

CHAPTER 18

Educational Curriculum, Milestones, and ACC Resources for the Interventional Cardiology Fellow-in-Training

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Introduction

The goal of graduate medical education is to train skilled and competent practicing physicians. The field of interventional cardiology has rapidly expanded over the last decade with the development of newer generation stents, increasingly complex coronary procedures, percutaneous mechanical circulatory support, peripheral vascular interventions, and the development of percutaneous valve technology. The Accreditation Council on Graduate Medical Education (ACGME) requires accredited programs to offer 12 months of interventional training, realizing that some institutions may require fellows to complete additional years of training in order to become competent in structural, peripheral, or complex coronary interventions. The goal of this section is to provide an overview of the educational content and evaluation tools of a one-year general interventional cardiology fellowship.

Curriculum

Medical education has changed in recent years with the focus on competency-based training. The ACGME has identified six core competencies that should be used by all programs to assess their trainees: medical knowledge, patient care and procedural skills, practice-based learning and improvement, systems-based practice, interpersonal and communication skills, and professionalism. The

training curriculum for interventional cardiology should be aligned with these competencies and provide a developmental roadmap (i.e. milestones) for trainees as they progress through fellowship. These curricular milestones will serve as the framework for trainee evaluation and the biannual ACGME milestone reporting.

Table 1 provides a representative curriculum for a one-year program in interventional cardiology, and general interventional cardiology fellows should have an understanding of the outlined topics. Given the breadth of the field and rapidly advancing technology, some programs may require additional training in order to meet competency-based goals in these areas with tracts developing in structural intervention, complex higher-risk indicated patients (CHIP), peripheral intervention, and critical care. In addition, skills achieved during earlier stages of training in the competencies of practice-based learning and improvement and systems-based practice should be continually practiced and reinforced.

Assessment Methods (Milestones)

The assessment of competency of a medical trainee is an educational challenge. Milestones are observable steps in the skill development of a trainee and can be used to describe trainee progress. The ACGME has defined reporting milestones that must be completed for all trainees every 6 months and reported to the ACGME. In addition, the Core Cardiology Training Symposium (COCATS) has defined curricular milestones that aid in the description of trainee progression. The ACGME and the Core Cardiology Training Symposium (COCATS) have defined assessment tools that can be used to assess trainees and to complete the biannual ACGME reporting milestones (**Table 2**). Primary resources used to assess trainees include direct observation, evaluation by faculty, staff, and patients, and procedural volume. In addition, trainees should be given an opportunity to self-reflect on their performance in order to assist with identifying knowledge and skill gaps as well as plan future learning goals. All

assessments should be reviewed by the trainee with the program director at least every six months. It is important for evaluations to be geared towards the individual trainee and compared over time using the ACGME scale of early learning to ready for unsupervised practice.

ACC Resources for the Interventional Cardiology Fellow-in-Training

The American College of Cardiology has several resources available for interventional cardiology fellow-in-training (FIT). Resources are available at www.acc.org and outlined below:

Website: <http://www.acc.org>

Links to guidelines with certified patient cases to re-inforce guidelines

Clinical topics

Invasive Cardiovascular Angiography and Intervention

Guideline Clinical App

Career Development Resources

Webinars: How to find the right mentor, the business side of cardiology: coding and documentation, how to transition from fellowship to your first job

<http://www.acc.org/membership/member-benefits-and-resources/career-resources/career-resource-webinars>

Mentoring program:

<http://www.acc.org/membership/member-benefits-and-resources/career-resources/mentoring-program>

Link to structural and congenital interventional programs:

<http://www.acc.org/membership/sections-and-councils/fellows-in-training-section/training-resources/structural-heart-disease-and-congenital-interventional-fellowship-programs>

Board preparation resources

ACC/SCAI Premier Interventional Cardiology Overview and Board Preparatory Course

CathSAP: self-assessment program geared towards interventional cardiology FITs to provide educational text, lectures, and ABIM board style questions to review learned concepts, identify knowledge deficiencies, and learn new information.

ACC Podcasts: <http://www.acc.org/latest-in-cardiology/features/podcasts>

Link to JACC journals with JACC intervention

<http://www.onlinejacc.org/>

<http://interventions.onlinejacc.org/>

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Fellow-in-Training

Tables

Table 1: Curriculum for One Year Interventional Fellowship.

Interventional Cardiology Curriculum	
Anatomy, pathology, and physiology	Coronary, valvular, and vascular
Pharmacology	Anticoagulation and antiplatelet agents
	Thrombolytics
	Anesthetics used in moderate conscious sedation
	Vasopressors and vasoactive agents
Radiation Safety and Imaging Strategies	Occupational exposure
	Patient and operator protection devices
Cardiovascular Hemodynamics	Shock
	Constriction vs. restriction
	Intracardiac shunts
Access Site Management	Invasive assessment of valvular dysfunction, hypertrophic obstructive cardiomyopathy, pulmonary hypertension, and heart failure
	Site choice, safe entry techniques, closure techniques, and management of complications
Coronary Intervention	Guide catheter selection
	Workhorse wires and escalation wires
	Interventional balloons and stents
	Bifurcation stenting techniques
	Bypass graft intervention techniques
	Chronic total occlusion intervention techniques*
	Indications and use of mechanical circulatory support devices to support intervention*
	Intracoronary imaging techniques
	Coronary hemodynamics with iFR, CFR, FFR
	Adjunctive techniques including coronary atherectomy and thrombectomy
Peripheral Intervention*	Lower extremity peripheral intervention
	Upper extremity peripheral intervention
	Intra-abdominal peripheral intervention
	Carotid intervention
	Neurovascular intervention
Valvular/Structural Intervention*	Trans-septal access

	Valvuloplasty techniques
	Alcohol septal ablation techniques
	Left atrial appendage closure
	Patent foramen ovale/atrial septal defect closure
	Transcatheter aortic valve interventions
	Transcatheter mitral valve interventions
	Transcatheter tricuspid valve interventions
	Transcatheter pulmonic valve interventions
	Use of intra-cardiac, transthoracic, and transesophageal echocardiography
Mechanical Circulatory Support	Appropriate use, patient selection, management of complications
	Percutaneous ventricular support
	ECMO
Communication and Professionalism	Appropriate use criteria for interventional procedures
	Effective communication with patients, families, and all members of healthcare team
	Effective communication with patients for shared decision-making and informed consent
	Effective participation in a Heart Team for complex medical decision-making
	Skill to function well in a team based setting and effectively as a team leader

*May require more subspecialized training

Table 2: Assessment Methods of Milestones.

Assessment Methods of Milestones for the Interventional Cardiology Fellow-in-Training	
Direct observation and supervision	
Evaluations	Self-evaluation
	Multi-source evaluations from patients, ancillary staff, nursing, trainees, and attending physicians using ACGME scale (early learning to ready for unsupervised practice)
Procedure logging	
Conference and case presentations	
Cath lab simulation (*when available)	
Review courses and practice exams	

References:

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4. Halperin J.L., Williams E.S., Fuster V. COCATS 4 introduction. [J Am Coll Cardiol 2015;65:1724-33](#).
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6. Sinha S.S., Julien H.M., Krim S.R., et al. COCATS 4: securing the future of cardiovascular medicine. [J Am Coll Cardiol 2015;65:1907-14](#).