



Registered Cardiac Electrophysiology Specialist (RCES) Scope of Practice

The Electrophysiology Laboratory (EPL) is one of the most unique medical environments in existence today. The goal of the electrophysiology lab is to perform diagnostic studies to obtain sufficient electrocardiographic and radiologic data regarding bradyarrhythmias, or tachyarrhythmias, and then to perform interventional procedures while maintaining maximal patient safety and comfort.

The field of Cardiac Electrophysiology is expanding by leaps and bounds every year. New interventional techniques and equipment are continually being evaluated, released, and revised. The competent electrophysiology 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 “niche” situations in the electrophysiology lab, making it difficult to maintain adequate operating competence without consistent continuing educational processes. The technical equipment utilized in the modern cardiac electrophysiology lab provides a continual challenge to maintain and troubleshoot. No school, or college, can possibly prepare students for this vast array of “intellectual and emotional opportunities”.

EDUCATIONAL/PROFESSIONAL BACKGROUND

Historically in the electrophysiology lab, a cardiologist works with a multi-disciplinary team of assistants to diagnose and treat life-threatening cardiac arrhythmias. At various institutions, this team can be comprised of registered nurses (RN), licensed practical nurses (LPN), radiologic technologists (RT/R), Registered Cardiovascular Invasive Specialists (RCIS), Registered Cardiovascular Electrophysiology Specialists (RCES), Certified Cardiac Device Specialists (CCDS), Certified Electrophysiology Specialists (CEPS), and others, such as anesthesiologists, emergency medical technicians (EMT or Paramedics), and respiratory therapists (RTT). Our patients benefit because of this diversity.

All personnel in the electrophysiology lab must be aware of the patient’s 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 patient’s 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 circulator 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 circulator/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 used during



procedures. It is therefore reasonable to prepare all electrophysiology lab personnel to function comfortably in all positions for all situations commonly encountered in the electrophysiology lab. Each professional brings his/her own strengths and education to the multi-disciplinary electrophysiology 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 electrophysiology lab. The Society of Invasive Cardiovascular Professionals (SICP) maintains that all electrophysiology 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 electrophysiology cardiovascular credentials (RCES, CEPS, CCDS).

For these reasons, the Society of Invasive Cardiovascular Professionals has chosen to develop a unified Scope of Practice for the Electrophysiology Cardiovascular Specialist. This Scope of Practice encompasses the responsibilities and functions of the technologist, which may be normally reserved specifically for registered nurses and radiologic technologists in departments other than the cardiac electrophysiology 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 electrophysiology procedure itself remains the responsibility of the physician of record.

DEFINITION

The Electrophysiology 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 treatment of congenital or acquired heart disease while maintaining maximum patient safety and comfort.

The Electrophysiology Cardiovascular Professional performs/reviews a baseline patient assessment, evaluates patient response to diagnostic or interventional maneuvers and medications during electrophysiology laboratory procedures, and provides patient care and drug administration commonly used in the cardiac electrophysiology laboratory under the direction of a qualified physician. The Electrophysiology Cardiovascular Professional acts as the first assistant during diagnostic and therapeutic electrophysiology procedures. The Electrophysiology 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 Electrophysiology 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 electrophysiology laboratory, but may be performed in cardiac catheterization laboratories, critical care areas, or specialized clinics as necessitated or allowed by the circumstances and equipment adaptability. There are four primary roles in which the Electrophysiology 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 Electrophysiology Cardiovascular Professional. Adequate education, training and orientation for any procedure of subspecialty (i.e.; invasive catheterization, pediatrics) are required before assuming responsibility as a staff member.

The Electrophysiology Cardiovascular Professional demonstrates the necessary knowledge, skills, and abilities to perform these functions, which may include, but are not necessarily limited to, the following:

I. Electrophysiology Procedures – General

a. Pre-procedural Patient Assessment

i. History and Physical

1. Chief complaint
2. History of present illness and current medications
3. Past medical history
4. Family/social history
5. Labwork (i.e.; CBC, BMP, Coagulation, Lipid Profile, Cardiac Enzymes)
6. ECG and Chest X-ray
7. Identify allergies to food and medication

b. Patient Preparation

- i.** Patient teaching
- ii.** Mallampati score
- iii.** Documentation of LOC/modified Ramsay score (pre-sedation)
- iv.** IV Access
- v.** Foley catheter insertion



- vi. Placement of ECG electrodes
- vii. Non-invasive blood pressure cuff
- viii. Palpate and assess distal pulses (pre-procedure)
- ix. Pulse oximeter
- x. Draping of patient
 - 1. Appropriate aseptic/sterile technique
 - 2. Site prep with antiseptic solution
 - 3. Drape access site
- xi. Insertion of arterial monitoring line (if applicable)
- xii. Administration of procedural sedation
 - 1. Communication with anesthesia provider (if applicable)
 - 2. Documentation
 - 3. Monitoring vital signs
 - 4. Administration of reversal agents
- c. Point of Care Testing Devices (Operation and Quality Assurance)
 - i. ACT (Activated Clotting Time)
 - ii. PT/aPTT/INR (if indicated)
 - iii. Oxygen saturation analyzer
 - iv. Glucometer
 - v. RPFA/PAU (Rapid Platelet Function Assay/Platelet Activation Unit)
 - vi. BNP
 - vii. BMP/CBC
 - viii. ABG
- d. Post-Procedure Recovery
 - i. Patient monitoring, assessment, and documentation
 - 1. ECG
 - 2. Vital signs
 - 3. LOC, modified Ramsay score (post-sedation)
 - 4. Management of procedure site(s)
 - a. Hemostasis
 - b. Identify and monitoring hematomas and/or other complications
 - c. Palpate and assess distal pulses (post-procedure)
 - 5. Ambulation
 - 6. Discharge instructions for patient and/or patient family member
- e. Emergency Procedures and Emergency Cart Equipment
 - i. ACLS/resuscitation medications
 - 1. PALS (if appropriate)
 - 2. Airway management
 - ii. Defibrillator



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1. Monophasic and/or Biphasic units
2. AED (automated external defibrillator)
- iii. Pacemakers
 1. Temporary transvenous line insertion
 2. External pacing
- iv. Pericardiocentesis

II. The Electrophysiology Laboratory

- a. Operation of physiologic monitoring equipment
 - i. Electrocardiography
 1. Recognize normal sinus and abnormal rhythms
 2. Recognize cardiac ischemia, injury, and infarction patterns
 - ii. Procedural database/electronic notes
- b. Function and operation of radiologic equipment
 - i. Image intensifier
 - ii. X-ray tube
 - iii. C-arm manipulation
 - iv. Table panning
 - v. Patient positioning
 - vi. Fluoroscopic imaging
 1. Magnification modes
 2. Normal vs. pulse fluoroscopy
 3. Collimation
 4. Fluoroscopy timer reset
 5. Radiation dose documentation
- c. Radiographic Information; development, storage, and quality assurance
 - i. Digital archive system
 - ii. Image review stations
 - iii. Digital image quality control
 - iv. Sensitometry/densitometry
- d. Right heart catheterization
 - i. Venous access
 - ii. Set-up and use of balloon tipped/flow directed catheters
 - iii. Position of catheter within cardiac chambers
 - iv. Identify intracardiac pressures
 - v. Venography
 1. Catheter selection and placement
 - vi. Transseptal catheterization
 1. Indications, risks, and precautions
 2. Set-up, function, and use



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- a. Brockenbrough needle
 - b. Baylis catheter
 - c. Transseptal sheaths
3. Direct left atrial pressure measurement

III. Introduction to Electrophysiology

- i. History of EP
- ii. Cardiac anatomy and physiology
 1. Anatomical structures of each chamber (i.e.; Eustachian ridge, Tendon of Todaro, Crista Terminalis, etc.)
- iii. The cardiac action potential
- iv. Mechanisms of arrhythmias
 1. Bradyarrhythmias
 - a. Impulse formation
 - b. Impulse propagation
 2. Tachyarrhythmias
 - a. Automaticity
 - b. Reentry
 - c. Triggered
- v. Pharmacotherapy
 1. Drug classification system
 2. Effect on action potential
 3. Effect on procedures
- vi. Electrocardiograms

IV. The Electrophysiology Study and Basic Arrhythmias

- a. Electrophysiology equipment
 - i. Multichannel physiologic recorders
 - ii. Stimulators
 - iii. Catheters
 - iv. Mapping systems (i.e.; CARTO, Ensite Velocity, etc.)
 - v. Echocardiography
 1. Views
 2. Anatomy
 - vi. Magnetic navigation systems
 - vii. Robotic navigation systems
- b. Electrophysiology studies
 - i. Indications
 - ii. Limitations
- c. Venous and arterial access



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- a. Mode of initiation and termination
- b. Patterns
- 3. Treatment
 - a. Pharmacotherapy
 - b. Ablation
- iv. Triggered tachycardias
 - 1. Mechanism
 - a. Pause-dependent
 - b. Catechol-dependent
 - 2. Characteristics
 - a. Mode of initiation and termination
 - b. Patterns
 - 3. Treatment
 - a. Pharmacotherapy
 - b. Ablation
- v. Miscellaneous
 - 1. Mechanism
 - a. Idiopathic LV VT
 - b. Outflow tract VT
 - c. RV dysplasia
 - d. BB reentry VT
 - e. Brugada syndrome

V. Transcatheter Ablation

- a. Technology
 - i. DC current
 - ii. RF current
 - iii. Cryoablation
 - iv. Mapping
 - 1. Endocardial
 - 2. Epicardial
 - 3. Electromagnetic
 - 4. Noncontact
- b. Location
 - i. Anatomy
 - 1. AV node, bypass tracts, Triangle of Koch, outflow tracts, etc.
- c. Ablation physics
 - i. RF Ablation
 - 1. Tissue heating
 - 2. Convective cooling



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3. Cellular effects of ablation
4. Tissue effects of ablation
5. Determinants of lesion size
 - a. Tip temperature
 - b. RF duration
 - c. Tip-tissue interface
 - d. Electrode orientation
 - e. Electrode length
 - f. Electrode material
 - g. Reference patch location
 - h. Blood flow
 - i. RF system polarity
6. Monitoring RF energy delivery
 - a. Impedance
 - b. Temperature
7. Complications of RF ablation
- ii. Cryoablation
 1. Extracellular ice
 2. Intracellular ice
 3. Vascular-mediated tissue injury
 4. Determinants of lesion size
 - a. Convective warming
 - b. Electrode orientation
 - c. Electrode contact pressure
 - d. Electrode size
 - e. Refrigerant flow rate
 - f. Electrode temperature
 5. Cryomapping vs. cryoablation

VI. Pacemaker/ICD

- a. History of devices
- b. Indications and contraindications
- c. Patient preparation
 - i. Sterile technique and draping protocol
 - ii. Equipment preparation
 - iii. Interrogation of current system (if applicable)
- d. Implantable device codes
- e. Device technology
- f. Lead technology
- g. Single-chamber pacing



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- i. Electrogram interpretation
 - 1. Sensing and capture
 - h. Dual-chamber pacing
 - i. Electrogram interpretation
 - 1. Sensing and capture
 - i. Basic paced ECG interpretation
 - j. Rate-responsive pacing
 - k. Special features
 - i. AV delay
 - ii. Hysteresis
 - iii. PVARP
 - iv. PVAB
 - v. Crosstalk
 - vi. Automatic Mode Switch (AMS)
 - vii. Ventricular Intrinsic Preference (VIP)
 - viii. Pacemaker Mediated Tachycardia (PMT)
 - 1. Termination algorithms
 - ix. Auto Rest Rate
 - x. Anti-Tachy Pacing (ATP)
 - l. Pocket closure
 - m. Systematic follow-up
 - n. Troubleshooting and diagnostics
 - o. Advanced features
 - p. Clinical trials on pacing
 - q. Lead extraction
 - i. Equipment
 - ii. Staff requirements
 - iii. Location
 - r. Chronic resynchronization therapy
 - i. Indications
 - ii. Anatomy
 - iii. Settings
 - iv. Trials

VII. Non-Invasive Testing

- a. Cardioversion
- b. Tilt-Table testing
- c. Holter monitoring
- d. Signal averaged ECG