

SCOPE OF PRACTICE FOR THE INVASIVE CARDIOVASCULAR PROFESSIONAL

The Cardiac Catheterization Laboratory (CCL) is one of the most unique medical environments in existence today. The goal of the cardiovascular lab is to perform diagnostic exams to obtain sufficient and valid data (hemodynamic) and radiologic), and then to perform interventional procedures while maintaining maximal patient safety and comfort.

The field of invasive cardiology is expanding by leaps and bounds every year. New interventions are continually evaluated, released and revised. The competent invasive cardiovascular professional must remain informed about current modifications and advances in procedures, as well as in the industry itself. Continuing education is necessary due to new and complicated equipment, which is often used only for “nitch” situations in the cardiac cath lab, making it difficult to maintain adequate operating competence without consistent continuing educational processes. The technical equipment utilized in the modern cardiac cath lab provides a continual challenge to maintain and troubleshoot. No school can possibly prepare students for this vast array of “intellectual and emotional opportunities”.

EDUCATIONAL/PROFESSIONAL BACKGROUNDS

Historically in the CCL, a cardiologist works with a multi-disciplinary team of assistants to diagnose and treat often life-threatening heart disease. At various institutions, this team can be comprised of RN’s, licensed practical nurses (LPN’s), radiologic technologists (RT/R’s), Registered Cardiovascular Invasive Specialists (RCIS’s), and others, such as emergency medical technicians (EMT’s or Paramedics), and respiratory therapists (RTT’s). Our patient’s benefit because of this diversity.

All personnel in the cardiac cath lab must be aware of the patients condition and status during procedures at all times. At different times during each procedure, various personnel perform duties that will preclude constant monitoring of the patients rhythm, pressure, oxygen saturations, heart rate, respirations, etc. Therefore, it is necessary for all personnel to maintain a constant vigilance of these parameters. If the patient is extremely unstable, more than one circulation may be necessary to complete the case. All personnel need to be fully cross-trained to function in every position of the lab (scrub assistant, x-ray, monitoring, and circulation/medications). Cross training also includes certification in emergency cardioversion/defibrillation, locating and opening supplies as needed by the physician, and operation of all equipment routinely during procedures. It is therefore reasonable to prepare all cath lab personnel to function comfortably in all positions for all situations commonly encountered in the cath lab. Each professional brings his/her own strengths and education to the multi-disciplinary cardiac cath lab team. The strongest team will be the one with a shared body of knowledge, which is utilized in commonly encountered situations, requiring different areas of expertise, which will allow accurate recognition and response to acute and non-acute patient situations that may occur in the cath lab.

The Society of Invasive Cardiovascular Professionals (SICP) maintains that all invasive cardiovascular professionals, with or without formal cardiovascular academic training, should demonstrate knowledge and competence through education and certification in advanced cardiac life support (ACLS/ECC) and the achievement of invasive cardiovascular credentials RCIS (Registered Cardiovascular Invasive Specialist). The credential RCIS offered by Cardiovascular Credentialing International (CCI), has been recognized as the cardiac cath lab credential of choice by the American College of Cardiology (ACC) and by the Society of Cardiac Angiographers and Interventionalists (SCA&I), an organization founded by the pioneers of cardiac catheterization, Mason Sones and Melvin Judkins, to ensure proper training and the maintenance of high standards in invasive cardiac laboratories.

For these reasons the Society of Invasive Cardiovascular Professionals has chosen to develop a unified scope of practice for the Invasive Cardiovascular Specialist, this scope of practice encompasses the responsibilities and functions, which may be normally reserved specifically for registered nurses and radiologic technologists in departments other than the cardiac catheterization laboratory. It is mandatory that all personnel be given additional education and training when assuming responsibilities for which they have not received formal education.

Personnel should not assume responsibilities for which they are not adequately prepared. It is the obligation of the employing institution to validate an employee's credentials, preparation and knowledge base for which he/she is hired to assume. Ultimately, the responsibility of the cardiac catheterization procedure itself remains the responsibility of the physician of record.

DEFINITION

The Invasive Cardiovascular Professional is a health care professional that, through the utilization of specialized equipment and under the direction of a qualified physician, performs procedures on patients resulting in accurate diagnosis and/or optimal treatment of congenital or acquired heart disease while maintaining maximum patient safety and comfort.

The Invasive Cardiovascular Professional performs/reviews a baseline patient assessment, evaluates patient response to diagnostic or interventional maneuvers and medications during cardiac catheterization laboratory procedures, provides patient care and drug administration commonly used in the cardiac catheterization laboratory under the direction of a qualified physician. The Invasive Cardiovascular Professional acts as the first assistant during diagnostic and therapeutic catheterization procedures. The Invasive Cardiovascular Professional is proficient in basic and advanced cardiac life support (pediatric advanced life support / PALS if working with children) as recommended by the American Heart Association. The Invasive Cardiovascular Professional is proficient in the operation and maintenance, as specified by the manufacturer, of all diagnostic and therapeutic equipment used for procedures in his/her specific area of operation.

Procedures are usually performed in the invasive cardiovascular lab, but may be performed in critical care areas or specialized clinics as necessitated or allowed by circumstances and equipment adaptability.

There are four primary roles in which the Invasive Cardiovascular Professional performs:

- 1) Scrub Assistant
- 2) Operation of imaging equipment
- 3) Circulating during the procedure
- 4) Patient Monitoring and Procedure Documentation

The following is a list of specific diagnostic examinations or procedures, which may be included in, but not limited to, an expected scope of practice for the Invasive Cardiovascular Professional. Adequate education, training and orientation for any procedure or subspecialty (ie; pediatrics, electrophysiology) are required before assuming responsibility as a staff member. It is recognized that many invasive cardiovascular labs are developing expanded practices that may include non-cardiac, peripheral/endovascular examinations and interventions.

The invasive cardiovascular professional demonstrates the necessary knowledge, skill and ability to perform these functions, which may include, but are not necessarily limited to, the following:

I. Invasive Cardiovascular Procedures – General

A. Pre-procedural Patient Assessment

1. History and physical
 - a) Chief complaint
 - b) History of present illness and current medications
 - c) Past medical history
 - d) Family/social history
 - e) Labwork (ie., CBC, BMP, Coags, Lipid Profile, Cardiac Enzymes)
 - f) ECG and Chest X-ray

I. Invasive Cardiovascular Procedures – General (cont'd)

- B. Patient Preparation
 - 1. Patient Teaching
 - 2. Intravenous Access
 - 3. Foley Catheter Insertion
 - 4. Place ECG electrodes
 - 5. Noninvasive Blood Pressure Cuff
 - 6. Pulse Oximeter
 - 7. Draping of Patient
 - a) Appropriate Aseptic/Sterile Technique
 - b) Site prep with antiseptic solution
 - c) Access site draping
 - 8. Administration of Procedural Sedation
 - a) Appropriate medication and dose
 - b) Documentation
 - c) Monitoring
 - d) Administration/use of Reversal Agents

- C. Point of Care Testing Devices (Operation and Quality Assurance)
 - 1. ACT (Activated Clotting Time)
 - 2. PT/aPTT
 - 3. Oxygen Content/Saturation Analyzer
 - 4. Glucometer
 - 5. RPFA / PAU (Rapid Platelet Function Assay / Platelet Activation Unit)
 - 6. BNP
 - 7. BMP/CBC
 - 8. ABG

- D. Post Procedure Recovery
 - 1. Patient monitoring, assessment, and documentation
 - a) ECG
 - b) Vital signs
 - c) LOC, modified Ramsay score (post sedation)
 - d) Management of procedure site
 - 1) Hemostasis
 - 2) Identify and monitoring hematomas
 - 3) Palpate and assess distal pulses Documentation
 - f) Ambulation
 - g) Discharge teaching

- E. Emergency Procedures and Emergency Cart Equipment
 - 1. ACLS/resuscitation medications
 - a) PALS if working with pediatric patients
 - 2. Airway management
 - 3. Defibrillator
 - a) Monophasic and/or Biphasic units
 - b) AED (automatic external defibrillator)
 - 4. Pacemakers
 - a) Temporary transvenous pacer insertion
 - b) External pacing
 - 5. Pericardiocentesis

II. The Cardiac Catheterization Laboratory

- A. Operation of Physiologic Monitoring Equipment
 - 1. Electrocardiography
 - a) Recognizes normal sinus and abnormal rhythms
 - b) Recognizes cardiac ischemia, injury, and infarction patterns
 - 2. Pressure Waveforms
 - 3. Set up and calibrate pressure transducer
 - 4. Properly identify, label, and sample, and interpret intracardiac and vascular pressure waveforms
 - a) Right and Left Heart pressures, arterial pressures
 - b) Valvular and vascular pressure gradients
 - c) Pericardial disease
 - d) CHF
 - e) HOCM
 - f) Identify Damped and Ventricularized waveforms
 - g) Select Proper recording scales (ie., x40, x50, x100, x200, x400)
 - 5. Procedural Database / Electronic Notes
- B. Function and Operation of Radiologic Equipment
 - 1. Image Intensifier
 - 2. X-ray tube
 - 3. C-arm manipulation
 - 4. panning table
 - 5. positioning patient
 - 6. Fluoroscopic Imaging
 - a) various magnification modes
 - b) normal vs. pulse fluoro
 - c) collimation
 - d) fluoro timer reset
 - 7. Digital Subtraction Angiography
- C. Radiographic Information: Development, Storage, and Quality Assurance
 - 1. digital archive systems
 - 2. image review stations
 - 3. data spoolers/laser printers
 - 4. digital image quality control
 - * laboratories that do not have digital imaging capabilities
 - 5. cineangiographic film camera and film magazines
 - 6. 35mm and spot film processing
 - 7. sensitometry/densitometry
- D. Right Heart Catheterization and Myocardial Biopsy
 - 1. Venous Access
 - 2. Set-up and use of Balloon tipped / flow-directed catheters
 - 3. Position of catheter within cardiac chambers
 - 4. Blood sampling (ie., for shunts, cardiac output)
 - 5. Pressure Measurements
 - 6. Cardiac Output and Index
 - a) Thermodilution
 - b) Fick Calculations

- D. Right Heart Catheterization and Myocardial Biopsy (cont'd)
 - 7. Myocardial Biopsies
 - a) Indications, risks, and precautions
 - b) Types of Myocardial Biopsy Forceps (Bioptomes)
 - c) Monitoring of PVC's during specimen collection
 - d) Tissue sampling
 - e) Echo-guided biopsies
 - f) Labeling, handling, preserving, and transporting specimens
 - 8. Right Ventricular and Pulmonary Angiography
 - a) Catheter selection and placement: Balloon-tipped angiographic, Grollman, NIH, and other alternatives
 - 9. Transseptal Catheterization
 - a) Indications, risks and precautions
 - b) Set up, function, and use of:
 - 1) Brockenbrough Needle
 - 2) Transseptal Sheaths
 - c) Direct Left Atrial pressure measurement

- E. Left Heart Catheterization/Angiographic Procedures
 - 1. Coronary Angiography
 - a) Arterial Access
 - b) Catheter Selection for vessel and anatomic variables
 - c) Identify Coronary Vessels
 - 1) Left Coronary Artery (LCA) and Branches
 - 2) Right Coronary Artery (RCA) and Branches
 - 3) Saphenous Vein Bypass Grafts (SVG's)
 - 4) Arterial and Alternative Conduit Bypass Grafts (ie., LIMA, RIMA, Radial, Gastroepiploic)
 - 5) Anomalous Vessels
 - 6) Select Angles to optimally define coronary anatomy
 - d) Identify Coronary Anatomy defined by various angulated views and landmarks
 - f) Distinguish between RAO, LAO, Cranial, and Caudal projections
 - g) Identify Lesions and Thrombus
 - 1) location and severity
 - 2) TIMI Flow Grade
 - 3) Collateralization
 - 4) Estimate vessel lumen size in relation to catheter
 - h) Quantitative coronary analysis techniques
 - i) Coronary Vasospasm Studies (ie., Ergonovine, Methergine, others)
 - j) Left Ventricular, Aortic Angiography, & Related Calculations
 - 1) Distinguish RAO and LAO Projections
 - 2) Catheter Selection for Left Ventriculography and Aortography: Pigtail, Multipurpose, and other alternatives
 - 3) Left Ventricular Ejection Fraction
 - 4) Regional Wall Motion Analysis of Left Ventricle
 - 5) Left Ventricular Stroke Volume
 - k) Contrast Pressure Injector
 - l) Select Rise/Fall, Injection Rate, Total Volume, PSI and other parameters

- E. Left Heart Catheterization/Angiographic Procedures (cont'd)
 - m) Contrast Media
 - 1) ionic, non-ionic, low-osmolar
 - 2) recognition and treatment of contrast reactions: Urticaria and skin itching, bronchospasm, facial/laryngeal edema, hypotension and shock

- F. Alternative Imaging/Diagnostic Techniques
 - 1. Intravascular Ultrasound (IVUS) / Intracardiac Ultrasound (ICUS)
 - a) Set up, operation, and delivery of mechanical and phased-array catheters
 - b) Set up and function of IVUS / ICUS unit
 - c) Interpretation of IVUS / ICUS image (ie., Plaque morphology, vessel and lumen size, presence of dissection, therapeutic outcome)
 - 2. Doppler Flow
 - a) Set up, operation, and delivery of Doppler wire (ie., FloWire)
 - b) Set up and function of Doppler unit (ie., FloMap)
 - c) Administration of hyperemic agent (ie., IC/IV Adenosine, Papaverine)
 - d) Acquisition and interpretation of Coronary Flow Reserve (CFR) and other blood velocity measurements
 - 3. Intracoronary Pressures
 - a) Set up, operation, and delivery of coronary pressure wire (ie. RADI PressureWire, Jomed WaveWire)
 - b) Setup and function of pressure unit and calibration to hemodynamic system
 - c) Acquisition of baseline coronary pressures
 - 1) Proximal guide catheter pressure
 - 2) Distal guidewire pressure
 - d) Administration of hyperemic agent (ie. IC/IV Adenosine, Papaverine)
 - e) Acquisition and interpretation of Fractional Flow Reserve (FFR)
 - 1) Manual calculation of FFR as needed
 - 4. Left Ventricular Mapping (ie. NOGA)
 - a) Set up, operation, and delivery of mapping catheter
 - b) Acquisition, construction, and interpretation of mapped points

- G. Percutaneous Coronary Interventions
 - 1. Interventional Procedural Accessories
 - a) Guide catheters
 - b) Guidewires
 - c) Inflation Device
 - d) Hemostasis Valve (ie. tuohy-borst)
 - 2. Procedures: Setup, function, and use of Therapeutic devices, and risks/benefits/alternatives related to Coronary Interventions
 - 3. Balloon Angioplasty (PTCA)
 - 4. Coronary Stenting
 - a) Balloon expandable and Self-expanding designs
 - b) Drug coated/drug eluting platforms
 - c) Prep, handling, risks
 - d) Stent grafts/Covered stents (ie. Jostent)
 - 5. Coronary Atherectomy
 - a) Rotational Atherectomy (ie. Rotablator)
 - b) Directional Coronary Atherectomy (DCA)
 - c) Excimer Laser Coronary Angioplasty (ELCA)
 - d) Frontrunner CTO (Chronic Total Occlusion)
 - e) Others

6. Coronary Thrombectomy
 - a) Transluminal Extraction Catheter (TEC)
 - b) Angiojet
 - c) Others
7. Intravascular Brachytherapy
 - a) Types: Gamma and Beta Systems
 - b) Indications/contraindications
 - c) Preparation and handling of delivery devices and sources
 - d) Additional safety requirements for staff and/or patient
 - e) NRC, state, and hospital radiation safety regulations
8. Distal Embolic Protection Devices
 - a) Balloon and Filter Devices

H. Non-coronary, Adult Interventions

1. Procedures: Setup, function, and use of devices related to
 - a) Aortic Valvuloplasty
 - b) Mitral Valvuloplasty
 - c) Alcohol Septal Ablations
 - d) TMR (Transmyocardial Revascularization)
 - e) Foreign body retrieval

I. Congenital and Pediatric Catheterization and Interventions

1. Knowledge of normal fetal circulation/anatomy and common congenital cardiac defects
2. Knowledge of common surgical repairs of congenital cardiac defects
3. Diagnostic Left and Right Heart Catheterization, Biopsies
4. Define congenital/pediatric cardiac disorders via angiography, hemodynamics measurements, blood samples, and Intracardiac Ultrasound
5. Setup, function, and use of devices related to:
 - a) Aortic, Mitral, Pulmonary, and/or Tricuspid Valvuloplasty
 - b) Balloon dilatation of Aortic Coarctation
 - c) Percutaneous Balloon and Blade Septostomy
 - d) Pulmonary venous angioplasty/stenting
 - e) Coil embolizations
 - 1) PDA
 - 2) Mapcas
6. ASD/VSD/PFO Closure devices

J. Non-Cardiac Angiography and Interventions (Peripheral/Endovascular)

1. Knowledge of normal vascular anatomy
2. Setup, function, and use of devices and catheters related to angiography and interventions of:
 - a) Lower Extremities
 - b) Renals
 - c) Subclavian / Brachiocephalic vessels
 - d) Carotid and Cerebral vessels

- K. Adjunctive Procedural Pharmacotherapy
 - 1. Preparations and Administration of:
 - a) Procedural Sedation and related Reversal Agents
 - b) Supplemental oxygen therapy
 - c) Anticoagulants
 - d) Protamine
 - e) IIb/IIIa Agents (ie., Reopro, Aggrastat, Integrillin)
 - f) Thrombolytics/Fibrinolytics
 - g) Nitrates
 - h) Pressure support agents
 - i) Beta Blockers
 - j) Calcium Channel Blockers
 - k) Electrolyte supplements (ie., Potassium, magnesium)
 - l) Antiarrhythmics
 - l) Antiemetics
 - n) Antibiotics
 - o) Steroids
 - p) Local anesthetics (ie. Lidocaine, novocaine)
 - q) Other Cardiovascular Agents
 - 2. Preparations and Administration of Intracoronary Medications:
 - a) Nitrates
 - b) Verapamil
 - c) Thrombolytic/Fibrinolytic Agents
 - d) Adenosine
 - e) Papaverine
 - f) Others

- L. Mechanical Support Devices
 - 1. Intra-Aortic Balloon Pump
 - a) Set up of Consoles
 - b) Prep and insertion of catheter
 - c) Timing
 - 2. Emergency cardiopulmonary support (CPS) /extracorporeal membrane oxygenation (ECMO)

- M. Hemostasis Methods and Devices (Mechanical closer and/or hemostasis accelerators)
 - 1. Manual Compression
 - 2. Topical Hemostasis Accelerators (ie. Syvek Patch)
 - 3. C-Clamps
 - 4. Femostop (pneumatic compression device)
 - 5. Suture Devices (ie. Perclose, others)
 - 6. Collagen/Thrombin devices (ie. AngioSeal, VasoSeal, Duet, others)

III. The Electrophysiology Lab

- A. Physiologic Monitoring
 - 1. Electrocardiography
 - a) Recognizes normal sinus and abnormal rhythms
 - b) Recognizes and interprets Intracardiac Electrocardiograms
 - 1) Atrial
 - 2) HIS Bundle
 - 3) RV Apical
 - 4) Coronary Sinus
 - 5) Others

III. The Electrophysiology Lab (cont'd)

- c) Recognizes and differentiates between:
 - 1) A-V Nodal re-entry arrhythmias
 - 2) Wolff-Parkinson-White Syndrome
 - 3) Idiopathic Ventricular Tachycardias
 - 4) Idiopathic Right Ventricular Outflow Tract Arrhythmias
 - 5) Ectopic Atrial Tachycardias
- 2. Hemodynamic Monitoring
 - a) Venous and Arterial Pressures
 - 1) Set up and calibrate pressure transducer
 - 2) Properly identify, label, and sample intracardiac pressure waveforms
 - 3. Procedural Database / Electronic Notes
- B. Diagnostic electrophysiology studies
 - 1. Vascular access
 - a) Venous – Femoral, subclavian, internal jugular, others as indicated
 - b) Arterial – Femoral, others as indicated
 - c) Vascular sheath selection
 - 1) Curve, length, type as indicated for arrhythmia
 - 2. Catheter Selection, set-up and use
 - 3. Positioning of catheters
 - 4. Intracardiac atrial /ventricular pacing for zonal refractory periods
 - 5. Determining of activation times
 - 6. Arrhythmia induction
 - a) Set-up, function, and operation of stimulator
 - 7. Operation of Defibrillator
 - a) Monophasic and Biphasic
- C. Pacemakers / Automatic Implantable Cardiac Defibrillators (AICD)
 - 1. Patient preparation
 - a) sterile technique and draping per protocol
 - 2. Temporary insertion with transvenous pacing catheter
 - 3. Permanent insertion with leads/generator
- D. Pacemakers / Automatic Implantable Cardiac Defibrillators (AICD) (cont'd)
 - 1. Programming with analyzer
 - a) Capture, threshold, sensitivity
 - b) Pacing Modes
 - c) Pacing Nomenclature/codes (ie. VVI, DDD, DDDR, etc.)
 - 2. Arrhythmia induction and testing of device (AICD)
 - 3. Closure of incision site
- E. Cardioversion
 - 1. External using paddles/hands free pads
 - 2. Internal using transvenous approach with catheters
 - 3. Pharmacotherapy
- F. Radiofrequency Ablation (RFA)
 - 1. RFA catheter insertion techniques
 - 2. Catheter selection
 - a) Standard RFA catheters
 - b) Cool-tip RFA catheters

- G. Intracardiac Mapping/Intervention
 - 1. Mapping catheters
 - 2. Mapping techniques
 - a) contact mapping (CARTO, ESI, others)
 - b) non-contact mapping

- H. Lead Extraction
 - 1. Mechanical
 - 2. Laser

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