

Cardiology Fellowship Manual

Goals & Objectives
-Cardiac Catheterization-

Cardiac Catheterization and Hybrid Laboratory

Children's Hospital & Medical Center

Fellowship Objectives, Responsibilities and Rotation Curriculum

Supervisory Policy:

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All procedures performed by Fellow Trainees within the Cardiac Catheterization Laboratory, including the recovery room, will be performed only under direct supervision of an Attending level physician with full hospital privileges.

General Objectives:

The understanding and practice of cardiac catheterization is intrinsic to Pediatric Cardiology. In addition, transcatheter therapeutic interventions in pediatric patients are increasingly common, and frequently provide alternatives to surgical intervention. It is thus vitally important that Pediatric Cardiology Fellows progress through a structured program that allows development of this knowledge and these skills. Core lecture series on the basics of cardiac catheterization, including the obtaining and interpretation of pressure wave forms, the cardiac output and physiologic calculations, and radiation use/exposure/safety will be included in the core lecture series and augmented and reinforced during each rotation.

The rotation through the cardiac catheterization laboratory is designed to provide the following foundation for the Cardiology Fellow:

- An understanding of the indications for cardiac catheterization.
- The acquisition of the skills and education on the process necessary to perform a basic diagnostic catheterization (see below).
- The ability to interpret hemodynamic and angiographic data in the context of a particular clinical scenario.
- The development of skills necessary to assist with interventions and comprehensive therapeutic procedures.
- Senior fellows who express a desire to pursue cardiac catheterization as a sub-specialty field will be given a higher level of exposure and responsibility.
- Fellows will learn the signs and symptoms of compromised hemodynamics. They will learn the means to anticipate and manage complications and potential life-threatening events that may arise during catheterization.
- Fellows will be taught to report and discuss catheterization data.
- Fellows will be taught techniques to limit radiation exposure both for the patient and staff.
- Participation and education in financial aspects of the catheterization laboratory

Fundamental to the rotation are responsibilities relevant to clinical service, medical records documentation and conferencing. These include (but are not limited to) the following (*Patient Care, PC; Interpersonal & Communication Skills, IPCS; Systems-Based Practice, SBP; Medical Knowledge, MK; Professionalism, P*):

Clinical Service (*PC; IPCS; SBP; MK; P*)

1.
 - a. Complete a careful review of all patient data prior to catheterization (medical records, ECG, Echo, CXR, perfusion scans, etc.). This is particularly germane to past catheterizations, and should be specific with regard to:
 - Original and current anatomy
 - Airway and sedation reactions/complications.
 - Co-morbid conditions
 - Prior catheterization difficulties and complications, including rhythm disturbances, challenging catheter maneuvers, aspects of procedure that were poorly tolerated by the patient.
 - Vascular access complications or occluded vessels
 - b. Perform history and physical examination on each catheterization patient in conjunction with the catheterization attending.
 - c. Obtain all procedural consents in conjunction with the attending.
 - d. Participate fully in all diagnostic and therapeutic procedures in the catheterization laboratory.
 - e. Ensure completion of pre- and post-catheterization orders.
 - f. Maintain responsibility for patients post procedure. Fellows on the cath lab rotation will care for patients that are being observed overnight in the hospital, including pre-discharge examinations and testing the following morning. They will be the first call with any post-procedural questions and problems.
 - g. Patients that are catheterized, but are cared for on the inpatient service will be transferred back to the inpatient service. The fellow will provide a detailed sign out of the catheterization findings to the team caring for the patient. If the patient is in the ICU, the fellow will accompany the patient to the ICU and provide sign-out to the ICU team and the inpatient cardiology service.

2. Medical Records Documentation (*PC; SBP*)

- a. Complete a preliminary report immediately after the catheterization if not completed by the Attending.
- b. Complete the cardiac catheterization report on the day of the catheterization. This includes:
 - Raw data is reviewed and edited as it is input into the Mennen program during the procedure.
 - Complete the PedCath report, including both data entry and an accurate diagram.

- Manual calculations are required during the first two months on the rotation.
 - c. Dictate the cardiac catheterization procedure report (see attached) within 24 hours of the procedure.
 - d. Edit and sign the final report within 2 days of the dictation being completed.
3. Conferencing (PC; IPCS; SBP; MK; P)
- a. Attending planning meeting
 - Prior to the day of the procedure, the fellow and the attending will review upcoming cases, with particular regard to special needs and peri-catheterization planning. As the catheterization schedule is fluid, the fellow and attending will both be expected to take responsibility for organizing these meetings, as the timing of the meeting will vary based on the schedule of procedures.
 - b. Monday Care Conference
 - The fellow who has participated in the catheterization will be expected to present the hemodynamic and angiographic data, regardless of current month assignment, unless other arrangements are made.
 - c. Weekly didactic conference.
 - The fellows and attending will participate in weekly informal conferences where specific interesting or challenging patients, techniques, or disease states are reviewed in greater detail. These will be arranged to flex with the schedule. Fellows not on the cath rotation are welcome to participate, and efforts will be made to arrange a time of greatest convenience for fellows both on and off the rotation.

Cardiac Catheterization Skill Requirements:

While these individual items are annotated in isolation, it is expected that each fellow will integrate these procedures as part of a complete catheterization. Pre-catheterization planning will take place in the Cardiac Catheterization Suite prior to the start of each procedure and after consent has been obtained. Specific items to be addressed are as follows:

1. Definition of specific diagnostic and therapeutic objectives of each case. This includes prioritization of data acquisition for a particular clinical scenario.
2. Plan for vascular access (femoral / subclavian / jugular / umbilical).
3. Plan for catheter manipulation for the purposes of a complete right and left heart catheterization. This includes anticipation of the various required measurements or procedures, as well as continual result assessment during the case.

4. Plan for angiography, including catheter choice, camera placement and contrast volume.

Goals of the Specific Cardiac Catheterization Rotations:

All fellows will have at least three 1 month rotations through the cardiac catheterization laboratory. Senior fellows (3rd and 2nd year, in that order) with interest in catheterization are encouraged to participate in all available interventional cases. The fellows are required to keep a procedure log. The ACGME requires a minimum of 100 procedures over the course of the fellowship. The fellows will be expected to track their progress, with the assistance of their mentor, towards meeting this requirement. Additional procedure exposure will be arranged, as required to ensure that all fellows meet the minimum requirement.

The specific objectives for each rotation outlined below are expected to be met after each month, and fellow evaluation will be partly based on this skills acquisition.

First Rotation:

- Begin to acquire vascular access skills (specifically femoral, using older/larger patients initially).
- Become proficient at sheath size selection.
- Begin to acquire catheter manipulation skills necessary for left and right heart catheterization.
- Become familiar with the basic diagnostic catheters (end-hole / balloon tipped, pigtail, etc.).
- Learn to interpret basic hemodynamic data.
- Learn to interpret basic angiographic data in an organized manner.
- Assist with therapeutic interventions.
- Understand aspects of cost/benefit in pre-cath planning and decisions within the catheterization laboratory
- Begin to understand billing aspects (hospital and physician)

Second Rotation:

- Build on knowledge and skills acquired during the first catheterization rotation.
- Add to vascular access techniques (femoral access in infants and introduction to jugular techniques).
- Become proficient at left and right heart catheterization.
- Become proficient at complex hemodynamic calculations.
- Continue to acquire angiographic interpretation skills.
- Assist with therapeutic interventions, and perform (under guidance) dynamic atrial septostomies (Rashkind procedure) and pericardiocentesis when indicated.
- Participate in the steps involved with physician billing

Third Rotation:

- Build on knowledge and skills acquired during the first two catheterization rotations.
- Be proficient at standard vascular access.
- Begin to learn techniques for catheter manipulation in anatomic single ventricle settings.
- Complete all hemodynamic calculations accurately, irrespective of complexity.
- Continue angiographic interpretation, with greater attention to anatomic ventricular sub-types and great vessel relationships.
- Participate in simple therapeutic interventions (e.g. Pulmonary valvuloplasty), and continue to assist with more complex interventions.
- Continue to participate and to be involved in financial aspects of the catheterization laboratory

Additional exposure and exposure for fellows with interventional interest:

- Build on knowledge and skills acquired during the first three catheterization rotations.
- Be proficient at vascular access.
- Be proficient at sheath and catheter selection.
- Be proficient at left and right heart catheterization, and be able to perform more complex catheter manipulations for simple single ventricle anatomic types.
- Be proficient at all hemodynamic calculations.
- Be proficient at angiographic interpretation.
- Continue to be actively involved in all forms of therapeutic interventions, with more specific attention to “hands-on” manipulation of the intervention. Device deployment, balloon and stent positioning and deployment, etc.

Attachment 1: Cardiac Catheterization Work-Flow Sheet

Attachment 2: Completing a Patient Report

Attachment 3: Cardiac Catheterization Dictation Template

Attachment 1**Cardiac Catheterization Fellow Work-Sheet**

(for manual calculation completion)

Name: _____ Cath Date: _____

Weight: _____ Height: _____ BSA: _____ Hg: _____

Measurements

	Condition I	Condition II	Condition III	Condition IV
SVC sat				
Ao sat				
PA sat				
PV sat				
RAP mean				
AoP mean				
PAP mean				
PVP mean				
O2 capacity				
VO2/m2				

Results

		Cond. I	Cond. II	Cond. III
AV Difference	Pulmonary			
	Systemic			
	Effective			
Flow (l/min/m2)	Pulmonary			
	Systemic			
	Effective			
Shunt (l/min/m2)	L – R			
	R – L			
Resistance (mmHg/l/min/m2)	Pulmonary			
	Systemic			
Qp/Qs				
Rp/Rs				

Work-Sheet: Page 3

Name: _____ Cath Date: _____

Time	Site	Comments	Sys / v	Dias / a / EDP	Mean

Valve dilation:

Initial pull-back gradient: _____

Final pull-back gradient: _____

Aortoplasty / Stent placement:

Site # 1: _____ Initial gradient: _____

Final gradient: _____

Site # 2: _____ Initial gradient: _____

Final gradient: _____

Site # 3: _____ Initial gradient: _____

Final gradient: _____

Site # 4: _____ Initial gradient: _____

Final gradient: _____

Comments / Other Results:

Attachment 2:

Completing a Patient Report

A. Reviewing and Selecting the Recorded Data:

1. Pressure tracings are recorded using the Mennon hemodynamic system.
2. As the waves are recorded, they are analyzed on the screen. The interpretation of the waves is made at that time, with results announced. Nursing staff that are recording – edit the data in the Mennen system.

Nursing completes the peri-procedural documentation, including medication administration, timing of events, and equipment utilized.

B. Creating a report in PedCath:

1. Data entry into Pedcath is done manually. The nursing staff assists with this during the procedure, but it is the fellow's responsibility to complete and review for accuracy.
2. Review the hemodynamic data to ensure data entry is accurate. Also select a representative heart rate for the case.
3. Click on "Calculation Override" to select out representative saturations and mean pressures for the calculations.
4. Add the arterial blood gas and O2 consumption data on the main screen.
5. Complete the free-text diagnostic information.
6. Complete the coded Diagnostic and Procedure information.
7. Complete the Mullins Diagram, and import data onto the report, either manually or with the "imbed" feature.
8. Save all changes as you proceed along the report.

Once completed, the Attending of record on the case will electronically sign the report.

Attachment 2:

Children's Hospital & Medical Center BASIC CARDIAC CATHETERIZATION PROCEDURE Dictation Template

Patient Name:
CHMC #:
DOB:

Indications:

Give a brief description of the clinical scenario and indications for catheterization.

Conduct of Procedure

The patient was brought to the cardiac catheterization laboratory and sedated/placed under general anesthesia by the anesthesia team. His access sites were prepared in the usual sterile manner, and subcutaneous 1% lidocaine/0.25% bupivacaine was infused. Access was obtained using the Seldinger technique in the (*SITE*) with an XXX French sheath and the (*SITE*) with an XXX French sheath. a complete antegrade right heart cath and retrograde (transeptal antegrade) left heart catheterization was performed with oximetry, hemodynamics, and angiography in multiple planes. After baseline data was obtained, measurements were repeated with the patient on oxygen / an Amplatzer ASD device was placed / a coarctation was dilated using an XXX millimeter / XXX centimeter dilation balloon, etc. Fluoroscopy time was XXX minutes and XXX ccs of contrast were used. Estimated blood loss was XXX ccs. After the procedure, catheters were removed and hemostasis was obtained. The patient was then transferred to the recovery room in stable condition. There were no complications.

Hemodynamic data:

1. Blood flow and shunts:

On room air, the ABG was pH XXX, p CO₂ XXX, and O₂ XXX. Representative oxygen saturations are as follows: SVC XXX %, RA XXX %, RV XXX%, LPA XXX %, and descending aorta XXX %. Using an *assumed / measured* oxygen consumption of XXX mls / min / mm² and a hemoglobin of XXX grams per deciliter, the Qs was calculated at XXX mls / min / mm² and the Qp XXX mls / min / mm², with the effective pulmonary blood flow XXX mls / min / mm². The Qp/Qs ratio was XXX

2. Pressure data:

Representative pressure measurements were as follows: , RA XXX mm.Hg, RV XXX mm.Hg, MPA XXX mm.Hg, LPA XXX mm.Hg, left pulmonary artery wedge XXX mm.Hg, LV XXX mm.Hg, and descending aorta XXX mm.Hg.

Using the previously calculated Qp and Qs, the Rs was XXX indexed Wood units and the Rp XXX indexed Wood units. The Rp/Rs ratio was XXX.

3. Angiography.

Dictate the angiograms in chronological order as follows: First portion: cameras are in XXX position, the catheter has been introduced *antegrade/retrograde* into the XXX cavity. An injection is performed that demonstrates.....

Impression.

1. XXX year old with a diagnosis of XXX.
2. Net L to R shunt with a Qp/Qs of XXX: XXX.
3. Dilated / hypoplastic XXX and XXX chambers.
4. No LSVC / PDA or coarctation, etc.

Dr. Delaney/Curzon/Taylor was/were present and participated in all key elements of this procedure.