University of Oklahoma Health Sciences Center

Interventional Cardiology Fellowship Curriculum

Table of Contents

1. Program Statement of Purpose
2. Overview of Objectives by Core Competencies
3. Faculty
4. Facilities and Resources
5. Rotations
6. Conferences
7. Procedures
8. Research
9. Learning Resources
10. Evaluation Process
1. Statement of Purpose

The Interventional Cardiology Fellowship at the University of Oklahoma Health Sciences Center is a 12-month program that offers advanced training to two fellows that have completed an American College of Graduate Medical Education (ACGME)-accredited 3-year fellowship program in cardiovascular diseases. This program operates within the confines of the Cardiovascular Diseases Section of the Department of Internal Medicine. The primary goal of this fellowship program is to train individuals that are technically skilled, knowledgeable, and compassionate interventional cardiologists that are competent to practice in private and academic settings. We strive to train leaders in this specialty.

The fellowship program aims to be comprehensive, and thus includes fellow responsibilities pertaining to clinical practice, education, and research. Each fellow will participate in >500 procedures annually, and function as primary operator in >250 percutaneous coronary interventions (PCI), >50 peripheral interventions, and will be part of multiple structural interventions including TAVRs. Fellows will attend several weekly didactic conferences, lead conferences at least once monthly, and have the opportunity to attend several national conferences focused on the practice of interventional cardiology. Fellows will also participate in clinical research trials, and be expected to lead at least one investigator-initiated project through the course of the fellowship training.

At the conclusion of training, fellows will be competent to practice independently as interventional cardiologists, and will be expected to sit for the American Board of Internal Medicine certification exam in interventional cardiology.
2. Overview of Objectives by Core Competencies

The fellowship program is structured around the achievement of proficiency in 6 core competencies: patient care and procedural skills, medical knowledge, practice-based learning and improvement, interpersonal and communication skill, professionalism, and systems-based practice.

A. Patient Care and Procedural Skills

- Provide care that is compassionate, appropriate, and effective to patients with cardiovascular conditions encountered in interventional cardiology
- Demonstrate competence in the prevention, evaluation, and management of inpatients and/or outpatients with:
  - Acute coronary syndromes
  - Bleeding disorders or complications relating to interventional procedures and/or medications (eg thrombolytic agents, glycoprotein inhibitors, anticoagulants, antiplatelets)
  - Chronic ischemic heart disease
  - Peripheral artery and venous disease
  - Structural heart disease including valvular and basic congenital heart disease (e.g. atrial septal defect, patent foramen ovale, hypertrophic cardiomyopathy)
- Demonstrate competence in:
  - Care of patients before and after interventional procedures
  - Care of patients in cardiac care unit, emergency department, or other intensive care settings
  - Use of antiarrhythmic drugs
  - Uses and limitations of hemodynamic support devices including intra-aortic balloon pump and Impella
  - Use of thrombolytics, anticoagulants, antiplatelets, and intracoronary medications
- Demonstrate competence in the management of PCI complications including:
  - Tamponade
  - Shock
  - Coronary dissections
  - Perforation
  - No reflow
  - Spasm
  - Thrombosis
- Demonstrate competent management of vascular access complications including pseudoaneurysm, bleeding (including retroperitoneal hemorrhage), vascular closure device complications, limb ischemia, and dissection
- Demonstrate competence in the performance of all diagnostic and interventional procedures considered essential to interventional cardiology including:
  - Coronary angiography via transfemoral/transradial and alternative access sites
- Left heart catheterization and ventriculography
- Right heart catheterization
- Peripheral diagnostic and interventional procedures
- PCI
- Fractional flow reserve testing
- Intravascular imaging including ultrasound and optical coherence tomography
- Pericardiocentesis
- Endomyocardial biopsy
- Structural heart interventions including TAVR

- Perform at least 250 PCIs as primary operator
- Perform at least 50 peripheral and venous interventions as primary operator

B. Medical Knowledge

- Demonstrate knowledge of indications, contraindications, complications, techniques, and interpretation of procedures in interventional cardiology
- Demonstrate knowledge of:
  - Coronary and peripheral vascular anatomy and physiology
  - Utility and limitations to the treatment of valvular and structural heart disease
  - Pathophysiology of restenosis
  - Radiation physics, biology, and safety related to X-ray imaging use
  - Strengths and limitations of noninvasive and invasive coronary and peripheral evaluation
  - Strengths and limitations of differing percutaneous approaches for different patterns of coronary and peripheral arterial disease
  - Strengths and limitations of primary PCI and thrombolysis in acute myocardial infarction
  - Assessment of plaque composition and response to intervention
  - Importance and implications of complete versus incomplete coronary revascularization in relation specific coronary anatomy
  - Role of emergency coronary artery bypass grafting in management of PCI complications
  - Treatment of coronary and peripheral restenosis
  - Role of platelets and clotting cascade in vascular injury
  - Use of trial and registry data in clinical decision making
  - Use of pharmacologic agents in the management of patients post-intervention
  - Invasive and non-invasive measurement of cardiac and peripheral hemodynamics
  - Management of patients undergoing structural interventions including TAVR
C. Practice-Based Learning and Improvement
   • Analyze practice using quality improvement methods, and administer changes with the goal of practice improvement
   • Appraise and apply evidence from scientific studies to the care of patients

D. Interpersonal and Communication Skills
   • Demonstrate communication skills that result in effective collaboration between healthcare professionals, patients, and families

E. Professionalism
   • Demonstrate high standards of ethical behavior, maintain appropriate professional boundaries with other healthcare professionals, and avoid conflicts of interest

F. Systems-Based Practice
   • Demonstrate awareness of the larger context and system of health care, and utilize resources in the system to provide optimal care
3. Faculty

**Usman Baber, MD, MS, FACC, FSCAI**  
Director, Interventional Cardiology and Cardiac Cath Lab, OU Medical System  
Director, Interventional Cardiology Fellowship Training Program

Dr. Baber is an Associate Professor of Medicine at the University of Oklahoma HSC and currently serves as the Director of the Cardiac Catheterization Laboratory and the interventional training program. Prior to joining OU, Dr. Baber served as the Director of Cath Lab Quality and Outcomes Research within the Cardiovascular Institute at Mount Sinai Hospital in New York City. Dr. Baber is a graduate of Rice University and earned his medical degree at the University of Texas Southwestern Medical Center in Dallas, Texas, where he also completed his Internship and Residency in internal medicine. He subsequently moved to New York City where he completed fellowships in Clinical Cardiology and Coronary Vascular Intervention at the Mount Sinai Medical Center. During his fellowship training he also earned a Master’s Degree in biostatistics from the Mailman School of Public Health at Columbia University.

From a clinical standpoint Dr. Baber focuses on complex, high-risk coronary interventions. Research interests include clinical and translational projects related to bleeding, thrombosis and platelet function. He is a frequent lecturer at international cardiology conferences, serves on the Editorial Boards of numerous peer-reviewed journals and teaches clinical trial design and biostatistics for the interventional cardiology board review course sponsored by the American College of Cardiology.

**Beau Hawkins, MD, FACC, FSCAI**  
Program Director, Cardiology Fellowship Program

Dr. Hawkins is Associate Professor of Medicine in the Cardiovascular Section at the University of Oklahoma Health Sciences Center. He obtained his medical degree from the University of Oklahoma, where he graduated with distinction and was inducted into the Alpha Omega Alpha Honor Medical Society. He completed residency, chief residency, and cardiovascular diseases fellowship at the University of Oklahoma. He completed fellowships in interventional cardiology and vascular medicine and intervention at Massachusetts General Hospital. He holds committee positions within the American College of Cardiology, Society of Cardiovascular Angiography and Interventions, and Society of Vascular Medicine. His clinical interests include transradial coronary interventions and critical limb ischemia. His research is clinically-based focusing on medical education and interventional cardiology quality and outcomes.

**Talla Rousan, MD, FSCAI**  
Associate Program Director, Interventional Cardiology Fellowship Program

Dr. Rousan is currently an Assistant Professor of Medicine at the University of Oklahoma Health Sciences Center, Cardiovascular Section. He graduated from Jordan University of Science and Technology in Irbid, Jordan in 2006. He completed internal medicine residency and cardiovascular disease fellowship at the
Interventional Cardiology Curriculum

University of Oklahoma Health Sciences Center. He then moved to Houston, Texas to complete a fellowship in interventional cardiology at the University of Texas Health Sciences Center at Houston Medical School. His clinical interests include structural heart disease and complex coronary interventions.

Mohan Edupuganti, MD, FSCAI, FACC

Dr. Edupuganti is currently a Staff Interventional Cardiologist at the Veterans Affairs Hospital and Clinical Assistant Professor of Medicine at the University of Oklahoma Health Sciences center, Cardiovascular section. After graduating from Kasturba Medical College in India he pursued further training in the United States. He completed residency training in Birmingham, Alabama and served as a chief resident. He completed general and interventional cardiology fellowship from the University of Arkansas for Medical Sciences in 2016 and 2017, respectively. His clinical interests include complex and high-risk PCI and research interests include coronary physiology.
4. Facilities and Resources

The University of Oklahoma Health Sciences Center is a comprehensive medical campus located in Oklahoma City, OK. It is the largest academic medical campus in the state, and the only academic center located in the Oklahoma City metro area. Two hospitals are on campus: VA Medical Center and OU Medical System (comprised of Women’s and Children’s Hospital and Presbyterian Tower). Each facility is a several-hundred bed, tertiary referral center. All facilities are connected by a skywalk system.

Both OU Medical Center and VA Medical Center offer a comprehensive spectrum of cardiovascular services including:

- Acute coronary care
- In-house primary PCI for ST Elevation MI
- Cardiac catheterization laboratories
- Echocardiography laboratories (including TEE and stress echocardiography)
- Nuclear cardiology services
- Cardiothoracic surgery (OUMC only)
- Device implantation (Pacemaker, ICD and CRT)
- Peripheral vascular laboratories and services
- Cardiac rehabilitation

Four new state of the art cath lab and two electrophysiology labs are installed at OUMC. The cath labs include a hybrid room for structural/adult congenital and hybrid procedures with vascular surgery and CTS surgery. The VAMC is also in the process of updating their 2 cath labs, and will be building a third lab after that.

Both hospitals have a very active clinical research groups with clinical research coordinators that actively recruit patients from the units, floors and cath lab to our research protocols. In addition, there is a half a day post PCI clinic on each site for fellows to gain outpatient experience.

Each cath lab has dedicated space for fellows to complete clinical work using existing electronic medical records, and academic assignments relating to independent study, conference preparation, and research. There is also a large medical library (Bird Library) located physically on campus that is available for education and academic work, and much of the literature housed by this facility is also available online. Fellows will also have institutional access to Cardiosource, and the associated board preparatory courses available within it.
5. Rotations

Fellows will alternate monthly between OU/VA cath labs, and Oklahoma Heart North Campus. Six months of the academic year will be spent at OU.

OU/VA Cath Lab Rotation

The workday starts at 7:00 AM and usually is completed by 5:00 PM Monday through Friday. Caseload on a daily basis is highly variable, and can range from 3 to 12 cases.

There are usually 1-2 general cardiology fellows in addition to 1 interventional fellow rotating through the OU lab each month. Interventional fellows are expected to assist with pre-procedure patient care including appropriateness assessment, obtaining informed consent, and completing relevant medical record paperwork (sedation forms, history and physicals). General fellows will be in most cases be first operators for the diagnostic aspects of coronary and peripheral procedures. Interventional fellows will assist the general fellows, and then function as first operator for all interventional procedures. Interventional fellows will complete post-interventional orders, admit post-interventional patients to the hospital, and respond to post-procedural problems and issues (eg., bleeding, family updates). Interventional fellows will round on all post-interventional patients the following day, and will provide documentation in the electronic medical record on that patient’s progress. The fellow will discharge the patient when the mid-level provider is unavailable.

The primary obligation of the interventional fellow is to provide coverage at OU with secondary coverage at the VA based upon case load and availability.

Oklahoma Heart Hospital

The Oklahoma Heart Hospital (OHH) group is a large private practice that includes over 80 cardiology providers with cardiovascular services provided across 2 campuses in the OKC metro (OHH North and South). OHH has identified a select group of interventional cardiologists that will provide direct supervision and guidance to the rotating interventional fellow at the OHH North campus. The interventional fellow is expected to arrive between 7 and 7:30 am and review the daily caseload and scheduled interventional procedures. The interventional fellow will function as primary operator during these cases. It is expected that the interventional fellow has reviewed the pertinent history, indication and other relevant details for the case. Post-procedure the interventional fellow will enter a cath report in the OHH EMR system. Other aspects of patient care (i.e. informed consent, orders, inpatient management) are provided by OHH staff and physicians and are not the responsibility of the interventional fellow.

During the OHH rotation the interventional fellow is expected to maintain virtual or in-person presence at the dedicated OU didactic sessions, conferences and ambulatory clinic.
6. Conferences

The Interventional Cardiology Fellows will be expected to attend these conferences, to participate in the clinical discussions, and will present and/or lead conference at least once monthly.

The weekly conference schedule is below. All conferences are currently conducted via Zoom.

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<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Conference Details</th>
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<tbody>
<tr>
<td>Monday</td>
<td>7:30a-8:30a</td>
<td>Morbidity/Mortality Conference (2nd Monday)</td>
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<tr>
<td></td>
<td>7:15a-8:00a</td>
<td>Film Review (1st &amp; 3rd Monday)</td>
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<tr>
<td>Tuesday</td>
<td>7:30a-8:30a</td>
<td>Cath Case Conference (1st and 3rd Tue)</td>
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<tr>
<td></td>
<td></td>
<td>Journal Club (2nd Tue)</td>
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<tr>
<td></td>
<td></td>
<td>Complex Case Review (4th Tue)</td>
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<td></td>
<td></td>
<td>Didactic/Board Review (5th Tue as needed)</td>
</tr>
<tr>
<td>Thursday</td>
<td>7:30a-8:30a</td>
<td>Cardiology Grand Rounds</td>
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<tr>
<td>Friday</td>
<td>7:30a – 8:30a</td>
<td>Limb Preservation Case Conference – Multidisciplinary care discussion of PAD patients Every other Friday</td>
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<tr>
<td>Friday</td>
<td>12:00p-1:00p</td>
<td>Vascular imaging Conference (monthly) – Didactics to prepare for the RPVI certification</td>
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Goals of the sessions include instruction in basic sciences, clinical medicine, evidence-based cardiology, and review of recent clinical trials.
7. Procedures

Interventional fellows will perform a minimum of 250 coronary and 50 peripheral interventions as first operator during the course of the academic year. Procedures are documented using the MedHub system, and are reviewed periodically by the Program Director. It is expected that interventional fellows will be proficient in coronary and peripheral, and select structural, interventions by graduation. Proficiency is determined by successful completion of the requisite number of procedures as primary operator with documented technical success, and demonstration of pre-procedural, intra-procedural, and post-procedural cognitive abilities in managing interventional patients. The following procedures will be taught during the course of the academic year:

**Coronary Procedures/Interventions**
- Angioplasty/stenting
- Coronary imaging (intravascular ultrasound, optical coherence tomography)
- Rheolytic thrombectomy
- Mechanical thrombectomy
- Rotational atherectomy
- Chronic total occlusion (CTO) intervention
- Bifurcation stenting
- Fractional flow reserve
- Hemodynamic support (intra-aortic balloon pump, Impella)

**Peripheral Procedures/Interventions**
- Atherectomy (orbital, directional)
- Re-entry techniques
- Femoropopliteal intervention
- Iliac intervention
- Infrapopliteal intervention
- Subclavian intervention
- Carotid intervention
- Renal intervention
- Mesenteric intervention
- IVC filter implantation and retrieval
- Pulmonary embolism intervention
- Venous intervention (iliofemoral DVT, thoracic outlet syndrome, SVC syndrome)
- Acute limb ischemia interventions

**Structural Procedures/Interventions**
- Intracardiac echocardiography
- Valvuloplasty (aortic and/or mitral)
- Endomyocardial biopsy
- Alcohol Septal Ablation
- ASD/PFO closure
- TAVR
8. Research

The OU and VA cath labs participate in multiple clinical trials relating to coronary and peripheral artery disease. Interventional fellows will be expected to complete training IRB-mandated training such that they may assist in the recruitment and enrollment of patients for these trials in conjunction with research staff. Additionally, under the supervision of interventional faculty, each fellow will be expected to complete a minimum of one research project (e.g., case report/series, observational study, trial) and present the data at a local or national meeting during the course of the academic year.
9. Learning Resources

Textbooks

Some suggestions include:

Cardiac Catheterization, Angiography and Intervention (Grossman)
Kern’ Interventional Cardiology Handbook (Kern)
Practical Peripheral Intervention (Cassely)

Journals

JACC Interventions
Circulation: Cardiovascular Interventions
Catheterization and Cardiovascular Interventions

Internet Resources

Cardiosource.org including CathSap4 available for free through the institution
SCAI Fellows-in-Training (FIT) Core Curriculum (www.scai.org/FIT)
10. Evaluation Process

The interventional cardiology program at the University of Oklahoma is committed to provide 360-degree evaluations as recommended by the ACGME. The fellows are frequently evaluated (formally and informally); and are able to evaluate the faculty members on monthly basis.

The fellows are constantly evaluated throughout the cath lab rotations. Informal feedback will be provided during and after each case which is integral to the teaching process. The formal evaluations include grading of: medical knowledge, patient care and procedural skills, systems-based practice, practice-based learning and improvement, interpersonal and communication skills, and professionalism.

Formal evaluations include:

a. Cath lab evaluation: Monthly evaluations through MedHub; each interventional cardiology faculty member is required to provide a comprehensive evaluation of the fellow for that month.

b. Clinic evaluations: the fellows are evaluated monthly through MedHub; each interventional faculty is required to provide a comprehensive evaluation of the fellow’s clinical competence in providing clinical care for patients in the outpatients setting.

c. Semi-annual meetings with the program director: the fellows meet with the program director twice a year (mid and end of year evaluation) to discuss their collective evaluations provided by all faculty members. In addition to the points mentioned in bullet “c”, the fellows are also evaluated semi-annually regarding scholarly activity.

d. Monthly evaluations by the fellows: the fellows are required to evaluate each faculty member on monthly basis.

e. Quarterly evaluations by the cath lab supervisor and the clinic supervisor.

f. Monthly evaluations of the IC fellows by the general fellows rotating in the cath lab. The evaluations will concentrate on professionalism, communications and team work.

g. Self-evaluations every six months.

h. Annual evaluation of the program by fellows and faculty.