Goals:
- To provide cardiovascular medicine trainees with the background knowledge and technical skills necessary for the practice of invasive cardiology.
- Instruction in core knowledge base of cardiac anatomy, physiology, pathology and pathophysiology
- Train fellows in the intravascular catheter insertion/manipulation skills necessary for the care of critically ill patients.

Training Requirements
Level I – requires a minimum of 4 months of experience in the cardiac catheterization laboratory. During this period, the fellow should participate in a minimum of 100 diagnostic cardiac catheterization procedures.
Level II – requires a minimum of 8 months in the cardiac catheterization laboratory over a period of three years and participation (under supervision) in at least 300 diagnostic cardiac catheterization procedures.

Competencies

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<th>Level I Objectives</th>
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| Professionalism          | ▪ Demonstrate respectful behavior and interactions with multiple providers  
 ▪ Demonstrate a commitment to ethical principles pertaining to provision of care, confidentiality of patient information, informed consent and business practices  
 ▪ Demonstrate sensitivity and responsiveness to patient culture, age gender and disabilities.                                                                                                           |
| Interpersonal and        | ▪ Demonstrate effective written, verbal and nonverbal communication with patients, families and colleagues  
 ▪ Generate effective electronic procedure reports  
 ▪ Communicate findings to patients and other medical providers  
 ▪ Review and explain procedure details and indications to patient and family                                                                                                                                  |
| Communication Skills     |                                                                                                                                                                                                                       |
| Medical Knowledge        | ▪ Understand indications for cardiac catheterization  
 ▪ Understand coronary anatomy, its variations and congenital abnormalities  
 ▪ Understand coronary physiology  
 ▪ Understand complications of the procedure and their management  
 ▪ Select optimal treatment modality  
 ▪ Understand cardiac hemodynamics  
 ▪ Interpret hemodynamic findings  
 ▪ Understand indications and complications of temporary venous pacing, pericardiocentesis and other laboratory procedures including |

Reviewed by:
| Patient Care | Understand principles of imaging, radiation protection and radiation safety  
| Understand the anatomy of and methods to access cardiac chambers and coronary arteries via the femoral, brachial and radial access sites.  
| Interpret coronary, ventricular, atrial, and aortic angiography and determine left ventricular ejection fraction.  
| Understand the indications for and complications of contrast agents and drugs commonly used for invasive procedures |
| Patient Care | Demonstrate appropriate and empathetic approach to patients undergoing catheterization  
| Perform percutaneous vascular access from the femoral artery and vein and subclavian or internal jugular vein  
| Perform right heart catheterization using a balloon flotation catheter  
| Perform temporary right ventricular pacemaker insertion  
| Perform left heart catheterization and coronary angiography (of native arteries) under supervision.  
| Diagnose and manage possible procedure complications  
| Monitor patient status after procedure  
| Demonstrate ability to interpret hemodynamic and angiographic data and use these data to make decisions regarding medical, interventional cardiac and surgical treatments. |
| Practice-Based Learning | Application of evidence-based medicine to investigate, evaluate and improve care of patients being evaluated for cardiovascular disease.  
| Analyze and evaluate practice experience with cardiac catheterization patients and implement strategies to improve practice, for example, by participating in the NCDR  
| Present cases with complications at the monthly Quality Improvement conference  
| Facilitate the learning of students and other health care professionals |
| Systems-Based Practice | Understand the role of the cath lab in the context of the needs of a large inpatient hospital system  
| Practice effectively as part of multi-disciplinary team to optimize patient care.  
| Learn means of application of systematic and cost-effective strategies to best diagnose and treat patients with cardiovascular disease. |

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| Professionalism | Participation as an integral part of the cath-lab team.  
| Assume progressive responsibilities for the conduct of the diagnostic procedure, as well as of the interactions with patients and families in the post-procedural phase  
<p>| Become more involved in the discussion of the study results with other |</p>
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<th>Patient Care</th>
<th>Practice-Based Learning</th>
<th>Systems-Based Practice</th>
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| • Understand radiologic imaging, including design and operation of x-ray cineradiographic units, digital imaging and storage, radiation physics, factors influencing image quality, radiation quality assurance, and physiology of x-ray contrast media  
• Understand the basic operation of physiologic recorders, pressure transducers, oximeters, and oxygen consumption measurement equipment  
• Understand how to differentiate the hemodynamics of constrictive pericarditis from restrictive cardiomyopathy  
• Understand coronary physiology using techniques such as Doppler flow and fractional flow reserve  
• Understand the indications for and methods of performing transseptal catheterization  
• Understand the indications for and complications of vascular closure devices  
• Perform vascular access from the femoral, radial or brachial route  
• Perform left heart catheterization and coronary angiography, as well as visualization of venous bypass and internal mammary artery grafts  
• Perform angiography of the cardiac chambers and aorta  
• Perform intra-aortic balloon insertion and operate a balloon pump  
• Perform cardiac catheterization in common types of valvular, adult congenital and cardiomyopathic heart disease  
• Perform pericardiocentesis  
• Perform vascular closure device insertion  | Facilitate the learning of students and other health care professionals  
• Present cases with complications at the monthly Quality Improvement conference  
• Demonstrate ability to interpret hemodynamic and angiographic data and use these data to make decisions regarding medical, interventional cardiac and surgical treatments  | Continue to gain deeper appreciation of procedural indications as well as of their cost effectiveness and use it in the context of a system that cares for a large number of patients with heart and vascular disease  
• Participate in improvement and or safety projects to increase positive outcomes |