

Task Force 3: Pediatric Cardiology Fellowship Training in Cardiac Catheterization¹

Laurie B. Armsby, MD, FAAP, Co-Chair, Robert N. Vincent, MD, CM, FACC, FSCAI, Co-Chair, Susan R. Foerster, MD, FSCAI, Ralf J. Holzer, MD, FSCAI, John W. Moore, MD, MPH, FAAP, FACC, FSCAI, Audrey C. Marshall, MD, Larry Latson, MD, FAAP, FACC, FSCAI, Michael Brook, MD

PII: S0735-1097(15)00817-7

DOI: [10.1016/j.jacc.2015.03.012](https://doi.org/10.1016/j.jacc.2015.03.012)

Reference: JAC 21062

To appear in: *Journal of the American College of Cardiology*

Please cite this article as: Armsby LB, Vincent RN, Foerster SR, Holzer RJ, Moore JW, Marshall AC, Latson L, Brook M, Task Force 3: Pediatric Cardiology Fellowship Training in Cardiac Catheterization¹, *Journal of the American College of Cardiology* (2015), doi: 10.1016/j.jacc.2015.03.012.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

Task Force 3: Pediatric Cardiology Fellowship Training in Cardiac Catheterization¹

Endorsed by the Society for Cardiovascular Angiography and Interventions

Laurie B. Armsby, MD, FAAP (Co-Chair); Robert N. Vincent, MD, CM, FACC, FSCAI (Co-Chair); Susan R. Foerster, MD, FSCAI; Ralf J. Holzer, MD, FSCAI; John W. Moore, MD, MPH, FAAP, FACC, FSCAI; Audrey C. Marshall, MD; Larry Latson, MD, FAAP, FACC, FSCAI; Michael Brook, MD

1. Introduction

1.1. Document Development Process

The Society of Pediatric Cardiology Training Program Directors (SPCTPD) board assembled a steering committee which nominated 2 chairs, 1 SPCTPD steering committee member, and 5 additional experts from a wide range of program sizes, geographic regions, and subspecialty focus. Representatives from the American College of Cardiology (ACC), American Academy of Pediatrics (AAP), and American Heart Association (AHA) participated. The steering committee member was added to provide perspective to each task force as a “non-expert” in that field. Relationships with industry and other entities were not deemed relevant to the creation of a general cardiology training statement; however, employment and affiliation information for authors and peer reviewers are provided in Appendices 1 and 2, respectively, along with disclosure reporting categories. Comprehensive disclosure information for all authors, including relationships with industry and other entities, is available as an online supplement to this document

http://jaccjacc.acc.org/Clinical_Document/Ped_TS_TF3_Comprehensive_RWI_Supplement.pdf.

The writing committee developed the document, approved it for review by individuals selected by the participating organizations (see Appendix 2), and addressed their comments. The final document was approved by the SPCTPD, AAP, and AHA, as well as endorsed by SCAI in February 2015, and approved by ACC in March 2015. This document is considered current until the SPCTPD revises or withdraws it.

¹ The American College of Cardiology requests that this document be cited as follows: Armsby LB, Vincent RN, Foerster SR, Holzer RJ, Moore JW, Marshall AC, Latson L, Brook M. Task force 3: pediatric cardiology fellowship training in cardiac catheterization. J Am Coll Cardiol. 2015;●●:●●●●—●●●●.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

1.2. Background and Scope

While diagnostic indications for catheterization are less frequent due to advances in noninvasive cardiac imaging, innovations in equipment and technologies continue to expand the role of interventional catheterization in the treatment of pediatric and congenital heart disease. The increasing complexity of cardiac catheterization procedures, hybrid approaches to integration of cardiothoracic surgery and transcatheter intervention, and the ability to support hemodynamically vulnerable patients through complex transcatheter procedures requires a high level of proficiency. While all pediatric cardiology fellows must understand the indications, risks, benefits, and limitations of cardiac catheterization, as well as acquire proficiency in assessment and utilization of the data generated through these procedures, not all fellows require the same degree of competence in performing cardiac catheterizations. The challenge inherent in the development of training guidelines for this subspecialty is that they provide sufficient instruction and experience to 2 groups of trainees, those who will continue to perform cardiac catheterizations after fellowship, and those who will not. A further challenge shared by all Task Forces is the paradox of the increasing knowledge base and complexity across all aspects of pediatric cardiology with the static total duration of fellowship training, and reduced in-hospital time due to current duty hour regulations.

The current training guidelines aim to address these challenges through a departure from the earlier focus on a minimum number of procedures, upon which the 2005 guidelines were based (1), to a training model in which proficiency of core concepts within the subspecialty are emphasized. The 3-year training experience should ensure achievement of competencies along a developmental continuum of performance, culminating in complete entrustment of professional activities expected for graduation involving the understanding of data generated by cardiac catheterization procedures.

Our revised training recommendations describe the program resources and environment that are required for training pediatric cardiology fellows, together with a competency-based system promulgated by the American College of Graduate Medical Education (ACGME), to implement specific goals and objectives for training pediatric cardiology fellows. This system categorizes competencies into 6 core competency domains: Medical Knowledge, Patient Care and Procedural Skills, Systems-Based Practice, Practice-Based Learning and Improvement, Professionalism, and Interpersonal and Communication Skills, along with identification of suggested evaluation tools for each domain. Core competencies unique to pediatric cardiac catheterization are listed in Section 3 (see the Training Guidelines for Pediatric Cardiology Fellowship Programs Introduction for additional competencies that apply to all Task Force reports).

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

1.3. Levels of Expertise – Core and Advanced

Innovations in the field of interventional cardiology have led to increasingly complex procedures in patients who are often hemodynamically vulnerable. Given the potential for great benefit as well as risk, physicians performing these procedures should be skilled in all aspects of diagnostic and therapeutic cardiac catheterization. However, since only a small percentage of pediatric cardiology fellows will ultimately perform cardiac catheterization procedures at the completion of their general pediatric cardiology training, the concept that proficiency with physical catheter manipulation and specific interventional catheterization techniques is mandatory to the general pediatric cardiologist is no longer substantiated.

In this statement, we discuss core training for all fellows enrolled in a traditional 3-year pediatric cardiology fellowship and advanced training for fellows who wish to embark on a career as a pediatric and congenital cardiac interventionalist. Core training is required for all trainees and is intended to ensure that fellows acquire the knowledge base and skills necessary to become a pediatric cardiologist referring his/her patient for cardiac catheterization. Advanced training guidelines are recommended for fellows who wish to specialize in cardiac catheterizations following training.

2. Program Resources and Environment

Training in pediatric and congenital cardiac catheterization should occur within a pediatric cardiology fellowship program accredited by the Accreditation Council for Graduate Medical Education (ACGME). The cardiac catheterization laboratory should be supported by facilities and units providing expertise in the treatment of children with congenital and acquired heart disease, including cardiac, pediatric, and neonatal intensive care units; an active cardiac surgical program; adequate cardiac imaging services; and outpatient facilities. The pediatric cardiac catheterization laboratory should be under the supervision of a designated pediatric and congenital interventional cardiologist who has primary responsibility for supervision of the laboratory. Catheterization equipment and inventory should be maintained to ensure high quality performance and to comply with regulations and guidelines for patient safety. A minimum of 150 diagnostic and/or interventional catheterizations must be performed in the laboratory per year to provide an adequate learning environment (2).

The director of the cardiac catheterization program should maintain a curriculum of training within the catheterization laboratory. This should include regular teaching conferences and morbidity and mortality conferences in which all adverse events related to catheterization are systematically reviewed in the presence of representatives from all constituents of the congenital cardiac program. In addition, there should be an established process for discussion of patient data, as well as indications for, and expected

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

findings and objectives of, the procedure prior to each catheterization. The cardiac catheterization laboratory should maintain active involvement in quality improvement programs including evaluation of outcomes and record of adverse events and, if possible, participation in a national pediatric and congenital cardiac catheterization registry (2).

3. Core Training: Goals and Methods

We have substantially revised the requirement delineated in the 2005 training guidelines that the pediatric cardiology fellow participate as primary operator or primary assistant in 100 catheterizations, at least 20 of which include an interventional component. The current guidelines replace the emphasis on performing a minimum number of procedures with demonstration of achievement of competencies within cardiac catheterization (Table 1). The acquisition of a number of catheterization specific competencies over the course of training will be assessed with explicit milestones currently being developed by SPCTPD in conjunction with the American Board of Pediatrics.

Table 1. Core Curricular Competencies and Evaluation Tools for Pediatric and Congenital Cardiac Catheterization

Medical Knowledge

- Know the risks and benefits of catheterization and specific interventions.
- Know the indications and contraindications for catheterization and specific interventions.
- Know procedural techniques for catheterization and specific interventions.
- Know the principles of radiation safety.

Evaluation Tools: direct observation, conference participation and presentation, procedure logs, in-training exam

Patient Care and Procedural Skills

- Have the skills to interpret waveforms, determination of pressures, and gradients.
- Have the skills to apply thermodilution and the Fick principle for flows and resistances.
- Have the skills to recognize normal and abnormal hemodynamics.
- Have the skills to interpret angiographic information.
- Have the skills to assess interventional outcomes, both successful and unsuccessful.
- Have the skills to assess the limitations of a procedure and to recognize and manage complications.

Evaluation Tools: direct observation, conference participation, procedure logs

Interpersonal and Communication Skills

- Effectively communicate catheterization data, both orally and in written form.

Evaluation Tools: direct observation, faculty evaluations, 360 evaluations

Instruction in catheterization-specific cardiac anatomy, cardiac physiology, and transcatheter diagnostic and interventional cardiology should be included in the 3-year core training experience. By completion of training the individual should understand, and be independently capable of explaining the indications, risks, benefits, and limitations of cardiac catheterization as a diagnostic modality and as a

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

therapeutic option for specific lesions. In order to appropriately risk stratify patients, they should have a working knowledge of the principles of radiation exposure and safety.

The fellow should be expert in interpreting hemodynamic and angiographic data acquired through cardiac catheterization. This includes recognition of abnormal hemodynamic and angiographic findings, an ability to perform hemodynamic calculations including cardiac output, flow relationships, pressure gradients and vascular resistance, and the application of hemodynamic data to physiologic principles. In addition, they will have a contemporary understanding of the basic methodologies of transcatheter intervention for valvuloplasty, arterio/venoplasty, device closure, stent placement and emergent procedures. The fellow will be capable of assessing the outcome of an intervention. This includes recognition of residual hemodynamic or anatomic perturbations, device stability and evaluation of radiographic and echocardiographic studies pertinent to an intervention. The fellow should be capable of evaluating patients presenting with symptoms of complications that could be attributable to a transcatheter intervention.

These competencies shall be acquired through clinical exposure and experience with a required minimum number of catheterization procedures during core fellowship training. Although the variability in which trainees achieve competencies in cardiac catheterization is significant, the requirement of a minimum number of procedures serves to provide an appropriate exposure to the field and establish an accurate assessment of competence. The core training curriculum should require that all fellows act as an assistant to the attending interventional cardiologist in a minimum of 50 cardiac catheterizations. The assistant's role for this purpose is defined as an active participant in the procedure, surgically scrubbed and with direct contact with the patient and equipment. Those fellows showing an interest or an affinity for catheterization should be encouraged to participate in many more cases over the 3 years. In addition to assisting in the procedure, the fellow should also participate in case preparation and post-procedural care, including monitoring and managing complications, hemodynamic calculations, interpretation of angiography, report generation, and communication of the findings to their interdisciplinary colleagues. Fellows should actively participate in quality improvement activities including morbidity and mortality conferences specific to interventional cardiology.

4. Advanced Training: Goals and Methods

In order to attain verification of competence to practice interventional cardiology without supervision at completion of training, an additional year or more of advanced training in pediatric and congenital interventional catheterization following the standard core fellowship should be mandatory (3-5). During this year, individuals would be required to perform procedures of gradually increasing

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

complexity under the supervision of an attending interventional cardiologist. The Congenital Heart Disease Section of the Society for Cardiovascular Angiography and Interventions (SCAI) has created an expert consensus statement for advanced training in pediatric and congenital interventional cardiac catheterization and the details of these specifics can be found in this report (3). We have summarized the key points here.

In general, the fellow undergoing advanced training in pediatric and congenital cardiac catheterization should attain a greater experience and level of independence of the core competencies in Table 1. In addition, advanced fellows should become highly skilled in the technical aspects of cardiac catheterization. Attaining advanced-level skills in pediatric and congenital cardiac catheterization requires that the trainee act as primary operator under the supervision of an attending interventionalist in all the major categories of pediatric and congenital cardiac catheterization procedures available at the training institution. Achievement of competence toward complete entrustment should be measured, monitored, and documented during the advanced training curriculum. At a minimum, it is expected that extensive instruction would be provided in the following procedural categories:

- Complex vascular access
- Aortic and pulmonary valvuloplasties
- Angioplasty of the aorta, pulmonary arteries, and systemic and pulmonary veins
- Emergent procedures such as balloon atrial septostomy and left atrial decompression
- Use of stents with deployment in the pulmonary arteries, aorta, and other vessels
- Use of closure devices including vascular plugs/coils, especially for the treatment of atrial and ventricular septal defects, fenestrations, and patent ductus arteriosus
- Endomyocardial biopsy
- Pericardiocentesis/creation of a pericardial window

Exposure to novel and complex techniques such as transcatheter valve implantation and radiofrequency valve perforation is ideal but may be limited by institutional preference and availability.

The subcommittee recognizes that many catheter techniques are similar, and that seasoned interventionalists use previously mastered skills to further their acquisition of new techniques throughout their career. We also acknowledge that technical skills continue to develop throughout an interventional career and recognize the value of continued professional growth and mentorship by a senior colleague, when available, after subspecialty training. Fellows participating in advanced training for pediatric and congenital cardiac catheterization should perform the minimum number of procedures recommended in Table 2 to meet advanced training standards.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization**Table 2. Advanced Training Requirements for Pediatric and Congenital Cardiac Catheterization**

Procedure	Minimum Number of Procedures
Cardiac catheterization (including interventions)	250
Interventional procedures (including those listed below)	150
Interventional procedures in neonate (≤ 30 days of age)	25
Device closures (ASD, VSD, PDA, PFO and others using closure devices and plugs)	30
Angioplasty procedures	30
Stent insertion	20
Transeptal punctures	5
Procedures to open the atrial septum	5

ASD indicates atrial septal defect; VSD, ventricular septal defect, PDA, patent ductus arteriosus; PFO, patent foramen ovale.

5. Specific Program Content: Core and Advanced Levels

Trainees will be expected to develop an appropriate level of knowledge and experience in each of the areas below.

- Know the indications for catheterization. *All fellows* should understand the appropriate indications for undertaking the risk of cardiac catheterization. This requires an understanding of the physiologic principles underlying the hemodynamic data collected during the procedure and facility in the appropriate application of that data to clinical decision making. Alternatives to acquiring diagnostic information must be understood and compared to the quality and risks of data acquisition during catheterization. Alternatives to interventional catheterization procedures must be understood and compared to the quality and risks of transcatheter interventions.
- Know the risks of catheterization and specific interventions. *All fellows* should understand the potential complications associated with acquisition of hemodynamic and angiographic data by catheterization. In addition, all fellows should have a contemporary working knowledge of the risks, complications, and limitations of transcatheter interventions. All fellows should actively participate in morbidity and mortality conferences in which complications of catheterization are analyzed and discussed in the presence of subspecialists across pediatric cardiology. *Advanced trainees* should have hands-on experience managing complications encountered during the major categories of interventional procedures.
- Know the interpretation of waveforms and determination of pressures and gradients. *All fellows* should be proficient at using the raw hemodynamic data collected at catheterization to determine cardiopulmonary physiology and pathophysiology for all congenital cardiac defects and acquired pediatric heart disease.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

- Know the application of thermodilution, the Fick principle, and resistances. *All fellows* should understand the principles of flow, pressure, and resistance measurements and calculations acquired at catheterization, as well as the assumptions and limitations inherent in their determination. Fellows should understand how these elements are derived, how they interrelate, and how they are appropriately applied to clinical decision making. They should understand provocative testing for pulmonary vascular reactivity and the concepts of oxygen content and oxygen consumption.
- Have the skills to analyze hemodynamic data collected at catheterization. *All fellows* should know the normal cardiopulmonary hemodynamics and understand the physiologic causes and implications of abnormal hemodynamics. Fellows should also understand the implication of level of sedation and mode and level of ventilation on the cardiopulmonary hemodynamics measured at catheterization.
- Know procedural technique. *All fellows* must have a conceptual knowledge of the process of vascular access, catheter manipulation, anatomic relationships, and data acquisition in a wide range of congenital cardiac and pediatric acquired heart disease. *Advanced fellows* should be expert in each of these areas, recognizing that further expertise will develop with experience and technological advancement.
- Have the skill to interpret angiographic information. *All fellows* should be skilled in recognizing basic cardiopulmonary anatomic structures delineated through angiography. They should be able to appreciate normal and abnormal anatomic details in a wide range of congenital heart defects. Fellows should also know the basic principles of angiography, including a working knowledge of catheter positioning, camera angles, and contrast toxicity. *Advanced fellows* should be expert at interpreting angiographic information. They should be proficient in recognizing complex cardiopulmonary anatomic structures both pre- and post-operatively. In addition, they should be able to independently capture appropriate and high quality angiographic images in all patients with congenital heart disease.
- Know how to assess interventional outcomes. *All fellows* should have a working knowledge of the indications, associated risks, and anticipated outcome for all transcatheter interventions. In addition, all fellows should have a basic understanding of safety and efficacy criteria for terminating efforts at intervention. They should understand and be able to interpret the results and requirements for noninvasive and/or invasive follow-up.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

- Effectively communicate catheterization data, verbally and written. *All fellows* should be competent in succinctly articulating the essential information of a cardiac catheterization. They should be able to summarize and explain the findings to a wide range of associates including patients/parents, nurses, noncardiac practitioners, cardiologists, and surgeons. Fellows should be given ample opportunity to present data in a variety of settings during their training.
- Know the principles of radiation safety. *All fellows* should be able to demonstrate a working comprehension of the principles of radiation safety, including the methods of risk reduction during cardiac catheterization. They should know the quantities of radiation necessary for catheterization procedures, as well as for alternative imaging modalities. *Advanced fellows* should be expert in these concepts and be facile in utilization and instruction of the principles of radiation safety principles.

6. Evaluation and Documentation of Competence

All training programs should include written goals and objectives for each cardiac catheterization rotation with performance goals set according to the fellow's level of training. These will serve as the basis for formative feedback. A copy of these goals and objectives should be supplied and explained to the trainee at the onset of fellowship training and reviewed at the beginning of each rotation. Evaluation of fellows should be performed midway through, and at the completion of, each rotation; evaluations should be directed towards whether the fellow met those pre-specified aims. The fellow evaluation should be performed by the cardiac catheterization lab director and/or senior cardiac catheterization physician chosen as director of cardiac catheterization training. The fellow evaluation should assess the fellow's performance in each of the 6 areas of core competencies, as appropriate for the level of training, and should be based on direct observation of the fellow. Evaluation of competency in preparation, performance, and interpretation of the results of a procedure should be given more consideration than a focus on the number of procedures performed. Evaluation of competency should be done in person with the trainee and documented in their fellowship record. If the trainee is not progressing as expected, remedial actions should be arranged and documented in accordance with institutional procedures. All fellows should maintain a log (preferably electronic) of all procedures performed.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization**APPENDIX 1. AUTHOR RELATIONSHIPS WITH INDUSTRY AND OTHER ENTITIES (RELEVANT)—PEDIATRIC CARDIOLOGY FELLOWSHIP TRAINING IN CARDIAC CATHETERIZATION**

Committee Member	Employment	Consultant	Speaker's Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional/ Organizational or Other Financial Benefit	Expert Witness
Laurie B. Armsby (<i>Co-Chair</i>)	Oregon Health Sciences University—Associate Professor of Pediatrics; Division Head, Pediatric Cardiology; Director, Pediatric Cardiology Fellowship Program	None	None	None	None	None	None
Robert N. Vincent (<i>Co-Chair</i>)	Emory University School of Medicine—Professor of Pediatrics	None	None	None	None	None	None
Susan R. Foerster	Children's Hospital of Wisconsin/Medical College of Wisconsin—Medical Director, Interventional Cardiology	None	None	None	None	None	None
Ralf J. Holzer	Sidra Medical & Research Center, Sidra Cardiovascular Center of Excellence—Medical Director, Cardiac Catheterization & Interventional Therapy	None	None	None	None	None	None
John W. Moore	Rady Children's Hospital—Director of Cardiology; University of California School of Medicine—Professor of Pediatrics	None	None	None	None	None	None
Audrey C. Marshall	Harvard University—Associate Professor of Pediatrics; Boston Children's Hospital—Senior Associate of Cardiology; Chief, Invasive Cardiology; Director, Cardiac Catheterization Laboratory	None	None	None	None	None	None
Larry Latson	Joe DiMaggio Children's Hospital/Memorial Healthcare System—Director, Congenital Cardiac Catheterization Laboratory; Director, Adult Congenital Heart Defects Program; Florida Atlantic University Medical School—Clinical Professor	None	None	None	None	None	None
Michael Brook	University of California-San Francisco—Professor of Pediatrics; Director, Pediatric	None	None	None	None	None	None

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

Committee Member	Employment	Consultant	Speaker's Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional/ Organizational or Other Financial Benefit	Expert Witness
	Echocardiography; Director, Pediatric Cardiology Fellowship Training						

For the purpose of developing a general cardiology training statement, the ACC determined that no relationships with industry or other entities were relevant. This table reflects author's employment and reporting categories. To ensure complete transparency, authors' comprehensive healthcare-related disclosure information—including RWI not pertinent to this document—is available in an online data supplement (http://jaccjacc.acc.org/Clinical_Document/Ped_TS_TF3_Comprehensive_RWI_Supplement.pdf). Please refer to <http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/relationships-with-industry-policy> for definitions of disclosure categories, relevance, or additional information about the ACC Disclosure Policy for Writing Committees.

APPENDIX 2. PEER REVIEWER RELATIONSHIPS WITH INDUSTRY AND OTHER ENTITIES (RELEVANT)—PEDIATRIC CARDIOLOGY FELLOWSHIP TRAINING IN CARDIAC CATHETERIZATION

Name	Employment	Representation	Consultant	Speaker's Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional/ Organizational or Other Financial Benefit	Expert Witness
Eric Bates	The Cardiovascular Center, University of Michigan	CMC	None	None	None	None	None	None
Regina Lantin-Hermoso	Texas Children's Hospital	ACC ACPC Council	None	None	None	None	None	None
Swee Chye Quek	National University of Singapore, Department of Pediatrics	ACC ACPC Council	None	None	None	None	None	None
Jonathan Rome	Children's Hospital of Philadelphia	AHA	None	None	None	None	None	None
Carole Warnes	Mayo Clinic—Professor, Medicine	ACC BOT	None	None	None	None	None	None
Eric Williams	Indiana University School of Medicine—Professor (Cardiology) and Associate Dean; Indiana University Health, Cardiology Service Line Leader	ACC CMC Lead Reviewer	None	None	None	None	None	None

For the purpose of developing a general cardiology training statement, the ACC determined that no relationships with industry or other entities were relevant. This table reflects peer reviewers' employment, representation in the review process, as well as reporting categories. Names are listed in alphabetical order within each category of review. Please refer to <http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/relationships-with-industry-policy> for definitions of disclosure categories, relevance, or additional information about the ACC Disclosure Policy for Writing Committees.

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

ACC indicates American College of Cardiology; ACPC, Adult Congenital and Pediatric Cardiology; AHA, American Heart Association; BOT, Board of Trustees; and CMC, Competency Management Committee.

ACCEPTED MANUSCRIPT

Armsby LB, et al

Pediatric Training Statement: Cardiac Catheterization

References

1. Beekman RH, III, Hellenbrand WE, Lloyd TR, et al. ACCF/AHA/AAP recommendations for training in pediatric cardiology. Task force 3: training guidelines for pediatric cardiac catheterization and interventional cardiology. *J Am Coll Cardiol* 2005; 46:1388-90.
2. Bashore TM, Balter S, Barac A, et al. 2012 American College of Cardiology Foundation/Society for Cardiovascular Angiography and Interventions expert consensus document on cardiac catheterization laboratory standards update: a report of the American College of Cardiology Foundation Task Force on Expert Consensus Documents. *J Am Coll Cardiol* 2012; 59:2221-305.
3. Armsby L, Beekman RH, III, Benson L, et al. SCAI expert consensus statement for advanced training programs in pediatric and congenital interventional cardiac catheterization. *Catheter Cardiovasc Interv* 2014; 84:779-84.
4. Ruiz CE, Mullins CE, Rochini AP, et al. Core curriculum for the training of pediatric invasive/interventional cardiologists: report of the Society for Cardiac Angiography and Interventions Committee on Pediatric Cardiology Training Standards. *Cathet Cardiovasc Diagn* 1996; 37:409-24.
5. Harold JG, Bass TA, Bashore TM, et al. ACCF/AHA/SCAI 2013 update of the clinical competence statement on coronary artery interventional procedures: a report of the American College of Cardiology Foundation/American Heart Association/American College of Physicians Task Force on Clinical Competence and Training (Writing Committee to Revise the 2007 Clinical Competence Statement on Cardiac Interventional Procedures). *J Am Coll Cardiol* 2013; 62:357-96.