

ORIENTATION STANDARDS

One of many roles a professional organization fulfills is the development and maintenance of standards for their field. Our field, the field of the invasive cardiovascular professional is a relatively new one. The original guidelines were compiled in 1996 and published in 1997.

For most fields, a five-year window is minor. For the field of the cath and interventional radiology laboratories, five years is a very long time. Hence, the review and update for the guidelines are in order.

The educators and cardiovascular professionals in the field were interviewed, both by direct telephoning to the laboratories around the nation, and at the CathLab Regional Symposiums held throughout the year. There were also “Networking Requests” published in the CathLab Digest asking for input for this very important topic.

There are basic givens for this task. First, the need for an excellent orientation program is vital. The JCAHO has mandated that hospitals must provide an orientation program that meets the needs of each specialty unit. That mandate, is even more vital to our specialty because of the major shortage of staff. There is currently a major shortage of health care professionals in all fields; ours are just as short staffed as everyone other healthcare field.

The second issue is that technology is a dynamic part of our field, and keeping abreast of it is both an orientation standards issue and a continuing education issue. This update will identify the components of a basic orientation program, including the newer advances in the field. The role of the Society of Invasive Cardiovascular Professionals is to facilitate and maintain the best educational, legislative, and development standards for our field. The role is not to dictate to the hospitals how to teach the orientation programs, but which components are identified as necessary for the basic education of all staff entering our field. The actual structure of the orientation program, i.e.: the number of hours spent in class, versus hand-on training, and formal teaching seminars, are determined by the hospitals and staff. We recognize that individualizing each program is highly specific to each institution.

As we did before, we asked laboratories to submit suggestions for inclusion for the new guidelines. It is interesting to note that the original standards are comprehensive, and are repeated below. The additions of the two most important changes in the educational training are listed first.

1. Conscious Sedation

There is, in addition to the basic pharmacology taught to CathLab professionals, the need to separate and highlight the training in delivering conscious sedation. There is the mandate not only to follow strict hospital and state laws and guidelines in the administration of these very potent pharmacological agents, but the vital need to document the administration in a standardized format throughout the hospital stay. That makes the addition two fold:

- A. Pharmacology and administration of Conscious Sedation
- B. Standardized documentation of the administration of those agents, throughout the patient's hospital forms and units.

2. Closure Devices

The technology and use of various vascular closure devices is becoming a normal part of the patient care in the cath lab. The use of these devices, as well as the state laws and hospital guidelines governing the deployment of these devices need to be included in the orientation checklists. There should be training for the post op care of the patients to complete the section on the use of closure devices in the cardiovascular laboratories. Both topics are necessary additions to a well-rounded orientation program for cardiovascular professional staff.

The Basic Concepts

- Orientation is the best time to teach the concepts of collaborative practice.
- The amount of classroom time allowed in any orientation program is secondary to the concept that class time is vital.
- Collaboration with institutional administrators on the mission of continuing education and the institutions mission to give the best patient care available is the very strength of that institution.

The Basic Components

The Basic Components of the Orientation Standards and the Basic Components in the Scope of Practice are duplicated on purpose for continuity of practice.

- I. Pre-Procedural
 - A. 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
 2. Lab work (i.e., CBC, BMP, Coags, Lipid Profile, Cardiac Enzymes)
 3. ECG and Chest X-ray
 - 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
- C. Point of Care Testing Devices (Operation and Quality Assurance)
1. ACT (Activated Clotting Time)
 2. PT/PTT
 3. Oxygen Content/Saturation Analyzer
 4. Glucometer
 5. RPFA / PAU (Rapid Platelet Function Assay / Platelet Activation Unit)
 6. BNP
- 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 of hematomas
 - 3) Palpate and assess distal pulses
 - e) 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 (i.e., x40, x50, x100, x200, and x400)
 5. Procedural Database / Electronic Notes
- B. Function and Operation of Radiological 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 (i.e., for shunts, cardiac output)
 - 5. Pressure Measurements
 - 6. Cardiac Output and Index
 - a) Thermodilution
 - b) Fick Calculations
 - 7. Myocardial Biopsies
 - a) Indications, risks, and precautions
 - b) Types of Myocardial Biopsy Forceps (Biotomes)
 - 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:
 - 1. Balloon-tipped
 - 2. angiographic
 - 3. Grollman
 - 4. NIH
 - 5. 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 (SVGs)
 - 4) Arterial and Alternative Conduit Bypass Grafts (ie., LIMA, RIMA, Radial, Gastroepiploic)
 - 5) Anomalous Vessels
 - d) Select Angles to optimally define coronary anatomy
 - e) 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 (i.e., 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
 - 1) Select Rise/Fall, Injection Rate, Total Volume, PSI and other parameters
- l) 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 (i.e., Plaque morphology, vessel and lumen size, presence of dissection, therapeutic outcome)
- 2. Doppler Flow
 - a) Set up, operation, and delivery of Doppler wire (i.e., FloWire)
 - b) Administration of hyperemic agent (i.e., IC/IV Adenosine, Papaverine)
 - c) 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 (i.e., 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 guide wire 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
 - 1) Prep, handling, risks
 - c) 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) Fronrunner 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 Catheterizations 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 Catheterizations, Biopsies
4. Define congenital/pediatric cardiac disorders via angiographic, hemodynamics, measurements, blood samples, and Intracardiac Ultrasound
5. Setup, function, and use of devices related to:
 - a) Aortic, Mitral, Pulmonary, and Tricuspid Valvuloplasties
 - b) Balloon dilatation of Aortic Coarctation
 - c) Percutaneous Balloon and Blade Septostomy
 - d) Pulmonary venous angioplasty/stenting
 - e) Coil embolization
 - 1) PDA
 - 2) Mapcas
6. ASD/VSD/PFO Closure devices

J. 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) Anti-arrhythmic
 - m) 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

K. 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 oxygenator (ECMO)

L. 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, Duett, others)

III. The Electrophysiology

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
 - 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
 - d) 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
 - 4. Programming with analyzer
 - a) Capture, threshold, sensitivity
 - b) Pacing Modes
 - c) Pacing Nomenclature/codes (ie. VVI, DDD, DDDR, etc.)
 - 5. Arrhythmia induction and testing of device (AICD)
 - 6. Closure of incision site

- D. Cardioversion
 - 1. External using paddles/hands free pads
 - 2. Internal using transvenous approach with catheters
 - 3. Pharmacotherapy

- E. Radiofrequency Ablation (RFA)
 - 1. RFA catheter insertion techniques
 - 2. Catheter selection
 - a) Standard RFA catheters
 - b) Cool-tip RFA catheters

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

Again, the goal of the Society of Invasive Cardiovascular Professionals is to identify the components of a well-rounded orientation system. These Guidelines will be published for the use of all cardiovascular staff and administrations to facilitate their development of the programs used to educate and orient our multidisciplinary team members.

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