusion therapies and the clinical, ECG, and angiographic signs of reperfusion.
Know the relative benefits and risks of fibrinolysis and primary PCI as an initial reperfusion strategy.

Patient Care
Skill To:
Evaluate and diagnose patients with STEMI, and initiate appropriate reperfusion therapy within guideline time limits.
Employ appropriate antiplatelet, anticoagulant, and other pharmacologic therapies.
Insert intra-arterial and pulmonary artery catheters.
Assess overall risk, identify candidates for invasive evaluation and treatment and establish optimal medical regimen in NSTE-ACS.

System-Based Practice
Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.
Practice in a manner that fosters the balance of appropriate utilization of finite resources with the net clinical benefit for the individual patient.
Practice-based Learning and Improvement
Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.

Professionalism
Exhibit sensitivity to patient preference end-of-life issues.

Demonstrate sensitivity and responsiveness to diverse patient populations.
Demonstrate a commitment to carry out professional responsibilities, appropriately refer patients, and respond to patient needs in a way that supersedes self-interest.

Interpersonal and Communication Skills
Effectively communicate with acutely ill patients across a broad range of cultural, ethnic, and socioeconomic backgrounds.
Communicate with all of healthcare providers involved in patient care.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the characteristic hemodynamic complications (including hypotension, low cardiac output, heart failure and shock).
Know the characteristic arrhythmia and conduction complications.
Know the characteristic mechanical complications (including papillary muscle rupture and myocardial rupture).
Know the characteristic findings and complications of right ventricular infarction.
Know the indications for transfer, angiography, and revascularization in patients who did not receive primary PCI (including those who received fibrinolysis or did not receive initial reperfusion therapy).

NSTE-ACS:
Know the differential diagnosis and the characteristic clinical, ECG, and biomarker features for diagnosis and risk stratification.
Know the relative risks and benefits of an initial invasive versus an ischemia-guided strategy for angiography and revascularization.

Patient Care
Recognize and treat hemodynamic disturbances (including hypotension, low cardiac output, heart failure, acute pulmonary edema and shock) and diagnose the cause.
Recognize and treat arrhythmias and conduction disturbances.
Recognize and treat mechanical complications (including papillary muscle rupture and myocardial rupture).
Recognize and treat patients with right ventricular infarction.
Assess ventricular function and utilize in treatment strategy decisions.
Interpret invasive hemodynamic data and angiographic findings and apply to treatment strategies.
Identify patients who would benefit from mechanical circulatory support.

Systems-based Practice
Work with EMS, ED, & hospital teams to establish effective first medical contact strategies for cardiovascular emergencies.

Practice in a manner that fosters the balance of appropriate utilization of finite resources with the net clinical benefit for the individual patient.

Practice-based Learning and Improvement
Identify gaps in knowledge & performance, and perform appropriate personal learning-activities.

CARDIAC CATHETERIZATION LABORATORY (Both Upstate Medical University Hospital and Veteran's Administration Medical Center)

MILESTONES: Invasive Cardiology
FIRST YEAR

Medical Knowledge
Know the indications/contraindications and potential complications of cardiac catheterization- for assessment of coronary, cardiac valve, myocardial, and basic adult congenital heart diseases.
Know the principles of radiation safety.
Know the use and complications of contrast agents and the role of renal protection measures.
Know the indications for, and complications of, endomyocardial biopsy and pericardiocentesis.
Know the indications for, and complications of, vascular access and closure strategies and devices.

Patient Care and Procedural Skills
Skill to perform right heart catheterization.

SECOND YEAR
In addition to skills acquired at the previous level:

Medical Knowledge
Know the indications for, and clinical pharmacology of, antiplatelet & anticoagulant drugs, and vasopressor & vasodilating agents, used in the cardiac catheterization laboratory.
Know cardiovascular hemodynamics and the principles & interpretation of waveforms, pressure, flow, resistance, and cardiac output measurements.
Know the characteristic hemodynamic findings with myocardial, valvular, pericardial, and pulmonary vascular diseases.
Know the methods to detect and estimate the magnitude of intracardiac shunts.
Know coronary anatomy, its variations & congenital abnormalities and coronary blood flow physiology.
Know the angiographic features of coronary artery disease and how to assess the anatomic and physiologic severity.
Know peripheral vascular anatomy; and, the indications for, and complications of, peripheral vascular angiography.
Know the indications/contraindications and potential complications for percutaneous coronary, valvular, and structural heart interventions.
Know the indications for, and the mechanisms of action of, mechanical circulatory support devices.

Patient Care and Procedural Skills
Skill to perform pre-procedure evaluation, assess appropriateness, and plan procedure strategy.
Skill to perform venous and arterial access and closure.
Skill to analyze hemodynamic, ventriculographic, and angiographic data, and to integrate with clinical findings for patient management.
Skill to manage post-procedural patients, including complications and coordination of care.

Systems-based Practice
Coordinate care in a multidisciplinary approach for patient management, including transition of care.
Utilize cost-awareness and risk-benefit analysis in patient care.

Practice-based Learning and Improvement
Locate, appraise, and assimilate information from scientific studies, guidelines, and registries in order to identify knowledge and performance gaps.
Document number and outcomes of diagnostic and therapeutic procedures.

Professionalism
Practice within the scope of personal technical skills or expertise.
Promote and adhere to guidelines and appropriate use criteria

Interpersonal and Communication Skills
Communicate with patients and families across a broad range of socioeconomic, ethnic, and cultural backgrounds, including obtaining informed consent.

THIRD YEAR

In addition to skills acquired at the previous level:

Patient Care and Procedural Skills
Skill to perform diagnostic left heart catheterization, ventriculography and coronary angiography.
Skill to perform pericardiocentesis.
Skill to insert and manage intra-aortic balloon counterpulsation device.

MILESTONES: Arrhythmias and Electrophysiology

EPS AND ARRHYTHMIA SERVICE (Both Upstate Medical University Hospital and Veteran's Administration Medical Center)

FIRST YEAR

Medical Knowledge
Know the mechanism and characteristics of normal sinus rhythm and of sinus node dysfunction.
Know the types, mechanisms, differential diagnosis, and clinical significance of atrioventricular dissociation and of atrioventricular heart blocks (first, second, and third degree).
Know the indications, contraindication, and clinical pharmacology of antiarrhythmic medications-including drug-drug and drug-device interactions and proarrhythmia potential.
Know the pathophysiology, differential diagnosis, and natural history of syncope, including neurocardiogenic causes.
Know principles and practice of radiation safety.

Patient Care

Skill to evaluate and manage patients with palpitations.
Skill to perform electrical cardioversion.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the pathophysiology, differential diagnosis, and clinical significance of reentrant (AVNRT; AVRT), and ectopic atrial tachycardias, and accelerated atrioventricular junctional rhythm.
Know the pathophysiology, differential diagnosis, and the clinical significance of atrial fibrillation and flutter.
Know the pathophysiology, differential diagnosis, and clinical significance of sustained and non-sustained ventricular tachyarrhythmias.
Know the physical examination characteristics of arrhythmias (e.g., findings of atrioventricular dissociation).
Know the significance of underlying structural or congenital heart disease in the likelihood and significance of cardiac arrhythmias, and in clinical management decisions.
Know the indications and limitations of non-invasive testing in the diagnosis and management of patients with arrhythmias: ambulatory, event, implantable loop recorder and tilt-table testing.
Know the indications for, and limitations and complications of, invasive electrophysiologic testing, as well as arrhythmia ablation.
Know the indications for permanent pacemaker placement, CRT, and of ICD placement.
Know the mechanisms, findings, and clinical significance of ventricular pre-excitation.
Know the pathology and clinical significance of genetic ion channel abnormalities and arrhythmias.

Patient Care
Skill to evaluate and manage patients with syncope.
Skill to evaluate and manage patients with supraventricular tachyarrhythmias.
Skill to evaluate and manage patients with atrial fibrillation and flutter (including rate and rhythm control and anticoagulation strategies).
Skill to evaluate and manage patients with wide-QRS tachycardia.
Skill to manage patients with non-sustained and sustained ventricular arrhythmias.
Skill to evaluate and manage patients with bradycardia and/or heart block.
Skill to perform tilt-table testing.
Skill to perform temporary pacemaker placement.
Skill to select and manage patients requiring permanent pacemaker, implantable cardioverter defibrillator or biventricular pacing.
Skill to perform pacemaker and ICD interrogation, programming, and surveillance.

Systems-based Practice
Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.
Use technology and available registries to assess appropriateness, performance, and safety of implanted devices.
Incorporate risk-benefit analysis and cost considerations in diagnostic and treatment decisions.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.
Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.

Professionalism
Exhibit sensitivity to patient preference and end-of-life issues.
Practice within the scope of personal expertise or technical skills.

Interpersonal and Communication Skills
Communicate with and educate patients and families across a broad range of cultural, ethnic and socioeconomic backgrounds.
Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.

THIRD YEAR
In addition to skills acquired at the previous levels:

Patient Care
Skill to select and manage patients requiring permanent pacemaker, implantable cardioverter defibrillator or biventricular pacing.
Skill to perform pacemaker and ICD interrogation, programming, and surveillance.
Skill to perform permanent pacemaker implantation and manage complications.

ECHOCARDIOGRAPHY/NUCLEAR (Both Upstate Medical University Hospital and Veteran's Administration Medical Center)

FIRST YEAR

Medical Knowledge
Know the physical principles of ultrasound, and the instrumentation used to obtain images.
Know the limitations and potential artifacts of the echo examination.
Know the standard views included in a comprehensive TTE.

Patient Care and Procedural Skills
Skill To:
1. Perform & interpret a basic TTE exam.

Systems-based Practice
Work effectively with the echo laboratory staff.

Professionalism
Promote adherence to guidelines and appropriate use criteria.

Interpersonal and Communication Skills
Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.

SECOND YEAR
In addition to skills acquired at the previous level:

Medical Knowledge
Know the appropriate indications for: M-mode, two-dimensional, & three dimensional transthoracic echocardiography (TTE); Doppler echocardiography & color flow imaging; transesophageal echocardiography (TEE); tissue Doppler & strain imaging; contrast echocardiography.
Know the standard views included in a comprehensive TEE.
Know how to quantify cardiac chamber sizes, evaluate left and right ventricular systolic and diastolic function, and hemodynamics.

Know the characteristic findings of cardiomyopathies.
Know how to use echo and Doppler data to evaluate native and prosthetic valve function and diseases.
Know the echo & Doppler findings of cardiac ischemia and infarction, and the complications of myocardial infarction.
Know the echo findings of pericardial disease, pericardial effusion, and pericardial constriction.
Know the characteristic findings of basic adult congenital heart diseases.
Know how to evaluate cardiac masses, and suspected endocarditis.
Know how to evaluate diseases of the aorta.
Know how to assess pulmonary artery pressure and diseases of the right heart.
Know how to evaluate patients with systemic diseases involving the heart.
Know the indications for- and the echocardiographic findings in- patients with known or suspected cardio-embolic events.

Patient Care and Procedural Skills
Skill To:
Perform & interpret comprehensive TTE exam.
Integrate echo findings with clinical and other testing results in the evaluation & management of patients.

Systems-based Practice
Incorporate appropriate use criteria, risk benefit, safety, and cost containment considerations in the use of ultrasound techniques.
Participate in echo quality monitoring and initiatives.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.

Interpersonal and Communication Skills
Communicate testing results in a timely manner to primary and referring physicians.

THIRD YEAR

In addition to skills acquired at the previous levels:

Medical Knowledge
Know the findings of complex/post-operative adult congenital heart disease.

Patient Care and Procedural Skills
Skill To:
Perform & interpret comprehensive TEE exam.
Recognize pathophysiology, quantify severity of disease, identify associated findings, and recognize artifacts in echocardiography.

Interpret stress echocardiography.
Utilize echo techniques during cardiac interventions, including intraoperative TEE.

MILESTONES: Heart Failure (HF)

FIRST YEAR

Medical Knowledge
Know the pathophysiology, differential diagnosis, stages, and natural histories of HF.
Know the characteristic history and physical exam findings- and their limitations- in evaluation of HF syndromes.

Patient Care
Skill To:
Evaluate and manage patients with new-onset, chronic, and acute decompensated HF.
Appropriately select and incorporate data from diagnostic and laboratory testing in the evaluation and management of HF.
Use and perform invasive hemodynamic monitoring.

Interpersonal and Communication Skills
Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the appropriate use of laboratory studies and imaging modalities in evaluation and management of HF patients.
Know the indications for, and clinical pharmacology of, drugs used for treatment of HF, including adverse effects and use in special populations.
Know the indications and clinical pharmacology of intravenous vasoactive and inotropic drugs used for circulatory support in advanced/refractory HF.
Know the types of and indications for mechanical circulatory support.
Know the effects and interactions of HF with other organ systems (kidney, nutritional, metabolic), & in the setting of other systemic disease.
Know the management of cardiac arrhythmias in HF patients, and the indications and risks of use of ICD and cardiac resynchronization therapies.
Know the indications for referral for cardiac transplantation or assist devices.

Patient Care
Skill To:
Identify candidates for palliative care and hospice, heart transplant and ventricular assist devices.
Recognize and manage cardiac arrhythmias, including the identification of candidates for ICD, biventricular pacing, or arrhythmia ablation.
Recognize and manage co-morbidities in HF patients.
Participate in the management of patients with heart transplantation and mechanical circulatory assist devices.

Systems-based Practice
Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.
Incorporate risk-benefit analysis and cost considerations in diagnostic and treatment decisions.
dentify and address financial, cultural, and social barriers to diagnostic and treatment recommendations.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.
Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.

Professionalism
Exhibit sensitivity to patient preference and end-of-life issues.

Interpersonal and Communication Skills
Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.

MILESTONES: Hypertrophic Cardiomyopathy (HCM)

FIRST YEAR

Medical Knowledge
Know the prevalence, pathophysiology, differential diagnosis, and natural history of HCM.
Know the genetic basis of HCM, the indications for genetic testing, and the indications for screening first-degree relatives.
Know the mechanism of dynamic left ventricular outflow obstruction and the effects of changes in load and contractility on the severity of obstruction.
Know the role of diastolic dysfunction in the clinical manifestations of HCM.
Know the cardinal symptoms and physical findings of HCM, including the effects of position change and Valsalva maneuver.
Know the appropriate indications for, and the characteristic findings with, non-invasive imaging studies in HCM patients.
Know the risk factors for sudden death.
Know the appropriate utilization of ICD for primary and secondary prevention.
Know the management of cardiac arrhythmias, including atrial fibrillation, in patients with HCM.
Know the indications for referral for heart transplantation.

Patient Care
Skill To:
Incorporate clinical and diagnostic testing results in the estimation of sudden death risk in HCM.

Advise appropriate activity levels and limitations for patients with HCM, including avoidance of competitive athletics.

Interpersonal and Communication Skills
Communicate with patients and families across a broad range of socioeconomic and cultural backgrounds.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the indications for, and limitations of, medical therapy, dual chamber pacing and septal reduction therapy.

Patient Care
Skill To:
Diagnose HCM and evaluate for resting and dynamic left ventricular outflow obstruction.
Appropriately select and incorporate data from non-invasive imaging in the evaluation, management, and follow-up of patients with HCM.
Medically manage HCM patients, with and without obstruction.
Identify appropriate candidates for septal reduction therapy.
Manage the patient with HCM who becomes hemodynamically unstable.
Recognize and manage cardiac arrhythmias in patients with HCM.
Identify appropriate candidates for ICD.
Recognize and manage co-morbidities in HCM patients.

Systems-based Practice
Coordinate care and hand-offs for patients with HCM, including transition or transfer of care.
Utilize cost-awareness and risk-benefit analysis in patient care.

Practice-based Learning and Improvement
Locate, appraise, and assimilate evidence from scientific studies and guidelines in the care of HCM patients.
Engage in self-directed assessment-seeking to identify competency gaps and develop individualized learning plans to address those gaps.

Professionalism
Respond to patient needs in a way that supersedes self-interest, including referral of complex HCM patients when appropriate.

CONSULTS/CCU (Both Upstate Medical University Hospital and Veteran's Administration Medical Center)

FIRST YEAR

Medical Knowledge
Developing a differential diagnosis
Gaining proficiency in the interpretation of EKGs
Know the genetic basis of HCM, the indications for genetic testing, and the indications for screening first-degree relatives.
Right heart cardiac catheterization including indications, placement of Swan Ganz catheters, hemodynamic monitoring and interpretation of data
Assessment of patients referred for cardiovascular consult focusing on clinical skills required in the assessment of such patients

Patient Care
Skill To:
Perform History and physical examination of the cardiovascular patient
"Work-up" and management plan formulation
Acquire an understanding of the perioperative assessment of patients undergoing non-cardiac surgery

System-Based Practice
Understanding the ethical, legal and cost-containment issues involved in patient care

Practice-based Learning and Improvement
Formulate a differential diagnosis and a management recommendation for such patients

Interpersonal and Communication Skills
Teaching of students and Residents

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Be able to effectively render assessment and recommendations on perioperative cardiovascular care of the patient undergoing non-cardiac surgery
Be able to effectively render assessment and recommendations on perioperative cardiovascular care of the patient undergoing cardiac surgery especially in the areas of arrhythmia management, hemodynamics and myocardial ischemia and infarction

Patient Care
Skill To:
Insertion of temporary transvenous pacemakers
Insertion of and management of intra-aortic balloon counterpulsation devices

Professionalism
Understanding the ethical, legal and cost-containment issues involved in patient care

Interpersonal and Communication Skills
Leading discussions on multi-disciplinary rounds

THIRD YEAR

In addition to skills acquired at the previous levels:

Medical Knowledge
Be able to effectively function as a Cardiovascular Consultant

Patient Care
Skill To:
Management of complex cardiovascular problems

System-Based Practice
Gaining further understanding of the interplay of various disciplines such as Critical Care, Pulmonary Medicine, Nephrology and Cardiothoracic Surgery in the care of the patient

Professionalism
Understanding the ethical, legal and cost-containment issues involved in patient care

Interpersonal and Communication Skills
Participate in the teaching of members of disciplines other than Cardiology

RESEARCH

FIRST YEAR

Medical Knowledge
Critically analyzing journal articles of relevance to Cardiovascular Diseases and presenting such analyses in the form of Journal Club presentations
Identifying areas of potential research

System-Based Practice
Researching topics of presentation with the help of assigned mentors

Professionalism
Attending the National Annual Scientific Sessions of the American Heart Association or American College of Cardiology

Interpersonal and Communication Skills
Presentation of researched topics in Conference formats

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Further refining research and presentation skills by acquiring the ability to present with clarity, complex topics and controversial topics in Internal Medicine and Cardiology in Conference format

System-Based Practice
Participating in ongoing clinical and basic science research protocols of the Division of Cardiology. Other research opportunities are available throughout the Upstate Medical University.

THIRD YEAR

In addition to skills acquired at the previous levels:

Medical Knowledge
Formulate research plans for a future career in Cardiovascular Medicine

System-Based Practice
Preparing and submitting for publication manuscripts on original research conducted

Professionalism
Attending the National Annual Scientific Sessions of the American Heart Association or the American College of Cardiology. Senior fellows may choose instead to attend other national Cardiology meetings such as NASPE.

MILESTONES: Electrocardiography/Ambulatory ECG

FIRST YEAR

Medical Knowledge
Know the basic principles of scalar electrocardiography, and the operation/use of the instruments to acquire, display, and store ECGs.
Know the underlying cellular and ionic mechanisms in the genesis of the surface electrocardiograms and the effects of the autonomic nervous system.
Know how to measure, and the normal values for, electrical axis and ECG intervals, durations, and voltage.
Know the anatomy of the specialized conducting tissue, and the spread of excitation in the ventricles.
Know reentry, automaticity, and triggered activity mechanisms for cardiac arrhythmias.
Know the types and mechanisms of aberrancy.

Patient Care
Skill to identify normal ECG patterns, normal variants, and artifacts (including incorrect lead placement).
Skill to identify ECG signs of atrial abnormalities, and of right and left ventricular hypertrophy or enlargement.
Skill to identify types and significance of intraventricular conduction delay or block (including

functional or aberrant conduction abnormalities).
Skill to identify first, second (types I, II, 2:1, and high degree), and third degree atrioventricular blocks.
Skill to identify the ECG patterns and localization of cardiac ischemia and infarction.
Skill to identify non-specific QRS and ST-T wave changes.

Systems-based Practice
Participate in hospital/practice quality monitoring of ECG testing.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.

Professionalism
Practice within the scope of personal expertise or technical skills.
Use of appropriateness criteria for ECG testing.

Interpersonal and Communication Skills
Communicate testing results in a timely manner to primary and referring physicians.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know capture and fusion complexes and the ECG pattern criteria for distinction of supraventricular arrhythmias with aberrancy from ventricular arrhythmias.
Know the concepts of concealed conduction and exit block- and their manifestation on the ECG.
Know the characteristic ECG patterns of key clinical diagnoses (attachment A).
Know the indications for, and limitations of, continuous (Holter) and intermittent (Event) ambulatory ECG recording.

Patient Care
Skill to identify the types of atrioventricular dissociation.
Skill to identify the ECG changes of electrolyte and metabolic abnormalities, and of drug effects.
Skill to identify atrial, atrioventricular nodal and ventricular arrhythmias.
Skill to identify each of the specific patterns and rhythms in appendix A.
Skill to integrate ECG findings into clinical and risk assessments, and the management of patients.
Skill to select and interpret ambulatory ECG recording studies.
Skill to identify normal and abnormal pacemaker rhythms/functions.

MILESTONES: Nuclear Cardiology

FIRST YEAR

Medical Knowledge
Know the indications for myocardial perfusion imaging and the appropriate selection of exercise versus pharmacologic stress testing.
Know how to evaluate pre-test probability and perform sequential probability analysis to assess post-test probability.

Patient Care and Procedural Skills
Skill To:
Select the appropriate imaging study.
Identify results that indicate a high-risk state.

Systems-based Practice
Incorporate appropriate use criteria, risk benefit, and cost considerations in the use of radionuclide imaging techniques.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the principles of single photon emission computed tomography (SPECT) and radionuclide ventriculography (RVG) image acquisition and display, including the standard tomographic planes and views.
Know the properties and use of standard perfusion tracers.
Know the principles of radiation safety and how to minimize radiation exposure.
Know the mechanism of the pharmacologic stress agents, the methods of their administration, and the safety issues in using the agents.
Know the protocols for administration of the standard perfusion agents, and the influence of the clinical situation on choice of imaging protocol.
Know the quality control issues, how to review raw data, and recognize artifacts.
Know how to assess ventricular function.
Know the protocols for the use of perfusion imaging to assess myocardial viability.
Know the quality control issues, how to review raw data, and recognize artifacts.
Know how to assess ventricular function.
Know the protocols for the use of perfusion imaging to assess myocardial viability.

Patient Care and Procedural Skills
Skill To:
Integrate perfusion imaging findings with clinical and other testing results in the evaluation & management of patients.

Systems-based Practice

Work effectively & efficiently with the Nuclear laboratory staff.

Practice-based Learning and Improvement
Identify gaps and opportunities to achieve focused education and performance improvement.

Professionalism
Know and promote adherence to guidelines and appropriate use criteria.

Interpersonal and Communication Skills
Communicate effectively and timely with patients, families, and referring physicians to ensure test result information is used optimally in patient care.

THIRD YEAR

In addition to skills acquired at the previous levels:

Medical Knowledge
Know the properties and use of standard perfusion tracers.
Know the principles of radiation safety and how to minimize radiation exposure.
Know the quality control issues, how to review raw data, and recognize artifacts.
Know the indications for PET imaging and the use of PET tracers.

Patient Care and Procedural Skills
Skill To:
Perform & interpret gated stress-rest perfusion study.
Perform & interpret an RVG study.

Systems-based Practice
Work effectively & efficiently with the Nuclear laboratory staff.
Participate in lab quality monitoring and initiatives.

Interpersonal and Communication Skills
Communicate effectively and timely with patients, families, and referring physicians to ensure test result information is used optimally in patient care.
Create a comprehensive and user-friendly report.

MILESTONES: Pericardial Disease

FIRST YEAR

Medical Knowledge
Know the pathophysiology, differential diagnosis, and natural history of acute and relapsing pericarditis.
Know the pathophysiology, differential diagnosis, and natural history of pericardial effusion and pericardial tamponade.
Know the cardinal physical findings of acute pericarditis, pericardial tamponade, and constrictive pericarditis.
Know the indications for pericardiocentesis.
Know the indications for, and clinical pharmacology of drugs used for the treatment of acute and relapsing pericarditis.
Know pericardial anatomy and structural abnormalities (pericardial cyst and congenital absence of the Pericardium).
Know the indications for surgical referral in pericardial diseases, and the expected outcomes.
Know the indications for surgical referral in pericardial diseases.

Patient Care
Skill to clinically evaluate, diagnose, and manage patients with acute pericarditis, and with chronic relapsing pericarditis.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the pathophysiology, differential diagnosis, and natural history of constrictive pericarditis.
Know the effects of pericardial disease on other organ systems.
Know the indications for and characteristic findings in, imaging studies of pericardial diseases.

Patient Care
Skill to identify cardinal physical findings, and to evaluate and manage patients with pericardial effusion, including tamponade.
Skill to identify cardinal physical findings, and to evaluate and manage patients with constrictive pericarditis.
Skill to appropriately select and incorporate date from laboratory testing and non-invasive imaging in the evaluation and management of patients with pericardial disease.
Skill to distinguish constrictive pericarditis from restrictive cardiac disease.
Skill to identify patients who should be referred for cardiac catheterization in the evaluation of pericardial disease.
Skill to identify patients with constrictive pericarditis who are candidates for referral for consideration of cardiac surgery.

Systems-based Practice

Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.
Incorporate risk-benefit analysis and cost considerations in diagnostic and treatment decisions.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.

Professionalism
Exhibit sensitivity to patient preference and end-of-life issues.
Practice within the scope of personal expertise or technical skills.

Interpersonal and Communication Skills
Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.
Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.

THIRD YEAR

In addition to skills acquired at the previous levels:

Patient Care
Skill to perform pericardiocentesis.

MILESTONES: Stable Ischemic Heart Disease (SIHD)

FIRST YEAR

Medical Knowledge
Know the epidemiology, pathophysiology, and natural history of atherosclerotic vascular disease, and the characteristic features of stable and unstable coronary artery plaque.
Know the determinants of coronary blood flow and myocardial oxygen consumption.
Know the differential diagnosis of chest pain syndromes, and the characteristic clinical features of typical angina, atypical angina, and non-cardiac chest pain.
Know the clinical features and natural history of angina pectoris in special populations: women, the elderly, and patients with diabetes.
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).
Know the medical conditions that can provoke or exacerbate angina pectoris.
Know the differential diagnosis and prognosis of myocardial ischemia in patients with non-obstructive coronary disease.
Know the characteristic ECG features of SIHD.
Know the indications, contraindications, and limitations of non-invasive testing in the context of the pre-test likelihood and predictive value for diagnosis of coronary artery disease.

Know the role of non-invasive testing in risk-assessment, including the clinical, functional capacity, ECG, and hemodynamic stress test findings indicative of advanced coronary disease or high-risk state.
Know the lifestyle & activity guidelines, & risk factor treatment targets in patients with SIHD.
Know the indications, contraindications, and the clinical pharmacology of medications used to improve symptoms and/or prognosis in patients with SIHD.
Know the role of left ventricular systolic function in clinical decision-making and in estimation of prognosis in patients with SIHD.
Know the indications, limitations, and risks of coronary angiography in patients with known or suspected SIHD.
Know the anatomic and physiologic catheterization findings indicating significant coronary artery obstruction; and the coronary angiographic features indicative of a high-risk state.
Know the indications, risks, and benefits of percutaneous or surgical revascularization versus medical therapy in patients with SIHD.
Know the treatment options for refractory symptomatic SIHD.
Know the indications for non-invasive or invasive evaluation following revascularization procedures.

Patient Care
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.
Distinguish stable versus unstable coronary syndromes.
Select evidence-based and cost-effective non-invasive testing for diagnosis and/or risk assessment in patients with chest pain syndromes.
Perform and interpret exercise ECG testing.
Establish an effective anti-ischemic medical regimen for patients with SIHD.
Identify appropriate candidates for coronary angiography, and percutaneous or surgical revascularization.
Implement lifestyle and pharmacologic interventions to control and achieve target levels of risk factors.
Perform pre-operative risk assessment in cardiovascular patients undergoing non-cardiac surgery.

SECOND YEAR

In addition to skills acquired at the previous level:

Patient Care
Skill To:
Interpret and apply results of non-invasive testing in the management of patients with SIHD.
Interpret diagnostic cardiac catheterization findings and integrate into patient management.

Systems-based Practice
Incorporate risk-benefit analysis and cost considerations in treatment decisions.
utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment-related issues.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance

improvement.
Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.

Professionalism
Exhibit sensitivity to patient preference and with end-of-life issues.
Identify and manage conflicts of interest.
Practice within the scope of personal expertise or technical skills.

Interpersonal and Communication Skills
Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.
Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.

THIRD YEAR

In addition to skills acquired at the previous level:

Patient Care
Skill To:
Perform diagnostic cardiac catheterization.

MILESTONES: Valvular Heart Disease (VHD)

FIRST YEAR

Medical Knowledge
Know the characteristic features and natural history of congenital bicuspid aortic valve disease.
Know the etiology, natural history, pathophysiology, and differential diagnosis of acquired aortic, mitral, pulmonic, and tricuspid valve diseases.
Know the characteristic features and natural history of rheumatic VHD.
Know the cardinal symptoms and physical findings of aortic & of mitral stenosis, and their role in management decisions.
Know the cardinal symptoms and physical findings of chronic aortic and chronic mitral regurgitation, and their roles in management decisions.
Know the causes and distinguishing characteristics of acute versus chronic mitral and aortic regurgitation.
Know the natural history, clinical features, and complications of mitral valve prolapse.
Know the role of stress testing in assessment of VHD.
Know the indications for, and clinical pharmacology of, drugs used for the treatment of native and prosthetic VHD, including anticoagulation and antibiotic prophylaxis.
Know the effects of arrhythmias on the clinical manifestations, risk of complications, and management of VHD.

Patient Care

Skill To:
Distinguish aortic stenosis from HOCM and other causes of LVOT obstruction.
Recognize bicuspid aortic valve disease and its associated abnormalities.
Recognize impact of ventricular dysfunction on clinical decision-making in VHD.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the causes and distinguishing characteristics of acute versus chronic mitral and aortic regurgitation.
Know the appropriate indications for, and characteristic findings of, echocardiographic testing for diagnosis and assessment of severity during initial evaluation and upon follow-up.
Know the indications for MRI and CT, in assessment of VHD.
Know the indications for, and characteristic findings with, cardiac catheterization in patients with VHD.
Know the indications and expected outcomes for surgical therapy in VHD, including valve selection and repair versus replacement.
Know the indications and expected outcomes for transcatheter therapy in VHD
Know the etiology, natural history, physical findings, differential diagnosis, complications and treatment of native valve and prosthetic valve endocarditis.
Know the effects of pregnancy on the clinical manifestations & management of patients with VHD (native & prosthetic).

Patient Care
Skill To:
Identify cardinal physical findings, & ECG abnormalities in patients with VHD.
Distinguish innocent from pathologic heart murmurs.
Manage patients with VHD and coronary artery disease.
Select appropriate testing and integrate results with clinical findings in the evaluation and management of patients with VHD.
Recognize the cause and impact of pulmonary hypertension in management of VHD.
Determine candidacy and optimal timing of cardiac surgical or transcatheter treatments in patients with VHD.

Systems-based Practice
Participate in interdisciplinary decision-making with regard to surgery and transcatheter therapy.
Practice in a manner that fosters the balance of appropriate utilization of finite resources with the net clinical benefit for the individual patient

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.
Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.

Professionalism
Exhibit sensitivity to patient preference & with end-of-life issues.
Practice within the scope of personal expertise or technical skills.

Interpersonal and Communication Skills
Engage in shared decision-making with patients about their condition and the options for diagnosis and treatment.

THIRD YEAR

In addition to skills acquired at the previous level:

Patient Care
Skill To:
Perform TEE in patients with VHD.
Perform diagnostic catheterization in patients with VHD.

MILESTONES: Vascular Disease

FIRST YEAR

Medical Knowledge
Know the anatomy of the peripheral arterial & venous systems.
Know the causes and clinical epidemiology of peripheral artery disease, including the incidence and prevalence, sex and ethnic differences, and the influence of traditional risk factors and demographics on outcomes.
Know the pathology, pathophysiology, and differential diagnosis of peripheral venous diseases, including venous thromboembolic disease, post-thrombotic syndrome, congenital abnormalities, and varicosity and venous insufficiency.
Know the indicated laboratory tests to assess for thrombophilia and vasculitis.
Know the causes and treatment of lymphedema.
Know the impact of peripheral vascular disease on overall cardiovascular morbidity and mortality.

Patient Care
Skills to identify asymptomatic patients who may benefit from intensive risk reduction management strategies.
Skill to evaluate and manage patients at risk for, or with, venous thrombosis and/or thromboembolism.

SECOND YEAR

In addition to skills acquired at the previous level:

Medical Knowledge
Know the pathology, pathophysiology, and differential diagnosis of peripheral artery diseases, including atherosclerotic, thrombotic, vasculitic, fibromuscular, vasospastic, and atheroembolic causes.
Know the cardinal symptoms & physical findings of carotid, aorta, renal artery, and of upper and lower extremity arterial diseases.

Know the indications for noninvasive vascular testing, including duplex ultrasonography of carotid arteries, peripheral arteries, bypass grafts and renal arteries.
Know the indications for CT & MR angiography in patients with suspected vascular disease.
Know the indications, risks, clinical pharmacology, and drug interactions of drugs used to treat vascular diseases.
Know the methods and indications to assess subclinical atherosclerosis (including coronary calcification, carotid intima-media thickness, and ankle-brachial index).
Know the indications for non-invasive screening for abdominal aortic aneurysm.
Know the role for exercise rehabilitation in patients with claudication.
Know the indications and risks for surgical and percutaneous interventional treatments for peripheral vascular diseases; and, the expected outcomes.

Patient Care
Skill to perform and interpret an ankle-brachial index measurement.
Skill to interpret limb segmental blood pressure measurements, pulse volume recordings, and treadmill vascular exercise tests.
Skill to determine when assessment for subclinical atherosclerosis may be indicated, and to select appropriate tests.

Systems-based Practice
Utilize a multidisciplinary coordinated approach for patient management, including transfer of care and employment related issues.
Practice in a manner that fosters the balance of appropriate utilization of finite resources with the net clinical benefit for the individual patient.

Practice-based Learning and Improvement
Identify competency gaps and engage in opportunities to achieve focused education and performance improvement.
Utilize decision support tools for accessing guidelines and pharmacologic information at the point of care.

Professionalism
Promote adherence to guidelines and appropriate use criteria.
forego recommending unvalidated diagnostic testing or treatments.

Interpersonal and Communication Skills
Communicate with and educate patients and families across a broad range of cultural, ethnic, and socioeconomic backgrounds.

THIRD YEAR

Patient Care
Skills to identify patients for whom referral for revascularization is indicated.