

UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER
DIVISION OF CARDIOVASCULAR DISEASES

University of Tennessee
Division of Cardiovascular Diseases
Fellowship Manual



Spring, 2008

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DIVISION OF CARDIOVASCULAR DISEASES**

General Overview:

The Cardiology Fellowship Program at the University of Tennessee, under the leadership of Dr. Karl Weber, is committed to providing each of its trainees with a broad, integrated knowledge in cardiovascular medicine, physiology and pathology needed to excel in the practice of Cardiovascular Diseases. The Program director and the faculty deeply believe in training cardiologists who are strong clinicians capable of facing the complex challenges posed by patients with cardiovascular disease. Over a three year period, the fellowship provides exposure to a wide variety of pathology; instruction in planning, performing and interpreting non-invasive and invasive procedures; guidance in interpreting the cardiovascular literature; exposure to clinical and basic research, and experience in scientific authorship; presentation at daily teaching conferences; and guided education towards becoming an effective teacher.

Program Facilities:

The University of Tennessee offers a three-year fellowship in cardiovascular medicine through rotations in the three hospitals comprising the medical center. These hospitals are the Veterans Affairs Medical Center at Memphis (VAMC), the Regional Medical Center (MED), and the Methodist University Hospital (MUH). Besides these institutions, additional rotations are available at Le Bonheur Children Hospital, an affiliate of Methodist University Hospital.

The VAMC at Memphis is an integral part of the training program. The referral area includes West Tennessee, Northeast Mississippi, East and Northeast Arkansas, and the southern part of Missouri. Inpatient services include coronary, medical, and surgical intensive care units, telemetry floor, and general medical, surgical, and surgical subspecialty floors. A large spinal cord injury unit is located in this hospital as well. A busy outpatient clinic system exists in the hospital, with cardiology section providing services through clinics that include cardiology fellows' clinic, cardiology staff clinic, lipid clinic, pacemaker follow-up clinic, hypertension clinic, heart failure clinic, vascular surgery clearance clinic, cardiac rehabilitation clinic, research clinic, and consult clinics. The fellows provide longitudinal care in the Thursday afternoon Fellows' clinic. In addition, they assist in the Lipid, Heart Failure, and the Pacemaker Follow-up clinics. It is equipped with state-of-the-art cardiac catheterization facilities providing a wide range of diagnostic and therapeutic modalities such as coronary angiography, percutaneous coronary intervention, intravascular ultrasound, endomyocardial biopsy, balloon valvuloplasty and hemodynamic studies. Non-invasive capabilities include transthoracic, transesophageal, three-dimensional echocardiography, and stress echocardiography, electrocardiography, ambulatory EKG monitoring, exercise testing, nuclear cardiac imaging, and cardiopulmonary exercise testing.



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The MED is a large community hospital supported by the Shelby County government. It is an acute care facility with very active cardiac, medical, surgical, trauma, and neuro intensive care units. Invasive and non-invasive cardiac services are provided at this hospital. It also houses the Elvis Presley Memorial Trauma Center, the only Level I trauma center in this area. Other areas of special expertise in the MED are the only Burn Center of the city, and a Neonatal Intensive Care Unit. Presence of an active high-risk obstetrics practice on site provides the opportunity to participate in the care of pregnant cardiac patients. The MED also has an attached clinic complex called the MedPlex. Cardiology fellows see patients in the MedPlex on Wednesday morning in the consult clinic and on Wednesday afternoon in the cardiology continuity clinic.



The Methodist University Hospital is a large not-for-profit private hospital located within minutes of the other hospitals. Fellows rotate through the cardiology service which is staffed by full-time University attendings, or on occasion by private volunteer faculty members. The cardiac catheterization laboratory is very busy with high number of diagnostic and interventional procedures performed. Fellows rotate through the cath lab and work with the full-time and volunteer faculty. Two months of mandatory elective time is spent in Electrophysiology under the tutelage of Dr. James Porterfield, generally in the third year.



Le Bonheur Children Hospital is located adjacent to the MED. It is an affiliate of the Methodist system, with satellite facilities in the surrounding areas. Fellows can take electives in pediatric cardiology if they want to gain further expertise in this field.



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GOALS OF THE FELLOWSHIP PROGRAM:

The Cardiology Fellowship Program at the University of Tennessee under the leadership of Dr. Karl Weber, M.D., is committed to providing each of its trainees with a broad, integrated knowledge in circulatory physiology, pathology and therapy needed to excel in the practice of Cardiovascular Diseases. Training for a career in Cardiovascular Disease must include guidance in interpreting the cardiovascular literature, exposure to clinical and basic research, and experience in scientific authorship and guided education towards becoming an effective teacher. For trainees planning careers in academic cardiology, additional mentored experience in independent investigation is vitally important.

The cardiovascular fellowship is a basic 3-year program approved by the Accreditation Council for Graduate Medical Education. Successful completion of all facets of the program qualifies the graduate to sit for the ABIM Subspecialty certifying examination in cardiovascular disease. The majority of core training is concentrated in the first 2 years to provide trainees with a broad exposure early in the program. This format allows fellows to determine an area of interest early, and apply their elective time toward developing expertise in that area. For those interested in academic cardiology, the format allows a block of time to committed research activity.

The specific program content is derived from requirements specified by the ACGME for specialization in cardiovascular disease (<http://www.Acgme.org>) and the recently published ACC Revised Recommendation for Training in Adult Cardiovascular Medicine Core Cardiology Training II (COCATS 2) published in the April 3, 2002 issue of the Journal of the American College of Cardiology and available at www.Acc.org.

GENERAL ORIENTED LEARNING GOALS AND MEASURABLE OBJECTIVES

The Cardiology Fellowship program at the University of Tennessee has developed a curriculum with competency oriented learning goals and measurable objectives as outlined in RRC's Program Requirements. The program's curriculum, goals and objectives have been related to the six general competencies required by the RRC as described below:

I. PATIENT CARE

Goal:

To provide quality care that is appropriate, effective and compassionate to patients with cardiovascular health problems.

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Objectives:

1. Obtain a complete and accurate history and physical examination from patients with cardiovascular complaints.
2. Interpret and obtain appropriate laboratory studies for the evaluation of cardiac disorders.
3. Formulate treatment plans based on patient information and preferences for specific cardiovascular disease states.
4. Apply current scientific evidence using information technology to facilitate the diagnosis and treatment of cardiac diseases.
5. Appropriately counsel and educate patients and their families about specific cardiac problems.
6. Know the health care services aimed at preventing cardiovascular problems and maintaining health.
7. Competently perform all diagnostic and invasive and non-invasive procedures required for the appropriate management of cardiovascular disorders in the in-patient and outpatient setting.

II. MEDICAL KNOWLEDGE

Goal:

Acquire basic scientific and clinical knowledge of the full spectrum of cardiovascular disorders and be able to apply this knowledge to the care of the cardiac patient.

Objectives:

1. Know the embryology, anatomy, physiology, biochemical and metabolic aspects of the cardiovascular system.
2. Apply knowledge of the pathophysiology of the cardiovascular disorders to the care of individual patients.
3. Obtain and process knowledge about cardiovascular disorders from reading sources, current literature, and didactic teaching sessions.
4. Perform well on written and oral examinations assessing fund of basic science and clinical knowledge.

III. PRACTICE-BASED LEARNING AND IMPROVEMENT

Goal:

Improve cardiac patient care practices by the critical evaluation of current practice patterns and by the appraisal and assimilation of scientific evidence and performance standards.

Objectives:

1. Critically analyze on a regular basis current practice experience using a systemic and reliable methodology.
2. Perform practice-based improvement by implementing a change in practice, based on newly acquired clinical information.

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3. Locate, appraise, and assimilate scientific studies from the cardiac literature applicable to patient management.
4. Understand scientific study design and statistical analysis to allow evaluation and appraisal of clinical studies.
5. Use information technology to access and manage on-line medical information.
6. Be an effective teacher of medical students, medical residents, junior cardiology fellows, and other healthcare professionals.
7. Analyze practical experience and perform practice based improvement activities using a systematic methodology.
8. Obtain and use information about the patient population and the larger population from which the patients are drawn.
9. Dedication to improvement in medical knowledge through a commitment to continued medical education.

IV. INTERPERSONAL AND COMMUNICATION SKILLS

Goal:

Develop interpersonal and communication (verbal and writing) skills that will allow effective exchange of information with cardiac patients, their families, and other healthcare professionals.

Objectives:

1. Develop a positive rapport with the patients and their families.
2. Develop effective listening skills and be able to elicit and provide information using appropriate non-verbal, explanatory and patient interview skills.
3. Formulate and write coherent and legible notes in the medical record.
4. Write clear, concise and comprehensible manuscripts for publication in the cardiovascular literature.
5. Prepare and deliver oral or case presentations in a thoughtful, organized and coherent manner.
6. Work effectively with students, residents and fellows as a member/leader of the cardiology healthcare team.
7. Develop the appropriate interpersonal and communication skills to effectively follow instructions, ask relevant questions, and communicate with consultants from other divisions and departments.
8. Work with other medical and surgical disciplines and healthcare professionals to provide multidisciplinary care to the patient.

V. PROFESSIONALISM

Goal:

Be professional by adherence to high ethical standards, professional responsibilities, and sensitivity to the diverse patient population.

Objectives:

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1. Have respect, compassion, and integrity in interactions with patients, their family members, and other healthcare professionals.
2. Accept responsibility readily, be industrious and self-motivated, and bring assigned tasks to completion.
3. Function as an effective leader of the cardiology healthcare team.
4. Understand and commit to the ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, informed consent, and cardiology business practices.
5. Demonstrate sensitivity and responsiveness to the cardiac patients' culture, age, gender, and disabilities.
6. Demonstrate respect, compassion, integrity, punctuality, reliability, and honesty with patients and colleagues.

VI. SYSTEMS-BASED PRACTICE

Goal:

Be aware of and responsive to the healthcare system and use available resources from this system to optimize the care of cardiac patients.

Objectives:

1. Demonstrate an understanding of how cardiovascular patient care practices affect other healthcare professionals within the local, regional, and national healthcare system.
2. Describe how these varied types of healthcare systems affect individual cardiology practice.
3. Demonstrate an understanding of the differences between various types of medical practices and delivery systems, especially with regards to healthcare costs and allocation of resources.
4. Readily identify and correct healthcare system deficiencies that may result in less than optimal care of the cardiac patient.
5. Assist patients in dealing with healthcare system complexities.
6. Practice cost-effective healthcare and resource allocation without compromising quality of patient care.
7. Know how to partner with healthcare managers or other providers in efforts to improve coordination and effectiveness of the healthcare system.

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Program Structure:

Training:

Cardiovascular medicine is a complex and rapidly developing science. To function effectively as a clinician and consultant, a cardiologist must possess a sound body of knowledge and basic diagnostic, therapeutic, and technological skills. The various rotations are designed to provide this necessary experience in compliance with ACC Revised Recommendation for Training in Adult Cardiovascular Medicine Core Cardiology Training II (COCATS 2) published in the April 3, 2002 issue of the Journal of the American College of Cardiology. Per the COCATS recommendations, the training is described under the following categories:

1. Clinical Cardiology
2. Electrocardiography, Ambulatory Electrocardiography and Exercise Testing
3. Nuclear Cardiology
4. Cardiac Catheterization, diagnostic and interventional
5. Echocardiography
6. Electrophysiology, Cardiac Pacing and Arrhythmia Management
7. Cardiovascular Research
8. Heart Failure and Cardiac Transplantation
9. Care of Adults with Congenital Heart Disease
10. Preventive Cardiovascular Medicine
11. Vascular Medicine and Peripheral Vascular Disease
12. Cardiovascular Magnetic Resonance

1. Clinical Cardiology:

Training in clinical cardiology encompasses inpatient and outpatient care. The inpatient training takes place at the VAMC, MED, and the MUH services, divided between CICU and consultative cardiology. The CICU and consult services are staffed by full-time Division faculty, with the exception of occasional rotations with volunteer faculty at MUH. The fellows work closely with the faculty, and supervise the house-staff and students assigned to the service. They help triage patients from the emergency room to ICU or floor care based upon the stability of the patient. The fellows are encouraged to

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learn cost effectiveness of care, allocation of resources and economic impact of their decisions on patients, as well as principles, objectives and processes of quality assessment and improvement. Given the large number of patients with varied financial, linguistic, religious and cultural backgrounds, the fellows also learn cross-cultural issues at the bedside in addition to didactics specifically arranged to address these issues.

The outpatient experience takes place at the MedPlex and the VAMC clinics. The MedPlex has a Wednesday morning consult clinic staffed by Dr. Howard Horn. One of the second year or third year fellows sees patients in this clinic along with residents and students on cardiology service or elective. The Chief Fellow designates the fellows to cover the clinic. After the initial consultation, the case is transferred to the continuity clinic if further follow-up by Cardiology is needed. The continuity clinic meets on Wednesday afternoon; Dr. Karl Weber is the supervising faculty. The first year fellows see patients here that have been discharged from the hospital, besides those transferred over from the consult clinic. All the fellows see patients in the Thursday afternoon Fellow's clinic at the VA. The supervising attending physicians are Drs. Davis, Riddle, and Munir. Most of the patients have previously been seen by cardiology on either the CICU or the consult service, though occasional new consults may have to be seen. The same person follows the patients for the three-year fellowship duration. Similarly, it is expected that the same fellow who had provided initial hospital care will see the patient in the clinic. Additional outpatient experience is gained by seeing patients in the Lipid, Pacemaker follow-up, and Heart Failure clinics.

First-year Fellow

Goal

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To establish firm foundations of the knowledge, understanding, diagnosis and management of cardiovascular diseases.

Objectives

Patient Care

1. Elicit and document an accurate history and physical examination of the cardiology patient. Review Staff critique of presentation and progress notes for deficiencies and proper documentation. Confirm physical examination findings with Staff.
2. Become skilled at patient counseling and educating.
3. Accurately perform and interpret commonly performed laboratory studies in cardiology.
4. Formulate differential diagnosis of common diseases in cardiology.
5. Diagnose and manage cardiovascular diseases (e.g. coronary artery disease, congestive heart failure, cardiac arrhythmias, valvular heart disease, and congenital heart disease).

Medical Knowledge

1. Demonstrate an understanding of the anatomy, physiology, pharmacology, biochemical and metabolic aspects of the cardiovascular system.
2. Learn the basics & interpretation of EKG's from conferences, lectures, discussions and teaching files.
3. Understand basics of commonly performed imaging studies in cardiology with the advantages and disadvantages of each.
4. Demonstrate an understanding of the basic concepts of pacing, defibrillation and electrophysiology.
5. Study and identify the cardiovascular risk factors.
6. Expand medical knowledge by regularly attending conferences on core curriculum topics, Journal club meetings, pro and con conferences, morbidity and mortality conferences, CT surgery conferences, Research conferences and Grand Rounds.
7. Gain knowledge about cardiovascular diseases on rounds.
8. Perform well on standardized examinations.
9. Understand scientific study design and statistical analysis for research projects.
10. Learn the basics and indications of IABP.
11. Develop the basic knowledge of interpreting chest x-rays.
12. Develop a knowledge base of the following cardiovascular diseases:
 - Coronary Artery Disease
 - a. Epidemiology
 - b. Risk factors
 - c. Management of risk factors (i.e. lipid abnormalities, metabolic syndrome, systemic hypertension etc.)
 - d. Recognition, evaluation and management of chronic stable angina

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- e. Recognition, evaluation and management of unstable angina
- f. Recognition, evaluation and management of ST elevation acute myocardial infarction
- g. Recognition, evaluation and management of Non ST elevation myocardial infarction
- h. Recognition and management of post infarction complications
- i. Post infarction risk stratification
- j. Post infarction home care
- k. Indications and use of non-invasive and invasive diagnostic tests (e.g. ECG, stress echo, stress nuclear, stress MR, CT, EBCT, coronary angiography, left ventricular function)
- l. Indications for percutaneous revascularization
- m. Indications for surgical revascularization
- n. Management of cardiogenic shock

Congestive Heart Failure

- a. Etiological factors and pathophysiology
- b. Devices and surgical approaches
- c. Diagnostic testing
- d. Recognition, evaluation and management of chronic congestive heart failure
- e. Evaluation and management of acute vs. chronic decompensation
- f. Recognition, evaluation and management of hypertrophic cardiomyopathy
- g. Recognition, diagnosis and treatment of pericarditis and pericardial effusion

Cardiac Arrhythmias

- a. Application of ACLS
- b. Recognition, evaluation and management of atrial fibrillation
- c. Evaluation and management of common tachyarrhythmias
- d. Evaluation and management of common bradyarrhythmias
- e. Indications for temporary and permanent pacing
- f. Indications for electrophysiologic and noninvasive electrocardiographic testing
- g. Recognize sinus node dysfunction, AV block, and bundle branch block
- h. Anti-arrhythmic therapy
- i. Cardiac evaluation of syncope

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Valvular Heart Disease

- a. Etiology, pathology and clinical presentation of valvular heart diseases
- b. Use of non-invasive and invasive modalities in the testing of valvular heart diseases
- c. Natural history of aortic and mitral valvular heart diseases
- d. Indications for surgical intervention
- e. Antibiotic prophylaxis for prevention of endocarditis
- f. Recognition and management of endocarditis

Congenital Heart Disease

- a. Recognition, evaluation and management of natural survivors-bicuspid aortic valve, atrial septal defect and mitral valve prolapse
- b. Recognition, evaluation and management of adult survivors following correction of heart disease in childhood
- c. Physical diagnosis and diagnostic testing for common congenital heart disease in the adult

Lipid Disorders

- a. Etiology, pathology and clinical presentation of lipid disorders
- b. Use of non-invasive and invasive modalities in the testing of lipid disorders
- c. Recognition, evaluation, and management of lipid disorders

Hypertension/ Pulmonary Heart Disease

- a. Etiology, pathology and clinical presentation of hypertension and pulmonary heart disease
- b. Use of non-invasive and invasive modalities in the testing of hypertension and pulmonary heart disease
- c. Recognition, evaluation, and management of essential, secondary, and pulmonary hypertension
- d. Recognize and treat hypertension in pregnancy (eclampsia)

Infections and Inflammatory Heart Disease

- e. Etiology, pathology and clinical presentation of infections and inflammatory heart disease
- f. Use of non-invasive and invasive modalities in the testing of infections and inflammatory heart disease
- g. Recognition, evaluation, and management of infections and inflammatory heart disease

Evaluation for Non-cardiac Surgery

- a. Cardiac risk assessment
- b. Preoperative and postoperative management

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Recognition and Management of Important Cardiovascular Emergencies

- a. Aortic dissection
- b. Acute pulmonary embolism
- c. Cardiac tamponade
- d. Hypertensive emergencies
- e. Acute complications of cardiac surgery

Cardiac Pharmacology

- a. Anticoagulation, short and long term, with all forms of heparin, IIb/IIIa antagonists, thrombolytics and coumadin
- b. Drug interactions and iatrogenic complications including pro-arrhythmias

Practice Based Learning and Improvement

1. Teach students and residents about the basic concepts in cardiology.

Interpersonal and Communication Skills

1. Make effective oral presentations on various topics on cardiovascular diseases.
2. Build a positive rapport with the cardiology patients and their families.

Second year Fellow

Goal

Aim towards independent functioning in the clinical cardiology setting with advancing the knowledge base, acquiring procedural skills and expertise in the diagnosis and management of cardiovascular diseases.

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

1. Formulate the work up and management plans of various cardiovascular diseases.
2. Order appropriate diagnostic imaging studies.
3. Work closely with the social services and patient's family regarding discharge planning and comprehensive care of the patient.
4. Manage critical care issues in a cardiology patient.
5. Manage transplant patients.
6. Treat cardiac conditions in a pregnant patient.
7. Treat and manage cardiovascular risk factors.
8. Recognize and manage various arrhythmias.

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9. Learn peri-operative assessment of cardiac patients undergoing cardiac and non cardiac surgery.
10. Manage IABP.

Medical Knowledge

1. Assimilate knowledge by a critical review of literature on current topics in cardiovascular diseases.
2. Learn the differential diagnosis of cardiovascular diseases.
3. Become skilled at decision making based upon clinical information, investigational and imaging studies.
4. Become skilled at the interpretation of hemodynamic data from right and left heart catheterization.
5. Gain knowledge of the Indications of pacemakers and ICDs and when to refer patients for further electrophysiology studies.

Practice Based Learning and Improvement

1. Improve clinical acumen by learning from experiences on clinical rotations and review of cases presented in mortality and morbidity conferences.

Interpersonal and Communication Skills

1. Develop leadership skills to be able to work as a team leader.

Systems Based Practice

1. Understand the ethical, legal and cost-containment issues involved in patient care.

Third-year Fellow

Goals

To achieve a level of clinical knowledge, decision making and management skills required for functioning as an independent cardiology consultant.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Improve decision making process for choosing appropriate therapy in the emergent and non emergent clinical setting.
2. Improve the decision making process for ordering appropriate imaging studies in the emergent and non emergent clinical settings.
3. Manage complex and seriously ill patients on inotropic support, Intraaortic balloon pump and mechanical ventilation.
4. Trouble shoot basic pacemaker problems.

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Medical Knowledge

1. Develop further understanding of interplay of various disciplines such as critical care, pulmonary medicine, Nephrology and CT surgery in the care of the patient.

Practice Based Learning and Improvement

1. Be able to review and critique current literature and be able to generate hypothesis for potential future research studies.

Professionalism

1. Be able to practice ethically, professionally and with the highest standards of patient care and respect for coworkers.

AIDS FOR ACHIEVING GOALS:

The attending on the service will help achieve these goals by

1. Providing orientation at the beginning of rotation.
2. Discussing each new case in detail and the developments in old cases on rounds.
3. Observing and verifying the historical information obtained. The attending will provide feedback regarding history taking techniques.
4. Observing and verifying the physical findings elicited.
5. Developing a list of topics for discussion on rounds. Such lists should include overview of various diagnostic modalities utilized, and the pros and cons of each. The attending should discuss the findings of various tests, and respective negative and positive predictive values.
6. Reviewing the notes written by the fellow for clarity and completeness, and discussing any deficiencies.
7. Providing assistance with preparation for conferences and journal club meetings.

EVALUATION OF PERFORMANCE IN CLINICAL CARDIOLOGY:

1. Monthly evaluation based on global clinical performance and oral examinations rating.
2. Evaluation of performance at the In-service examinations.
3. Evaluation of attendance and performance at the weekly mortality and morbidity conference.
4. Evaluation of attendance and performance at the weekly cardiac surgical conference.
5. Evaluation of attendance and performance at the Journal club meetings.
6. 360 degree evaluation
7. Resident Portfolio

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2. Electrocardiography, Ambulatory Electrocardiography and Exercise

Testing:

Training in electrocardiography is imparted through didactic teaching, case-based teaching, and by over-reading and feedback from the faculty. Regular EKG lectures are part of the conference schedule. The format can be both didactic and case-based. Additional sessions to practice ECG-SAP CD-ROMs of the American College of Cardiology are also scheduled. The non-invasive fellow at MED is regularly assigned EKGs to read, and receives feedback from supervising faculty. All the fellows rotating through the VAMC read EKGs on the computerized MUSE system according to assigned floors. The Chief Fellow makes these assignments in consultation with the Section Chief, Dr. Ramanathan. During the three years, the fellows read in excess of 5000 EKGs, thus fulfilling Level 2 requirements of COCATS II.

The Ambulatory Electrocardiography training follows the same format as EKG teaching. Tracings from Holter monitors, Loop event recorders, and Reveal implantable recorders are interpreted by fellows with feedback from faculty. The number of studies interpreted is sufficient to meet COCATS II Level 2 requirements.

Fellows rotate through the stress labs at UT and MED as part of the non-invasive rotation. All stress modalities are used, including bicycle and arm ergometry, treadmill, and pharmacological stress with Dobutamine or Adenosine. Imaging with both nuclear and echocardiographic methods is undertaken. The goal of training includes understanding of the onset and offset of the ischemic ST-segment depression, exercise-induced cardiac arrhythmias, magnitude and slope of ST-segment depression or elevation, ST/heart rate indices, exertional hypotension, chronotropic incompetence, and

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hemodynamic measurements such as maximum exercise heart rate, systolic blood pressure, and double product. Choosing the appropriate imaging modality according to the clinical situation and thus practicing cost-effective care is an important learning objective as well. The fellow becomes proficient in integrating the data, understanding the reasons for stopping exercise, and producing a written report. The fellow more than anything else understands the diagnostic accuracy (sensitivity and specificity) and prognostic importance of the procedure in different clinical settings. During the course of the fellowship, in excess of 300 tests are performed by each fellow, again satisfying Level 2 requirements.

Cardio-pulmonary exercise testing (CPX) involving breath-by-breath respiratory gas exchange is available and part of fellow training. It is used in the assessment of functional capacity, differential diagnosis of exertional dyspnea (ventilatory vs. cardiac), progression of illness, stratification for heart transplantation, response to treatment, and preparing a prescription for exercise training and rehabilitation.

First-year Fellow

Goals

To become proficient in the basic concepts of electrophysiology, pacing, Ambulatory and exercise electrocardiography and be able to order appropriate stress lab studies.

Objectives

Patient Care and Medical Knowledge

1. Demonstrate knowledge of the basic EKG principles through didactic, case based teaching and self assessment aids.
2. Recognize structural abnormalities of the heart on EKG and changes produced on EKG due to electrolyte and metabolic disturbances.

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3. Demonstrate an understanding of the basic principles, advantages and disadvantages of various pharmacologic and exercise stress modalities.
4. Recognize exercise induce ischemic ST-segment changes.
5. Recognize exercise-induced cardiac arrhythmias.
6. Demonstrate an understanding of the basic electrophysiology of cardiac impulse generation and propagation.
7. Describe the physiologic basis of tilt table testing.
8. Recognize normal waveforms on surface electrocardiograms and normal variants.
9. Demonstrate an understanding of various elective cardioversions.
10. Describe the various exercise stress protocols.
11. Develop the knowledge of administering appropriate cardiovascular rehabilitation.

Second-Year Fellow

Goals

To have an in depth knowledge of indications, use and interpretation of various stress and electrocardiographic modalities.

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

1. Order appropriate stress modalites according to the clinical situation of the patient.
2. Interpret tracings from Holter monitors, Loop event recorders, and Reveal implantable recorders.
3. Diagnose chronotropic incompetence by using an exercise stress test.

Medical Knowledge

1. Recognize various atrial and ventricular arrhythmias, and different degrees of atrioventricular block.
2. Recognize the indications, and reasons to terminate stress tests.
3. Demonstrate knowledge in the indications and interpretation of tilt table testing.
4. Know the indications of bicycle and arm ergometry, treadmill, and pharmacological stress with Dobutamine or Adenosine.
5. Demonstrate an understanding of the diagnostic accuracy (sensitivity and specificity) and prognostic importance of the stress modalities in different clinical settings.

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Third-year Fellow

Goals

Be able to independently make accurate, appropriate and efficient use of various stress lab modalities for the diagnosis and management of various cardiovascular disorders.
To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Use the results of various stress tests to arrive at a diagnosis and formulate a management plan for the patient.
2. Integrate the data obtained from various stress tests into a written report.
3. Analyze Holter monitor recordings.
4. Integrate clinical, resting and ambulatory electrocardiographic data, stress and tilt table data to diagnose the cause of syncope.
5. Prepare a prescription for exercise training and rehabilitation.
6. Formulate a differential diagnosis for exertional dyspnea (ventilatory vs. cardiac).
7. Utilize both nuclear and echocardiographic methods.

Medical Knowledge

1. Demonstrate an understanding of the pathophysiology and significance of false positive and false negative stress tests.
2. Learn the cost-effectiveness of various stress test modalities.
3. Demonstrate knowledge of the scientific principles behind the cardio-pulmonary exercise testing (CPX).
4. Demonstrate knowledge of the progression of cardiovascular diseases diagnosed as a result of exercise testing.
5. Demonstrate an understanding of the magnitude and slope of ST-segment depression or elevation, ST/heart rate indices, exertional hypotension, and hemodynamic measurements.

Practice Based Learning and Improvement

1. Teach Medical students and residents about electrocardiography.

AIDS FOR ACHIEVING GOALS:

1. Monthly EKG conference
2. Board review sessions
3. Review of ECGSAP
4. Review of EKGs with Staff physicians

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ASSESSMENT:

1. In-service examination
2. Monitoring of the EKGs read with feedback provided on mistakes
3. Monthly evaluation based on Global clinical performance and oral examination ratings.
4. 360 degree evaluation forms
5. Resident Portfolios

3. Nuclear Cardiology:

Training in nuclear cardiology is imparted at VAMC and MED concurrently with echocardiography and exercise testing, with more than six to eight months spent during the three years. The Nuclear training is undertaken with the help of Dr. John Ware at the VAMC, and Dr. Dan Massie at the MED.

The fellows learn the general principles, indications, risks and benefits of nuclear cardiovascular procedures such as radionuclide ventriculography and myocardial perfusion and viability assessment. All fellows receive training in radiation safety. The training is undertaken in both classroom lectures and case discussions. Monthly conferences on correlation between coronary arteriographic anatomy and nuclear perfusion studies are held. Fellows spend enough time in the nuclear lab to acquire in excess of 80 hours of training required becoming competent at Level 1. The training program helps fellows get authorized leave of absence to attend a course in basic nuclear imaging principles with two hundred hours of didactic lectures.

First-year Fellow

Goals

Learn the basic principles, indications, use, risks and benefits of nuclear cardiovascular procedures.

Objectives

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Medical Knowledge

1. Develop an understanding of the basics of nuclear physics, and radioactivity.
2. Learn the basics and practice of radiation safety.
3. Distinguish between the properties and characteristics of various isotopes used in the practice of nuclear cardiology.
4. Learn the process of generation of isotopes used in nuclear cardiology.
5. Learn the indication and use of nuclear imaging procedures available in nuclear cardiology lab.
6. Learn the basis of image generation from radioisotopes in nuclear cardiology.

Second-year Fellow

Goals

To be able to select the most appropriate nuclear imaging study according to the clinical situation and correctly interpret various nuclear medicine studies

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

1. Assess left ventricular systolic function on MUGA scans.

Medical Knowledge

1. Demonstrate an understanding of the general principles, indications, risks, and benefits of viability, myocardial perfusion and radionuclide ventriculography.
2. Demonstrate an understanding of the radioisotope uptake in specific cardiac conditions such as, hibernating, ischemic, and infarcted myocardium.
3. Recognize normal studies and normal variants.
4. Demonstrate an understanding of the indications and contraindications of various nuclear diagnostic modalities.
5. Recognize abnormal studies, and differentiate between low risk and high risk scans.

Third-year Fellow

Goals

To be able to independently decide when nuclear imaging is indicated, be able to correctly interpret it and be able to make clinical decisions on the basis of the results of these studies.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

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Objectives

Patient Care

1. Make clinical decisions based on nuclear imaging data.

Medical Knowledge

1. Recognize artifacts and shortcomings of nuclear imaging.
2. Correlate coronary arteriographic anatomy and nuclear perfusion studies.
3. Attend nuclear and cath correlation conferences.
4. Complete 200 hours of didactic education by attending nuclear medicine review courses.

Systems Based Practice

1. Demonstrate an understanding of the cost effectiveness issues of nuclear imaging co.

AIDS FOR ACHIEVING GOALS:

1. Daily reading sessions with Dr. Ware at VA, and Dr. Massie at MED
2. Monthly Nuclear Cardiology Case conference
3. Didactic lectures by Dr. Ware
4. Assistance in travel for the 200-hour radioisotope physics course

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings.
2. In-service Examination
3. 360 degree evaluation forms
4. Resident Portfolio

4. Cardiac Catheterization

The fellows spend a total of nine months in the catheterization laboratories in their three years of training, rotating at VA, MED, and MUH. The directors of the labs at the VA, MED, and MUH are Drs. Ramanathan, Newman, and Wilson, respectively. Other supervising faculty members include Drs. Davis, Munir, Gerlach, McGee, and Shirwany. The fellows participate in right and left heart catheterizations, coronary angiography, and ventriculography. They perform more than 300 cases and at the completion of training become qualified to perform diagnostic catheterization

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independently using both the femoral and brachial routes. Further, they also learn to insert and manage intra-aortic balloon pumps, and perform endomyocardial biopsies. Although the fellows participate in the interventional procedures, they do not become qualified to perform these procedures independently.

First-year Fellow

Goals

To make firm foundations of knowledge and procedural skills required to function in the cath lab. To get familiarized with the various catheters, instruments and equipment used in the cath lab.

Objectives

Patient Care

1. Acquire vascular access efficiently and safely both from the brachial and femoral approaches.
2. Obtain venous access from femoral, subclavian and jugular approaches.
3. Develop basic skills to perform the following procedures that include but are not limited to right and left heart catheterizations, coronary angiography, and ventriculography.
4. Acquire skills for pericardiocentesis.

Medical Knowledge

1. Develop an understanding of the gross cardiac anatomy with special emphasis on coronary anatomy, commonly encountered congenital anomalies.
2. Develop an understanding of the radiographic anatomy and land marks of the heart.
3. Demonstrate a familiarity with the commonly used catheters, wires and other instruments and equipment in the cath lab.
4. Develop the knowledge in radiation safety and importance of radiation dose exposure records.
5. Demonstrate the basic concepts and pathophysiology in performance of right heart catheterization.
6. Develop the knowledge in anticoagulation and antiplatelet therapy.
7. Review previous invasive studies and results of all pertinent non invasive information before cardiac angiography, right and left heart catheterization.

Second-year Fellow

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Goals

To be able to independently perform coronary angiography, left and right heart catheterization and left ventriculography along with insertion and management of intra aortic balloon pump.

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

1. Choose appropriate catheters in a patient.
2. Interpret the hemodynamic data obtained from a right heart catheterization.
3. Interpret a coronary angiogram and define the severity of lesions.
4. Integrate and further improve the basic skills learned to perform coronary angiography safely and accurately.
5. Gain expertise in quantitative coronary angiography.
6. Refine the techniques of insertion and management of IABP.
7. Participate in the interventional procedures with interventional staff.
8. Perform a shunt run.
9. Acquire expertise in pre and post catheterization management and treatment issues.
10. Communicate with the patient's family about the results of the invasive studies and further plans about management.

Medical Knowledge

1. Recognize the indications and contraindications of cardiac catheterization.
2. Demonstrate an understanding of the use of various imaging angles to bring out the lesions in the coronary anatomy.
3. Develop the knowledge about various hemodynamic calculations, measurement of cardiac output, shunts and calculation of severity of valvular heart disease.
4. Recognize complications of invasive cardiovascular procedures.

Third-year Fellow

Goals

To be able to independently and safely perform diagnostic invasive cardiac procedure, be able to interpret results and be able to formulate therapeutic and management plans of various cardiac diseases. Be able to recognize and manage complications of invasive procedures.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

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Objectives

Patient Care

1. Refine the decision making process of performing cardiac catheterization and other invasive cardiac procedures.
2. Perform cath lab procedures efficiently by keeping vascular access time and fluoroscopy time to the minimum.
3. Integrate the data obtained from invasive hemodynamic data with clinical and non invasive studies to arrive at a diagnosis and formulate management plans.
4. Generate appropriate surgical referrals for coronary artery bypass grafting, valve replacement and pericardial diseases.
5. Perform endomyocardial biopsies.

Medical Knowledge

1. Demonstrate an understanding of the techniques of endomyocardial biopsies.
2. Develop the knowledge of the indications and principles of coronary artery balloon angioplasty and stenting. Assist staff with coronary interventions and get familiarized with the equipment used in interventions.
3. Gain knowledge about the various procedures used to assess borderline coronary lesions such as IVUS and fractional flow reserve and assist with interventional staff in performing these procedures.

Interpersonal and Communication Skills

1. Keep a Log of procedures, complications, etc.

AIDS FOR ACHIEVING GOALS:

1. Weekly Cath conference
2. Feedback from Attending physicians on every case performed
3. Review of ACC Self Assessment Program materials
4. Core Curriculum didactic lectures

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings.
2. In-service examination
3. Monthly procedure logs with complications
4. Fluoroscopy time
5. RCA cannulation time
6. Vascular Access time
7. 360 degree evaluation forms
8. Resident Portfolio

5. Echocardiography:

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The Fellowship program offers training in echocardiography consistent with Level 2 competency as described in COCATS II of the American College of Cardiology. Training in transthoracic, transesophageal (TEE) and stress echocardiography is undertaken at both VA and MED. The fellows perform TEEs at MUH as well. Dr. D’Cruz is the director of the echo lab at the VA while Dr. Shirwany supervises the MED lab. Drs. Davis, Newman, Gerlach, Munir, and Soberman are also involved in echocardiographic interpretation and teaching. The fellows are expected to perform at least 150 transthoracic studies, and interpret more than 500. Fellows also perform and interpret more than 50 TEEs.

First-year Fellow

Goals

To gain in depth knowledge of the basic principles, indications and interpretation of transthoracic and transesophageal echocardiography and acquire skills for the performance of an independent transthoracic echocardiogram

Objectives

Patient Care

1. Gain skills in performing a Transthoracic echocardiogram by obtaining M-mode, 2-D, and Doppler examination in standard views.

Medical Knowledge

1. Demonstrate an understanding of the basis of sounds and ultrasonic imaging.
2. Develop the knowledge of the echocardiographic anatomy.
3. Demonstrate an understanding of the basic principles of M-mode, two-dimensional, and Doppler echocardiography.
4. Demonstrate an understanding of the principles of Doppler derived volume, pressure, and area measurements.
5. Gain knowledge of the pathophysiology and echocardiographic features of pericardial diseases.

Second-year Fellow

Goals

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Be able to perform a good quality echocardiographic study, know the correct indications and accurately analyze and interpret data obtained from the study
To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

1. Understand the indications and contraindications of exercise and pharmacological stress echocardiograms.
2. Assess wall motion abnormalities.
3. Perform and interpret stress echocardiograms.
4. Perform and interpret transesophageals (TEEs).
5. Perform and interpret intra-operative transesophageals (TEEs).
6. Diagnose hemodynamic compromise in various pericardial diseases.
7. Interpret the echocardiographic features of hemodynamic compromise in pericardial diseases.

Medical Knowledge

1. Expand knowledge base about echocardiography by attending Echo case conference, read echocardiograms with Attending physicians, ACC Self Assessment Program Echo review sessions and core curriculum didactic lectures.

Third-year Fellow

Goals

To be able to independently perform Transthoracic, transesophageal and Stress echocardiograms with accurate an accurate assessment of cardiac status and be able to place the echocardiographic information in clinic perspective to formulate a diagnosis and management plan.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Assess the severity of valvular abnormality and be able to decide the correct timing of valve surgery.
2. Integrate clinical echocardiographic and invasive hemodynamic data for the diagnosis and management of pericardial diseases.
3. Assess accurate LV systolic and diastolic function.
4. Assess clinical and echocardiographic data for the diagnosis of endocarditis.
5. Formulate a differential diagnosis of various cardiac masses.
6. Integrate echocardiographic data of viability and ischemia on stress ECHO with nuclear imaging data for the formulation of a management plan of the patient.
7. Perform and interpret intraoperative Transesophageal echocardiograms.

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AIDS FOR ACHIEVING GOALS:

1. Monthly Echo case conference
2. Read echocardiograms with Attending physicians
3. Pre-read echocardiograms, with feedback provided by Attending physicians regarding errors and omissions
4. ACC Self Assessment Program Echo review sessions
5. Core curriculum didactic lectures
6. Review of educational tapes available in the Department, such as Mayo Clinic tapes

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings.
2. In-service examination
3. Procedure log with complications
4. 360 degree evaluation forms
5. Resident Portfolio

6. Electrophysiology, Cardiac Pacing and Arrhythmia Management:

All the fellows spend two months of training in invasive electrophysiology at the Methodist University Hospital under the close supervision of Dr. James Porterfield. In addition, the fellows attend Pacemaker Follow-up clinic at the VA and participate in evaluating external and implanted ambulatory monitoring devices. The fellows also perform at least 10 cardioversions, and insert at least 10 temporary pacemakers.

The fellowship program offers only Level 1 training that does not qualify the fellows to implant permanent pacemakers or perform electrophysiologic studies independently.

First-year Fellow

Goals

To learn the basic concepts in electrophysiology, pacemaker and ICD technology.

Objectives

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Patient Care

1. Develop the basic skills of implanting a temporary pacemaker.
2. Develop the basic understanding of performing cardioversions.
3. Get experience in implantation of pacemakers and ICDs by assisting staff.
4. Get experience in implantation of implantable loop recorders by assisting Staff.

Medical Knowledge

1. Learn the basics of impulse generation and propagation for better understanding of electrophysiologic studies.
2. Learn the basic principles of physics in pacing and defibrillation.
3. Learn the various modes and nomenclature used in pacemakers.
4. Learn the physical principles of the various setting and parameters used in pacemaker programming.
5. Gain knowledge about the functioning of an ICD.
6. Gain knowledge about the indications of pacemaker and ICD.
7. Learn the indications and working of implantable loop recorders.

Second-year Fellow

Goals

Be able to appropriately refer patients to electrophysiologists for the correct indications of pacemakers, ICDs and EP studies. Be able to perform basic trouble shooting for pacemakers and ICDs. Be able to prescribe appropriate antiarrhythmic medications for various arrhythmias

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

1. Pre and post operatively manage pacemaker and ICD implantation.
2. Perform cardioversions.

Medical Knowledge

1. Learn the indications of various devices used in electrophysiology according to the established guidelines.
2. Demonstrate an understanding of the basic programming of pacemakers, ICD and biventricular devices.
3. Recognize and manage various arrhythmias.
4. Demonstrate an understanding of the various classes of anti-arrhythmic drugs with special attention to indications of use, and potential pro-arrhythmias.

Practice Based Learning and Improvement

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1. Expand knowledge base about electrophysiology by attending lectures, conferences and review sessions of ACC Self-Assessment Program materials.

Third-year Fellow

Goals

Be able to acquire a level of knowledge and understanding about electrophysiology to be able to recognize and address electrophysiology problems in general cardiology practice and be able to refer patients appropriately to the EP physicians.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Interpret intracardiac electrograms for the diagnosis of arrhythmias.
2. Interrogate permanent pacemakers.
3. Diagnose and manage pacemaker and ICD infections and complications.
4. Acquire skills of basic pacemaker implantation skills by assisting staff.
5. Implant and interrogate Reveal loop recorder devices.

Medical Knowledge

1. Demonstrate an understanding of the indications and contra-indications of invasive EP studies.
2. Recognize pacemaker and ICD malfunction.
3. Learn the indications and contraindications of biventricular ICDs.
4. Learn the indications of ablation procedures for the treatment of various arrhythmias.

AIDS FOR ACHIEVING GOALS:

1. Monthly EKG conferences
2. Core curriculum didactic lectures
3. Special Thursday afternoon Electrophysiology lectures
4. Review of ACC Self-Assessment Program materials

EVALUATION OF PERFORMANCE:

1. Monthly evaluations based on Global clinical performance ratings
2. In-service examination
3. Procedure log with complications
4. 360 degree evaluation forms
5. Resident Portfolio

7. Cardiovascular Research:

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Upon entering the fellowship, all trainees are introduced to the spectrum of research programs underway in the department. With guidance from Dr. Weber, they elect to participate in any of the ongoing projects or design and execute their own project. The purpose is to help them attain skills in critical literature reading; hypothesis and specific goal development; design and implementation of research protocols; collection and interpretation of data; and presentation of the results within the division conferences and at regional or national meetings. Each fellow is expected to complete and present at least one project during the three-year period. Besides the full-time members of the Division faculty, Drs. Yao Sun, Marshall Elam, Ivan Gerling, and Arnold Postlethwaite have research programs directly or indirectly related to cardiovascular diseases.

First-year Fellow

Goal

Be able to attain skills in critical literature reading and scientific thinking and be able to develop a keen interest in a medical science question or a clinical problem. Be able to generate a hypothesis about a scientific problem and develop research methods to test it.

Objectives

Medical Knowledge

1. Develop basic understanding of the spectrum of research programs underway in the department.

Practice Based Learning and Improvement

1. Elect to participate in any of the ongoing projects or develop and execute a new project.
2. Present research studies from literature in conferences and Journal clubs with analysis and critique to the methods and findings.

Professionalism

1. Gain knowledge in the ethical issues of research.

Second-year Fellow

Goal

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To be able to function as an investigator in a research study, collecting and analyzing data in an organized and scientific fashion coordinating with other personnel involved in the study

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Medical Knowledge

1. Develop knowledge base in chosen research area.
2. Collect, compile, and interpret research data.

Practice Based Learning and Improvement

1. Gain experience of research by working with faculty members who act as mentors.
2. Analyze and evaluate cardiovascular literature for information pertaining to research project.
3. Formulate, write, and submit for approval an original research plan.
4. Develop specific research goals and hypothesis.
5. Design and implement research protocols.

Interpersonal and Communication Skills

1. Present data and results of research within the division conferences and at regional or national meetings.
2. Clearly present research findings to colleagues and professional associates.

Professionalism

1. Demonstrate a familiarity with the ethical constraints of the IRB.

Third-year Fellow

Goals

Be able to author a research study and publish it in a peer reviewed journal.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Medical Knowledge

1. Further develop knowledge base in cardiovascular research whether individually or within the division.

Practice Based Learning and Improvement

1. Prepare manuscripts with supervision and revision of attending physicians.
2. Gain experience in manuscript submission to journals and correspondence with editorial staff for revisions in response to reviewers' comments.
3. Continue to participate in ongoing basic science and clinical research projects in the Division.

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4. Continue to present research findings at regional and national meetings.
5. Attend Division research conferences and cardiology Grand Rounds with renowned research scientists from across the United States and Canada.
6. Gain experience in Grant application submission for various research products.

AIDS FOR ACHIEVING GOALS:

1. Identification of a faculty member as mentor
2. Division Research conferences
3. Monthly Cardiology Grand Rounds with renowned research scientists from across the United States and Canada
4. Morbidity & Mortality conferences and Cardiology / CT surgery conferences where potential research ideas are floated
5. Assistance in attending at least one national meeting per year

EVALUATION OF PERFORMANCE:

1. Attending evaluation of Research conferences presented
2. Number of projects successfully completed
3. Abstracts presented
4. Papers published
5. Grant applications submitted
6. Grants received for research work
7. Resident Portfolio

8. Heart Failure and Transplantation:

Dr. Karl Weber is nationally and internationally recognized for his expertise in heart failure. Most of the research protocols, both basic and human, are in congestive heart failure. At the VA, the fellows actively participate in the Heart Failure clinic. In addition, the fellows are exposed to a large number of acute and chronic heart failure patients during the clinical training. They learn the pathophysiology, principles of clinical management along with nuances of therapy, and finally the ability to define suitability for transplantation. The fellows spend more than a month among heart failure patients to qualify for level 1 competence.

Cardiac transplant services are not offered in any of the participating hospitals. However, didactic teaching is imparted regarding eligibility for transplant, and

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complexities of subsequent care. Fellows also participate in the care of veterans who have undergone cardiac transplantation, and are frequently called upon to evaluate donor suitability at the MED trauma center.

First-year Fellow

Goals

Be able to gain comprehensive understanding and knowledge of the pathophysiology, etiology and management of heart failure. Be able to recognize the signs and symptoms of heart failure and be able to order appropriate imaging studies.

Objectives

Patient Care

1. Obtain an accurate history and physical examination of heart failure patient.

Medical Knowledge

1. Learn the basic physiology of cardiac function.
2. Gain knowledge in the pathophysiology of heart failure.
3. Recognize the characteristic of various types of heart failure.
4. Learn the pharmacology of heart failure patients.
5. Gain knowledge in the medical therapy for heart failure.
6. Learn the various investigations required to diagnose the etiology of heart failure.
7. Develop a basic understanding of defining the eligibility for transplant recipients and of the complexities of subsequent care.

Practice Based Learning and Improvement

1. Attend regular heart failure clinics.

Second-year Fellow

Goals

Be able to independently diagnose and treat heart failure based upon guidelines and be able to tailor medical therapy according to the clinical circumstances and co-morbidities of the patient.

To expand and cultivate the skills learned during the first year of the fellowship program.

Objectives

Patient Care

Medical Knowledge

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1. Study the landmark clinical studies in literature on heart failure.
2. Learn the relative merits and demerits of various diagnostic modalities for heart failure.
3. Understand the rationale for the different therapeutic options offered.
4. Learn the ACC/AHA clinical guidelines for treatment of heart failure.
5. Understand the clinical conditions and comorbidities in which guideline prescribed therapies cannot be followed. Learn to document these conditions and reasons where such clinical judgment decisions are made in the interest of patient.
6. Understand the indications for non-pharmacological therapies for congestive heart failure, such as biventricular pacing, assist devices, and Enhanced external counter pulsation.
7. Expand knowledge of pathophysiology, diagnosis, treatment of Heart Failure by attending lectures and conferences.
8. Gain knowledge of cardiac rehabilitation.

Third-year Fellow

Goals

Be able to independently diagnose and manage heart failure patients according to the standard of care and guidelines and to appropriately refer patients for further therapies such as Biventricular pacing, ICD, cardiac transplantation and cardiac rehabilitation.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Document and follow the performance measures in heart failure management.
2. Gain experience in the care of cardiac transplant patients.
3. Evaluate donor suitability at the MED trauma center.
4. Diagnose and manage patients with heart failure.
5. Educate and counsel patients on available therapies for heart failure (e.g. biventricular pacing, ICD, cardiac transplantation, cardiac rehabilitation).

Medical Knowledge

1. Define the suitability for transplantation.
2. Demonstrate an understanding of the pharmacology of immunosuppressive agents used in transplant patients.

Practice Based Learning and Improvement

1. Attend lectures on transplantation with the possibility of an elective rotation in cardiac transplantation.

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Interpersonal and Communication Skills

1. Provide education and counseling to patients and their families using non-technical language.

AIDS FOR ACHIEVING GOALS:

1. Attend Heart Failure clinic at the VA
2. Attend Wednesday afternoon Cardiology clinic at the MED where a large proportion of patients have heart failure
3. Core curriculum didactic lectures

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings
2. In-service examination
3. Attending physician evaluation of conference presentations
4. 360 degree evaluation forms
5. Resident Portfolio

9. Care of Adults with Congenital Heart Disease:

Training in adult congenital heart disease is undertaken both in the didactic form with lectures on cardiac anatomy, pathology, physiology and genetic counseling. Dr. D’Cruz deals with anatomy using echocardiograms of common congenital heart disorders. Pathology lectures are undertaken by Dr. Martinez, Chief of Pathology at the VAMC. Dr. Jewel Ward gives lectures on genetic counseling, and Dr. Kevin Newman provides lectures on clinical recognition and care of patients with common defects presenting in adulthood. Pediatric cardiologists from one of the affiliated hospitals discuss operative and post-operative management, with focus on care of patients as they transition into adulthood. Thus, the Fellowship program satisfies the requirements for Level 1 training; for those desiring further exposure, rotation through Le Bonheur can be arranged.

First and Second-year Fellows

Goals

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Be able to understand the development of the human heart and to learn about the various anatomic defects in the heart and their pathophysiologic consequences

Objectives

Patient Care

1. Clinically recognize and care for patients with common congenital defects presenting in adulthood (e.g. Ebstein's anomaly, pulmonary stenosis, bicuspid aortic valve, coarctation of the aorta, transposition of the great vessels).
2. Diagnose and manage pregnant patients with congenital heart disease.

Medical Knowledge

1. Learn the basic anatomy, embryology, and physiology of the heart.
2. Learn the various congenital abnormalities of the heart.
3. Learn the pathologic and clinical consequences of various congenital abnormalities.
4. Develop the basic understanding of appropriate genetic counseling for patients.

Third-year Fellow

Goals

Be able to independently diagnose and manage congenital heart disease patients that survive into adult hood and to appropriately refer patients for further management. To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Diagnose congenital heart disease in patients by using various imaging studies.
2. Screen, counsel, and treat pregnant women with corrected and uncorrected congenital cardiac anomalies to ensure a successful outcome of pregnancy.
3. Understand the importance of genetic counseling in congenital heart disease patients and learn to appropriately refer patients to specialists in the field.

Medical Knowledge

1. Understand the presentation of surgically corrected cardiac anomalies expected in adult life.
2. Spend elective time for further knowledge at the Pediatric hospital.

AIDS FOR ACHIEVING GOALS:

1. Core curriculum didactic lectures
2. Review of ACC Self Assessment Program materials

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3. Board review sessions
4. Consult service at the MED where high risk obstetrics in-patients are seen
5. Cardiology Consult clinic at the MED where high risk obstetrics out-patients are seen

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings
2. In-service exam in clinical cardiology
3. 360 degree evaluation forms
4. Resident Portfolio

10. Preventive Cardiovascular Medicine:

The training covers all aspects of preventive cardiology, with both didactics and clinical experience. Several faculty members hold joint appointment in Preventive Medicine. Fellows see patients in Lipid clinic at the VA with Dr. Elam who is a nationally recognized expert in the field. Another venue is the Hypertension clinic at the VA that is run by Dr. William Cushman, a leading national investigator in the field. Areas of vascular biology, epidemiology and biostatistics, genetics, cardiac rehabilitation, and geriatric cardiology are extensively covered.

First and Second-year Fellows

Goals

Be able to recognize and manage various treatable risk factors in cardiovascular disease.

Objectives

Patient Care

1. Identify various risk factors of cardiovascular diseases.
2. Treat patients with various risk factors based upon the current guidelines.

Medical Knowledge

1. Develop the basic knowledge of lipid and hypertension disorders.
2. Understand the importance of primary and secondary preventive measures in the treatment of cardiovascular disorders.
3. Learn to stress the importance of risk factor modification to the patient by focusing on patient education.

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4. Demonstrate a familiarity with smoking cessation programs.

Practice Based Learning and Improvement

1. Attend the Lipid and Hypertension clinics.

Third-year Fellow

Goals

Be able to independently identify and treat the underlying risk factors along with the treatment of the actual cardiovascular disease itself. Be able to educate the patient about treatable risk factors and to motivate the patient for compliance.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Educate and counsel patients about treatable risk factors.
2. Motivate patients to comply with management plans to reduce the risk of cardiovascular disease.
3. Treat patients with risk factors of cardiovascular diseases.
4. Diagnose and manage patients with lipid and hypertension disorders.

Medical Knowledge

1. Develop the knowledge of the various guidelines for the treatment of risk factors.
2. Demonstrate an understanding of performance measures and learn to optimize the care of the patient by keeping a track of these measures.
3. Learn the basic statistical methods used in epidemiological studies

Practice Based Learning and Improvement

1. Learn the comprehensive care of the cardiology patient by attending the lipid and hypertension clinics.

AIDS FOR ACHIEVING GOALS:

1. Attend Lipid clinic at the VA
2. Attend Hypertension clinic at the VA
3. Core curriculum didactic lectures

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings
2. In-service examination
3. 360 degree evaluation forms
4. Resident Portfolio

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11. Vascular Medicine and Peripheral Vascular Disease:

The fellows spend a month in the vascular laboratory and observe peripheral vascular procedures. Training in peripheral vascular interventions is not offered. Dr. Lisa Jennings gives the basic science lectures while Dr. Howard Horn gives the clinical vascular biology lectures. The fellows perform clinical assessments of peripheral arterial and venous systems during the general cardiology and peripheral vascular medicine rotations, enabling them to achieve required competence. They also become knowledgeable in the selection of patients for non-invasive and invasive vascular tests and interpretation of data. Thus, Level 1 training in vascular medicine is offered in the fellowship.

First and Second-year Fellows

Goals

Be able to understand the pathophysiology of various vascular diseases and be able to diagnose and treat common vascular diseases.

Objectives

Patient Care

1. Identify and manage risk factors of peripheral vascular disease.
2. Diagnose vascular disease by using various non invasive and invasive tests.

Medical Knowledge

1. Develop the knowledge of the structure and function of a normal blood vessel with special emphasis on endothelial function and dysfunction.
2. Develop the knowledge of the pathophysiology of atherosclerosis.
3. Learn the clinical manifestations of vascular disease.
4. Demonstrate an understanding of cerebrovascular disease.
5. Develop the basic knowledge of selecting patients for non-invasive and invasive vascular tests.
6. Develop the knowledge of the indications of various vascular tests.

Third-year Fellows

Goals

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Be able to independently diagnose and manage peripheral vascular disease and appropriately refer patients for percutaneous interventions and surgery.

To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Perform and interpret non invasive tests for the diagnosis of peripheral vascular disease.
2. Learn the indications for invasive diagnostic procedures.
3. Diagnose, treat, and prevent vascular complications of invasive cardiology procedures.
4. Manage and coordinate the care of a peripheral vascular disease patient with surgeons and interventional cardiologists.
5. Refer patients for percutaneous interventions and surgery.
6. Perform clinical assesement of peripheral arterial and venous systems.

Medical Knowledge

1. Understand the pathophysiology and management of renovascular disease.
2. Rotate through the vascular lab during the non invasive rotation.

Practice Based Learning and Improvement

1. Expand knowledge of vascular disease by attending lectures and conferences on vascular disease.

AIDS FOR ACHIEVING GOALS:

1. Core curriculum didactic lectures
2. Attend vascular clinic
3. Weekly Cath conference at the VA where the pre- and peri-operative management of patients with peripheral vascular disease is frequently discussed

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings
2. In-service examination
3. 360 degree evaluation forms
4. Resident Portfolio

12. Cardiovascular Magnetic Resonance:

Fellows are exposed to cardiac MRI as well as different aspects of CT scanning pertinent to the cardiovascular system. MRI is available at all the institutions. Currently, the program offers training at the Level 1 with didactics and selected case studies.

First and Second-year Fellows

**UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER
DIVISION OF CARDIOVASCULAR DISEASES**

Goals

Be able to understand the basics of MRI and cardiac CT scanning and be able to appropriately refer patients for these imaging studies.

Objectives

Patient Care

1. Refer patients for MRI and cardiac CT scanning.

Medical Knowledge

1. Learn the basic physics of MRI and cardiac CT scan.
2. Learn the indications of MRI and CT scanning for the diagnosis of various cardiovascular diseases.
3. Rotate through the MRI and CT scan suites during the non invasive rotations and read with cardiology and radiology Attending physicians.

Third-year Fellows

Goals

Be able to appropriately refer patients for Cardiac MRI and CT scans according to the guidelines and be able to gain experience in the basic interpretation of imaging results. To expand and cultivate the skills learned during the first and second years of the fellowship program.

Objectives

Patient Care

1. Read cardiac MRI and CT scans on non invasive rotations.
2. Interpret the results of the MRI and CT scans.

Medical Knowledge

1. Understand the utility of contrast enhanced MRI and Ct scan in detecting infarct size, hibernating myocardium, delineating coronary anatomy and other structural abnormalities of the heart.
2. Learn the strength and weaknesses and limitations of cardiac MRI and CT scans.

Practice Based Learning and Improvement

1. Expand knowledge about these imaging modalities by attending lectures and conferences.

AIDS FOR ACHIEVING GOALS:

1. Core curriculum didactic lectures
2. Ability to read cardiac MRs during non-invasive rotations

EVALUATION OF PERFORMANCE:

1. Monthly evaluation based on Global clinical performance ratings

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2. In-service examination
3. 360 degree evaluation forms
4. Resident Portfolio