

Rotation: Interventional Cardiology - Advanced Catheterization Rotation (Level -2)

Rotation Director: Dr. Jon Resar

Faculty: Drs. Brinker, Kass, Miller, Rade, Thiemann,

Hours: Monday–Friday: 8 a.m. to 7 p.m.; 2 weekends off during the rotation.

Home call: fellows will also take “home call” after hours

A. Cardiac Catheterization: Patient Care

	Principal Educational Goals	Learning Activities	Evaluation Methods
1.	Take a complete medical history and perform a careful and accurate physical examination with a cardiology focus.	DPC, AR	AE
2.	Explain the risks, benefits, and potential complications of cardiac catheterization and percutaneous interventions.	DPC, AR	AE
3.	Perform and interpret the results of diagnostic left and right heart catheterizations, coronary angiograms, and ventriculograms.	DPC, DSP, AR	AE, DSP
4.	Perform and interpret the results of aortograms, carotid, renal and peripheral angiograms.	DPC, DSP, AR	AE, DSP
5.	Perform and interpret hemodynamic assessments of various cardiac diseases including pericardial disease, restrictive heart disease, congenital heart disease, intra-cardiac shunts, and valvular heart disease.	DPC, DSP, AR	AE, DSP
6.	Evaluate severity of coronary artery atherosclerotic disease using various methods including measurement of coronary flow reserve, fractional flow reserve, use of quantitative lesion assessment, and intravascular ultrasound.	DPC, DSP, AR	AE, DSP
7.	Gain experience in various techniques of coronary intervention including balloon angioplasty, stenting, atherectomy, and brachytherapy.	DPC, DSP, AR	AE, DSP
8.	Recognize and manage complications associated with cardiac catheterizations and interventions including care of the percutaneous sheath insertion site.	DPC, AR	AE
9.	Evaluate, manage, and perform cardiac catheterization and interventions in acute coronary syndromes, congestive heart failure.	DPC, DSP, AR	AE, DSP
10.	Placement and management of intra-aortic balloon pumps and temporary pacemakers.	DPC, DSP, AR	AE, DSP
11.	Assist in interventional procedures such as carotid artery stenting, transcatheter closure of patent foramen ovale and atrial septal defects, renal artery stenting, transcatheter repair of abdominal aortic aneurysms, peripheral angioplasty and stenting, and coil embolization of artero-venous malformations.	DPC, AR, DSP	AE, DSP
12.	Follow up and routine care of the post catheterization and post-intervention patient.	DPC, AR	AE

B. Cardiac Catheterization: Medical Knowledge

	Principal Educational Goals	Learning Activities	Evaluation Methods
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1.	Expand clinically applicable knowledge base of the basic and clinical sciences underlying the care of patients with chest pain and acute cardiac disease.	DPC, CC	AE
2.	Access and critically evaluate current medical information and scientific evidence relevant to acute cardiac care.	DPC, NC	AE
3.	Understand indications for aggressive anticoagulant and antiplatelet therapy as well as the mechanisms of action of the various agents.	DPC, CC	AE
4.	Understand the physiologic and pathophysiologic principles of invasive hemodynamic monitoring including indications.	DPC, HC	AE
5.	Develop and demonstrate in-depth knowledge of the pathophysiology, clinical manifestations, diagnosis and management of cardiac diseases.	DPC, CC, AR, GR	AE
6.	Develop and demonstrate in-depth knowledge of the principles of diagnosis and management of ischemic heart disease including unstable angina pectoris and myocardial infarction; congestive heart failure; rheumatic heart disease, and congenital heart disease.	DPC, AR, CAC, IC	AE
7.	Develop and demonstrate in-depth knowledge of the indications for, Principal, complications, and interpretation of right and left heart catheterization, coronary angiography, ventriculography and percutaneous interventions.	DPC, DSP, AR	AE, DSP
8.	Fully understand principles of assessment of lifetime cardiovascular risk & cardiovascular risk prevention.	DPC, AR	AE
9.	Develop in-depth knowledge of the strategies for cessation of use of tobacco.	DPC, AR	AE

C. Cardiac Catheterization: Interpersonal Skills and Communication

	Principal Educational Goals	Learning Activities	Evaluation Methods
1.	Communicate effectively with patients and families in a stressful critical care environment.	DPC, FS	AE, ECR
2.	Communicate effectively with physician colleagues and members of other health care professions to assure timely, comprehensive patient care.	DPC, FS	AE, PR, ECR
3.	Communicate effectively with colleagues when discussing results of various cardiac catheterization and interventions and further management.	DPC, FS	AE, PR, ECR

D. Cardiac Catheterization: Professionalism

	Principal Educational Goals	Learning Activities	Evaluation Methods
1.	Interact professionally toward patients, families, colleagues, and all members of the health care team.	DPC	AE, PR, ECR
2.	Interacting with patients and families in a professionally appropriate manner.	DPC, PC	AE, ECR
3.	Acceptance of professional responsibility as the primary care physician for patients under his/her care.	DPC, PC	AE, ECR
4.	Appreciation of the social context of illness.	DPC	AE, ECR

5.	Effective utilization of ethics knowledge and consultants. This includes guidelines for CPR and DNR and end of life cardiac care.	DPC, EI	AE, PR, ECR
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E. Cardiac Catheterization: Practice-Based Learning and Improvement

	Principal Educational Goals	Learning Activities	Evaluation Methods
1.	Identify and acknowledge gaps in personal knowledge and skills in care of acute cardiac patients.	DPC, CC, ESR	AE
2.	Develop real-time strategies for filling knowledge gaps that will benefit patients in the coronary care unit.	DPC	AE
3.	Commitment to professional scholarship, including systematic and critical perusal of relevant print and electronic literature, with emphasis on integration of basic science with clinical medicine, and evaluation of information in light of the principles of evidence-based medicine.	DPC, FS	AE

F. Cardiac Catheterization: Systems-Based Practice

	Principal Educational Goals	Learning Activities	Evaluation Methods
1.	Understand and utilize the multidisciplinary resources necessary to care optimally for acutely ill cardiac patients.	DPC, PC	AE
2.	Collaborate with other members of the health care team to assure comprehensive coronary care.	DPC, PC	AE
3.	Use evidence-based, cost-conscious strategies in the care of patients with chest pain and other acute cardiac disease.	DPC	AE
4.	Knowing when to ask for help and advice from senior fellows and attending physicians.	DPC	AE, PR
5.	Effective professional collaboration with residents, other fellows, and faculty consultants from other disciplines such as Radiology, Neurology and Surgery.	DPC, PC	AE, ECR
6.	Learning by participation in ward rounds, teaching conferences and other educational activities.	DPC, AR	AE
7.	Effective collaboration with other members of the health care team, including residents, medical students, nurses, and cath lab technicians.	DPC, PC	AE, ECR
8.	Effective utilization of ethics consultants, including knowing when and how to request consultation, and how best to utilize the advice provided.	DPC, PC	AE
9.	Consideration of the cost-effectiveness of diagnostic and treatment strategies.	DPC, ACS	AE
10.	Ability to lead team, including medical students, residents, nurses, and cath lab technicians.	DPC, ACS	AE, ECR
11.	Willingness and ability to teach medical students and residents.	DPC	AE, PR

Objectives and expectations while on this rotation:

Individuals seeking third year cardiac catheterization laboratory training generally plan to follow this training with an additional year devoted to interventional cardiology or plan to perform independent catheterization and angiography as an invasive but non-interventional cardiologist.

These individuals will require additional training in both percutaneous arterial entry and arterial incision and repair including femoral, brachial, and radial access techniques. They must receive additional education regarding the theoretic and practical aspects of radiation physics and safety. A working knowledge of catheterization laboratory equipment, including physiologic recorders, pressure transducers, blood gas analyzers, image intensifiers and other X-ray equipment, cine processing, digital imaging and quality control of films, is requisite.

An understanding of the fundamental principles of shunt detection, cardiac output determination and pressure waveform recording and analysis is mandatory. Trainees also begin to perform straight-forward coronary interventional procedures including coronary artery balloon angioplasty and intracoronary stenting. Fellows must learn to manage patients in the cardiac catheterization laboratory presenting with acute ischemic syndrome including acute myocardial infarction.

The trainee planning a career in the catheterization laboratory must be trained to perform studies in chronically and acutely ill patients, such as those with cardiogenic shock, acute myocardial infarction or unstable angina.

Trainees will also develop an understanding the following: anticoagulant and antiplatelet agents used during coronary interventional procedures; advanced understanding of valvular heart disease and indications for valvuloplasty. Aortography and assessment of peripheral vascular disease including renal artery stenosis should be learned.

Trainees will gain a clear understanding of the indications, limitations, complications and medical and surgical implications of the findings at cardiac catheterization and angiography, as well as a detailed understanding of related interventional procedures. This includes an understanding of the pathophysiology of cardiovascular disease and the ability to interpret hemodynamic and angiographic data and to use these data to select cases for surgical and catheterization-based therapeutic procedures.

Trainees must also have a basic understanding of and formal training in radiation physics, radiation safety, fluoroscopy and radiologic anatomy, as well as clinical cardiovascular physiology (e.g., pressure waveforms, shunt calculations, blood flow, resistance calculations). Trainees must learn to perform pulmonary artery catheterization with flow-directed catheters by both the cutdown and percutaneous (subclavian, femoral and internal jugular) routes.

All trainees must be capable of performing temporary right ventricular pacemaker insertion and should have some experience performing right and left heart catheterization, including ventriculography and coronary angiography. In addition, they will learn to perform pericardiocentesis and insertion of intraaortic balloons for counterpulsation.

Learning activities

- Pre-cardiac catheterization evaluation and pre-procedure preparation.
- Ability to obtain informed consent for cardiac catheterization understanding the risks and benefits of invasive cardiac imaging.
- Arterial and venous vascular access emphasizing the femoral approach.
- Performance of right heart cardiac catheterization including proper data acquisition and interpretation.
- Performance of coronary artery angiography including interpretation of angiographic images.
- Performance of ventriculography including measurement of pressures and calculation of ejection fraction.
- Ability to calculate valve areas and regurgitant fraction.
- Performance of a saturation run and calculation of a shunt fraction.
- Perform insertion of intraaortic balloons for counterpulsation therapy.
- Performance of pericardiocentesis.
- Placement of a temporary transvenous pacing wire.
- Aortography and peripheral vascular angiography including renal arteriography.
- Deployment of vascular access closure devices.
- Basic coronary interventional techniques including balloon angioplasty and intracoronary stent implantation.
- Interpretation of intracoronary ultrasound imaging.

- Post-cardiac catheterization management including assessment of access site complications.

Content and methods

- The curriculum covers the above procedures. The following textbooks are valuable: Baim and Grossman: Cardiac Catheterization, Angiography, and Intervention, Topol: Textbook of Interventional Cardiology, Safian and Freed: The Manual of Interventional Cardiology
- Performance of catheterization techniques are learned directly by participating in procedures with attending physicians.
- Didactic lectures on calculation of valve areas, shunt fraction, and ventricular function.
- Weekly conferences discussing cardiac catheterization and interventional patients.
- Intensive discussion by the attending with the fellow after each case reviewing angiographic and hemodynamic findings.

Supervision:

All aspects of procedures (including vascular access) are directly supervised by the attending catheterization laboratory attending who is scrubbed and assisting the fellow during procedures. Interpretation and reporting of catheterization data is completed by the fellow following discussion and review of the case with the attending.

Evaluation Process: fellows will be evaluated on rotation using a competency-based system, using the online program E*Value.

Fellows are evaluated directly by the attending cardiologists supervising their procedures. Evaluation of procedural skills is reported to the fellows following each case in an oral manner and after each month on service with a web based evaluation process.

Concerns regarding a fellow's procedural skills are brought to the attention of the Director of the Catheterization Laboratory for more intensive discussion and instruction on an individualized basis.

Electronic database procedure logs are maintained and examined at the end of each month to track the number of procedures successfully completed. Complications related to cardiac catheterization are discussed at a weekly meeting with all attendings and catheterization laboratory fellows present.