A Proposal for the Core Curriculum for Credentialing and Training of Cardiovascular Specialist Assistants to Perform Invasive and Interventional Cardiovascular Procedures with Medical Simulation Training Programs: Part IV

A Report of the International Council for Certification of Cardiovascular Specialist Assistants, Inc and the Committee on Training Standards

I. Purpose

The purpose of this proposed curriculum is to develop the learning objectives and content specifications that defines the level of knowledge, skill sets, and experience of cardiovascular specialist assistants with an open opportunity for cardiovascular medical specialists so they, also, can be attested on their performance on the medical simulators designed for cardiovascular procedures that encompass the circulatory system of the human body.

The sole intention of the International Council for Certification of Cardiovascular Specialist Assistants Incorporated (hereafter termed Council) is to improve the standards of care, improved the educational process, and most importantly improve patient safety by reducing medical error. Also, the other purpose is to set a standard for international and national education, training, and formal certification.

II. Introduction

The focus of this program will coincide with the proposed United States Public Health Service Act amendment that will authorize medical simulation enhancement programs. The Act has been cited as the “Enhancing Safety in Medicine Utilizing Advanced Simulation Technologies to Improve Outcomes Now ACT of 2009” (111th Congress 1st Session, HR 855, February 4, 2009).

The scope of this material pertains to training advanced level allied healthcare professionals and electively by physicians, who perform invasive and interventional cardiovascular procedures in a medical simulation enhancement program. The logistics will pertain to the needs of physicians, who meet the standards and qualifications of the Council, and the cardiovascular specialist assistants, who seek registry as Registered Cardiovascular Specialist Assistants or by the physicians, who seek technical credentials as a Registered Cardiovascular Medical Specialist; a Registered Vascular Medical Specialist; and/or both offered physician-based credentials.

III. Logistics of training and being certified on the “virtual patient”

A. Cardiovascular specialists (physicians) and allied health professionals who work full-time in cardiac catheterization laboratories, cardio-thoracic surgical suites, interventional radiology suites, and vascular surgical operating rooms, can:

1. Enhance their procedural skills
2. Reinforce best practices by allowing experienced clinicians and healthcare professionals to perform procedures on “virtual patients.”
3. Reduce adverse events that increase morbidity and mortality
4. Decrease costs
5. Decrease radiation exposure

B. Development of clinical skills provided by simulation-based training programs

1. Benefits patients and other health care consumers
2. Improves continuity and quality of care
3. Improves health outcomes
4. Improves safety of the patient
5. Reduces number of medico-legal cases
6. Reduces complications caused by deficient skills and experience
7. Reduces costs associated with patient care
8. Reduces medical errors
9. Reduces number of medical professionals who function below excellence
10. Reduces rates of morbidity and mortality

C. Abilities of healthcare providers in urban and rural regions would be enhanced through medical simulation if the employers incorporate the technology into training and formal certification protocols.

D. Excellent leadership with guidance provides healthcare entities with cutting-edge medical technology.

IV. Qualifications for Training and Certification

A. Cardiovascular Specialists (Physicians)

1. Cardiologists – Invasive
   a. Must be board-certified and/or eligible
   b. Must produce necessary records that indicate completion of an accredited fellowship program.
   c. Must have three supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot accept recommendations from associates

2. Cardiologists – Interventional
   a. Must be board-certified and/or eligible
   b. Must produce necessary records that indicate completion of an accredited fellowship program.
   c. Must have three supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot accept recommendations from associates

3. Cardiology Fellows – Invasive and Interventional
   a. Must be fellow in accredited fellowship program
   b. Must produce necessary records that indicate current participation in a fellowship program
   c. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot use recommendations from fellows.

4. Cardio-thoracic surgeons
   a. Must be board-certified and/or eligible
   b. Must produce necessary records that indicate completion of an accredited fellowship program.
   c. Must have three supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot use recommendations from associates

5. Cardio-thoracic surgery fellows
   a. Must be fellow in accredited fellowship program
   b. Must produce necessary records that indicate current participation in a fellowship program
   c. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot use recommendations from fellows.

6. Interventional radiologists
   a. Must be board-certified and/or eligible
   b. Must produce necessary records that indicate completion of an...
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Dr. Harvey A. Koolpe contributed a tremendous amount of time and effort to help develop this proposal for the core curricula to train allied health profession- als, who excel in the cardiovascular medical imaging procedural suites. Dr. Koolpe passed away on October 18, 2007.

accrued fellowship program.
 c. Must have three supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot accept recommendations from associates

7. Interventional radiology fellows
 a. Must be fellow in accredited fellowship program
 b. Must produce necessary records that indicate current participation in a fellowship program
c. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot use recommendations from fellows

8. Orthopedic surgeons
 a. Must be board-certified and/or eligible
 b. Must produce necessary records that indicate completion of an accredited fellowship program.
c. Must have three supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot accept recommendations from associates

9. Orthopedic surgery residents
 a. Must be resident in accredited fellowship program
 b. Must produce necessary records that indicate current participation in residency program
c. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot use recommendations from fellows

10. Radiology residents
 a. Must be resident in accredited fellowship program
 b. Must produce necessary records that indicate current participation in residency program
c. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot use recommendations from fellows

11. Vascular surgeons
 a. Must be board-certified and/or eligible
 b. Must produce necessary records that indicate completion of an accredited fellowship program.
c. Must have three supporting letters of recommendation from medical directors, administration, and credentialing committee
d. Cannot accept recommendations from associates

12. Vascular surgery fellows
 a. Must be fellow in accredited fellowship program
 b. Must produce necessary records that indicate current participation in a fellowship program
c. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
directors, administration, and credentialing committee
d. Cannot use recommendations from fellows.

13. Other medical specialties (interventional oncologists, nephrologists, e.g.)
a. Attending physicians
   1. Must be board-certified and/or eligible
   2. Must produce necessary records that indicate completion of an accredited fellowship program.
   3. Must have three supporting letters of recommendation from medical directors, administration, and credentialing credentialing committee
   4. Cannot use recommendations from associates
b. Fellowship status
   1. Must be fellow in accredited fellowship program
   2. Must produce necessary records that indicate current participation in a fellowship program
   3. Must have five supporting letters of recommendation from medical directors, administration, and credentialing committee
   4. Cannot use recommendations from fellows.

B. Cardiovascular specialist assistants and allied healthcare professionals

   1. Associate degree and/or equivalent with 5 continuous years of clinical experience with at least one current CCI RCIS, RCES, and/or RCS credential
   2. Bachelor’s degree and/or equivalent with 3 continuous years of clinical experience with at least one current CCI RCIS, RCES, and/or RCS credential
   3. Master’s degree and/or equivalent with 3 continuous years of clinical experience with at least one current CCI RCIS, RCES, and/or RCS credential
   4. Doctorate degrees with 3 continuous years of clinical experience in cardiovascular procedures
      a. PhD with one CCI credential (RCIS, RCES, or RCS)
      b. MD or DO with foreign post graduate degree and functioning as a:
         1. RRA (ARRT) with one CCI credential (RCIS, RCES, RCS)
         2. RPA (CBRPMA) with one CCI credential (RCIS, RCES, RCS)
         3. RCIS (CCI)
         4. RCES (CCI)
         5. RCS (CCI)
         6. RT(R) with at least the CI, CV or VI credential
   5. Radiology practitioner assistants (CBRPMA certified)
      a. Minimum 3 continuous years in cardiovascular procedures
      b. Minimum of a bachelor’s degree and/or equivalent
      c. Current ARRT credentials with at least one CI, CV, or VI advanced specialty certification and/or
      d. One CCI RCIS, RCES, or RCS credential and/or
      e. Full-time physician extender in cath lab, interventional radiology, or vascular surgery settings
      f. Board eligible for ARRT Cardiac Interventional or Vascular Interventional examination
   6. Physician Assistants (PA-Cs)
      a. Minimum of bachelor’s degree and/or equivalent
      b. Minimum of 3 continuous years “hands-on” experience in cardiovascular procedures
   7. Advanced practice registered nurses (APRN)/registered nurse clinical specialists
      a. Minimum of master’s degree
      b. Minimum of 3 continuous years “hands-on” experience in cardiovascular procedures
   8. Registered nurse
      a. Minimum of an associate’s degree and/or equivalent
      b. Minimum of 5 continuous years of “hands-on” experience in cath labs, EP, echocardiography, or interventional radiology
      c. Must have one CCI credential (RCIS, RCES, RCS)
      d. CCI board eligible
   9. Registered cardiovascular invasive specialist (CCI RCIS, RCES, or RCS)
      a. Minimum of an associate degree and/or equivalent
      b. Minimum of 5 continuous years of experience in cardiovascular settings (Cath lab, EP labs, echocardiography)
      c. CCI board eligible ( Must have credential prior to exam )
   10. Registered radiology assistants (ARRT certified)
      a. Minimum of 5 continuous years of clinical experience in cath lab settings, IR suites, EP suites, and vascular surgery suites
      b. Minimum of a bachelor’s degree and/or equivalent
      c. Current ARRT credentials – CV, CI, VI, S, (at least one)
      d. Current CCI – RCIS, RCES or RCS credentials can be substituted for advanced level ARRT credentials
   11. Registered radiologic technologists
      a. Must have at least 7 continuous years of clinical experience in the field (cath lab, interventional radiology, sonography, vascular surgery)
      b. Must have at least an associate’s degree
      c. Must hold at least one of the ARRT advanced credentials (CV, CI, VI, S)
      d. May substitute current CCI credentials – RCIS, RCES, RCS for ARRT credentials
      e. May be board-eligible for either agency’s credentials
   12. Cardiovascular technologists
      a. Must be board-eligible
      b. Must have an associate’s degree and/or equivalent
      c. Must have at least 7 continuous years of clinical experience in cath lab, electrophysiology units, and/or echocardiography
   13. Other requirements
      a. Must provide records to substantiate all qualifications upon request within one month (30 days) after request has been made by letter.
      b. Completion of two (2) continuous years of clinical and didactic training in invasive/interventional cardiology procedures
      c. Must complete of two (2) continuous years in invasive/ interventional carotid and peripheral procedures in conjunction with the invasive/interventional cardiology procedures.
      d. Must complete two continuous years of internship under the direct and immediate supervision of board-certified and/or board-eligible physicians such as:
         1. Invasive cardiologists
         2. Interventional cardiologists
         3. Interventional radiologists
         4. Cardio-thoracic surgeons
         5. Electrophysiologists
         6. Orthopedic surgeon
         7. Vascular surgeons
      e. May substitute any of the above disciplines with the same exact validation of training in conjunction with the invasive/interventional cardiology practices.
      f. Must pass the written examination with a passing score of at least an 87% before being granted permission to take the medical simulation examination which requires an excellent rating to pass.
      g. Must complete an accredited certification examination developed and administered by the Council.
      h. Must complete the “hands-on” examination(s) with an excellent rating administered and assessed by appointed examiners by the Council.
      i. Recertification
         1. Must recertify on medical stimulation (Virtual Patient) every seven (7) years at an assigned national or international testing site to maintain credentials.
         2. Must complete recertification process with an excellent rating to maintain credential(s)
         3. Must complete recertification or multiple recertifications at standard set of fees.
      j. Annual renewal of credentials
         1. Required each year for six consecutive years prior to “hands-on” recertification, which occurs during the seventh year of practice.
         2. Fees for renewal
            a. Set by the Board of Directors of the International Council for Certification of Cardiovascular Specialist Assistants, Inc.
            b. Based on number of credentials received
V. Pathways to Proficiency

A. Basic proficient requirements

1. Advanced cognitive skills
   a. Excellent knowledge of normal and pathological anatomy
   b. Excellent knowledge of hemodynamics and cardiac calculations
   c. Excellent leadership and communication skills
   d. Superb decision-making skills
   e. Excellent management of adverse events and complications
   f. Excellent knowledge of ACLS guidelines

2. Basic angiographic skills
   a. Excellent skills to assess patients
   b. Excellent abilities to plan angiographic procedures
   c. Excellent knowledge with image management
     1). C-arm control (panning)
     2). 2-D fluoroscopy/ digital cineangiography
   d. Excellent ability to select, handle, and manipulate angiographic catheters
   e. Excellent ability to select, handle, and manipulate guide wires
   f. Excellent ability to prepare and manage devices as needed
   g. Excellent tactile interaction with device handling
   h. Excellent decisive skills to determine sequence in angiographic procedures

3. Complex interventional skills
   a. Excellent ability to plan and rehearse interventional procedures
   b. Excellent ability to determine sequence in interventional procedures
   c. Excellent skills with handling balloons during pre and post dilatation
   d. Excellent ability to select, handle, and manipulate guiding catheters
   e. Excellent ability to select, handle, and manipulate angioplasty guidewires
   f. Excellent ability to select, handle, position, and deploy stents
   g. Excellent ability to select, handle, position, and deploy EPD filters
   h. Excellent ability to select, handle, position, and deploy coils

4. Clinical knowledge
   a. Understands roles of the team members
   b. Maintains ACLS certification (PALS if involved with pediatric studies)
   c. Develops effective rapport with patient, which includes bedside manner
   d. Handles adverse events professionally, without causing alarm with patient or support staff
   e. Establishes professional rapport with support staff team members that conveys confidence and direction as an advanced practice team member
   f. Remains focused on the mental well-being of patient throughout procedure and on vital signs (blood pressure, cardiac rhythms, and respiratory status, and has plan to manage adverse or near-fatal events)
   g. Able to handle procedure-induced cardiac events such as bradycardia; supraventricular tachycardia; 1st, 2nd, and 3rd degree heart blocks; atrial fibrillation, atrial flutter; ventricular tachycardia with or without pulse; ventricular fibrillation; asystole, and pulseless electrical activity, etc.
   h. Knows when to ask for help or when to discontinue a procedure that cannot be completed safely
   i. Exhibits knowledge of managing patient’s discomfort with the use of appropriate analgesic and sedative medications
   j. Has extensive knowledge and experience with emergency lab protocols and procedures
   k. Has knowledge and experience of alternative techniques
   l. Understands the need for a standard work protocol

5. Manipulative skills
   a. Early cognizance
      1). Stays attentively focused
      2). Observes keenness
   b. Lengthy practice (2 years)
      1). Directed concentration
      2). Forms correct performance
   c. Autonomous stage
      1). Automaticity occurs
      2). Accuracy increases
      3). Dexterity increases
      4). Greater understanding increases
      5). Speed increases
      6). Time management continues to improve
   d. Variabilities of skills
      1). Demonstrative events
         a. Enhances confidence
         b. Enhances psychomotor skill acquisition
         c. Improves technique
         d. Improves understanding of performance
         e. Influences student’s skill acquisition
         f. Reduces anxiety over performing unfamiliar skills
      2). Feedback
         a. Important in early stages of practicing simple closed-loop skill
         b. Improvement of rate of skill parallels frequency and precision
         c. Lack of feedback declines performance in early development of skills
         d. Types of feedback
            1). Kinesthetic
            2). Verbal
            3). Visual
      3). Knowledge of results
         a. Requires feedback
         b. Requires error detection
         c. Mandates error correction
      4). Mental practice
         a. Must be familiar with prior tasks
            1). Prior experiences
            2). Demonstrations
         b. Requires instruction for mental practice
         c. Requires binding with physical practice to gain highest level performance gains
         d. Requires complex and simple skills to be placed in sub-units
         e. Performing of mental practice should be accomplished in each person’s personal time and place
         f. Should not exceed five (5) minutes
      5). Motivation
         a. Influences development of psychomotor skills
         b. Accounts for indeterminacy during educational process
         c. Creates an atmosphere of uncertainty
         d. Develops perplexity
         e. Strategies that increase motivation
            1). Variety of psychological strategies
               a. Personal goals
               b. Personal interests
               c. Values of skill sets
               d. Personal challenges
            2). Arousal of curiosity from a puzzling problem
            3). Sets challenging standards
            4). Combines curiosity and skills
      6). Physical practice
         a. Improves performance through repetitive processes
         b. Reduces fear and anxiety that surrounds the required performance of skills
         c. Helps effectiveness with distributed practices
         d. Distributed practices
            1). Short frequent practices over longer periods are most effective
            2). Practices must be long enough to enhance improvement
            3). Time period between sessions lowers level of forgetfulness
            4). More effective than massed practices
      7). Important variables during development
         a. Requires upmost mental thought
         b. Requires uppermost physical involvement
         c. Requires quality instruction by educators who understand expe-
angiography

Must correlate hemodynamic values with contrast media studies of the heart chambers and pulmonary circulation

Must be able to operate intra-balloon pumps and manage patients in cardiogenic shock

Must have skills to manage possible complications at access site

VIII. Cardiovascular Hemodynamics, Physiology & Pathophysiology

A. System instrumentation
B. Cardiac physiology
C. Cardiovascular pathophysiology

IX. Cardiovascular Pharmacology

A. Pre-procedure preparation for diagnostic and interventional studies
B. Pre-medications administered prior to procedure
C. Medications used during procedure

X. Post-Procedure Care

A. Technical cognition
1. Evaluation and documentation of vascular integrity
2. Immediate post-procedural patient care
3. Monitoring and location of patient for post-procedural care
4. Length of bed rest and immobilization of extremity

B. Management of complications
1. Adverse contrast media sensitivities
   a. Urticaria (mild, moderate, severe)
   b. Anaphylactoid reactions (mild, moderate, severe)
   c. Anaphylactic shock
      1. Respiratory distress and arrest
      2. Cardiac arrest
      d. Current ACLS and PALS guidelines
2. Adverse medication sensitivities
   a. Urticaria (mild, moderate, severe)
   b. Anaphylaxis (mild, moderate, severe)
   c. Anaphylactic shock
      1. Respiratory distress and arrest
      2. Cardiac arrest
      d. Current ACLS and PALS guidelines
3. Knowledge of ECG rhythms and cardiac dysrhythmias
4. Systolic and diastolic left ventricular dysfunction
5. Access sites
   a. Hematoma
   b. Hemorrhage (retroperitoneal, external)
   c. A-V fistulae
   d. Pseudo-aneurysms
   e. Thrombotic and embolic events
6. Neurologic events
   a. Transient ischemic attack (TIA)
   b. Blurred or loss of vision
   c. Loss of sensory function
   d. Stroke or CVA
   e. Loss of motor function
   f. Paresis or paralysis
C. Hemodynamic and angiographic interpretation
1. Hemodynamic analyses
   a. Principles and methods of calculating cardiac outputs
      1. Angiographic
      2. Approximate
      3. Fick
      4. Thermodilution
      5. Sphygmomanometry and tonometry
   b. Calculations of stenotic valvular areas (hand method, computer-assisted)
   c. Calculation of intracardiac shunt ratios
      1. Oxygen saturation determination
      2. Qc: Qs ratio determination
      3. Correlation with echocardiography
   d. Analyses and explanation of pressure waveforms and measurements
      1. Right heart
      2. Left heart
      3. Stenotic valvar gradients
      4. Stenotic arterial – arterial gradients

angiography

1. Indications for invasive cardiac procedures
2. Indications for interventional cardiac procedures
3. Signs and symptoms, indications, treatment, and management for acute pulmonary thromboembolism
4. Symptoms and indications for invasive and interventional carotid studies
5. Symptoms and indications for vertebral basilar artery revascularization
6. Symptoms and indications for innominate and subclavian arterial revascularization
7. Indications for aortic repair and revascularization
8. Indications & considerations for visceral arterial revascularization
9. Symptoms and signs that influence invasive/interventional transcatheter therapy (TCT) for percutaneous peripheral revascularization.

VI. Considerations for Vascular Access

A. Requires knowledge of sterile procedure, draping, and local anesthesia
B. Requires dexterity and proficiency with access method
C. Vascular approaches
D. Requires knowledge and experience of angiographic materials

VII. Angiography

A. Must have knowledge of size and style of catheters
   1. Diagnostic catheters
   2. Interventional catheters
   3. Sheaths (long, short)
B. Must have knowledge of catheters used to perform angiographic procedures as listed:
   1. Aortic stent/stent-graft interventional studies
   2. Aortography (ascending, arch, descending, abdominal)
   3. Cerebral and neck angiography/interventional procedures
   4. Gonadal angiography/venography-interventional procedures
   5. Hepato-portal venography/interventional studies
   6. Left heart and coronary angiography
   7. Lower extremity arteriography and venography/interventional procedures
   8. Pelvic arteriography and venography – interventional procedures
   9. Pulmonary angiography – interventional procedures
   10. Renal dialysis shunt/graft angiograms/interventional studies
   11. Right heart catheterizations – hemodynamics/cardiopulmonary calculations
   12. Selective bronchial arteriography/interventional procedures
   13. Selective renal angiography/interventional procedures
   14. Selective visceral angiography/interventional studies (celiac, SMA, IMA)
   15. Upper extremity arteriography and venography/interventional procedures
C. Must recognize pressure dampening quickly, understands implications, and non-seating of catheters
D. Must observe ostial pressures before, during, and after contrast media injections
E. Must ensure adequate vessel opacification with appropriate amount of contrast media and force during systole and diastole cycles without injecting an air embolus or thrombus
F. Must respond rapidly to post-injection adverse events
G. Must determine angiographic views that permits quality imaging with the lesser use of contrast media and radiation exposure
H. Must communicate expectations with patient effectively throughout procedure
I. Must couple knowledge with dexterity to cross normal or diseased aortic valves with appropriate techniques, projections, catheters, and guide wire options
K. Must understand necessity of proper panning sequences with excellent hand coordination
L. Must understand importance of panning when collateral vessels fill distal areas of contralateral and ipsilateral occluded arteries
M. Must understand how to use exchange wires to change catheters
N. Must specify adequate metered contrast media injection rates for coronary angiography, injections.
O. Must correlate hemodynamic values with contrast media studies of the
5. Aortic pressure- hepatic venous wedge ratio

2. Communicative (bedside manner) skills
   a. Discusses diagnosis with a patient and family members
   b. Discusses prognosis, alternative treatment regimens, and need for compliance of medical management plans as expected under HIPAA guidelines to maintain continuity and standards of care with:
      1. Patient (post-sedated state)
      2. Family members
      3. Referring physicians
      4. Consulting surgeons
      5. Directly involved allied healthcare team members

3. Final complete diagnostic report
   a. Structure of medical record
      1. Has all required data been collected on the patient?
         a. Problem list
            (1). Serves as table of contents of illnesses
            (2). Links problems of a patient to structures of care, education, and compliance
         b. Required for complete diagnosis
            (1). Etiologic identification
            (2). Abnormal anatomy
            (3). Physiology
               (a) Clinical manifestations
               (b) Molecular biology
               (c) Pathophysiology
               (d) Prognosis
               (e) Treatment
            (4). Organ status
            (5). Relation of prognosis and disease
         c. Must include abnormalities not related to complete diagnosis
            (1). Reflects lower levels of resolution
            (2). Complete possible causes of each problem
            (3). Solved problems increased to higher level of resolution
         d. Must reflect uppermost resolution
         e. Must be kept up-to-date
         f. Must be kept up-to-date
         g. Create plans for each problem
   b. Educational plans
      a). Required for each medical plan
      b). Includes all medications (current and former)
      c). Includes all planned invasive, interventional, and surgical procedures
      d). Numbering and titling of orders on order sheet match number of each listed problem
         (1). Sensible identification
         (2). Enables other physicians to link a written order and managed problem
         (3). Helps all other related allied health caregivers to understand the process planned methods of care
   c. Therapeutic plans
      a). Required for each medical plan
      b). Includes all medications (current and former)
      c). Includes all planned invasive, interventional, and surgical procedures
      d). Numbering and titling of orders on order sheet match number of each listed problem
         (1). Sensible identification
         (2). Enables other physicians to link a written order and managed problem
         (3). Helps all other related allied health caregivers to understand the process planned methods of care
   d. Progress notes
      a). Record observations in progress notes
      b). Number and title equivalently labeled list of problems on list of problems and in all plans
      c). Determines change in characteristics of problem(s) followed
      d). List changes in symptoms, laboratory values, physical examinations, etc.
      e). Use data to organize:
         (1). New subjective data
         (2). New objective data
            (a) Blood pressure
            (b) Cardiovascular disease
            (c) Functional capacity
            (d) Neurologic changes
         (3). Assessment of new data
         (4). New plans
            (a) Diagnostic strategies
            (b) Therapeutic modifications
            (c) Educational strategies
               1) Compliance 2) Non-compliance
            (d) Flow sheets
   e. Flow sheets
      a). Establishes interrelationship between multiple items
      b). Displays data from treatment of specific problems
      c). Assesses relationship of variables with ease
      d). Indicates clinical pathways
         (1). Abdominal aortic aneurysm repair
         (2). Cardiac cath/PCI/ stent
         (3). Cardiac surgery
         (4). Carotid endarterectomy - vascular surgery
         (5). Carotid/cerebral angiography/PTA/stent
         (6). Cerebral vascular accident
         (7). Cerebral hemorrhage
         (8). Craniotomy
         (9). End of life
         (10). EPS/ablation
         (11). Pacemaker/ICD
         (12). Peripheral vascular disease/arteriography/PTA/stent
         (13). Thoracic aortic aneurysm repair
         (14). Visceral angiography/PTA/stent

XI. Radiation Safety Guidelines, Dose Limits, Safety, and Biology
A. Radiation safety guidelines/ radiation dose limits
   1. Maximum permissible doses (MPD)
   2. Fluoroscopy vs. digital imaging radiation exposure
   3. Radiation dosage
      a. Patient exposure
      c. Occupational (staff) exposure

Due to the size of the curriculum report, Cath Lab Digest was unable to accommodate the entire article in this issue. Sections of the manuscript that were shortened include:

V. Pathways to Proficiency, Part B. Indications and Symptoms for Procedures
VI. Consideration for Vascular Access
VIII. CV Hemodynamics, Physiology, & Pathophysiology
IX. Cardiovascular Pharmacology
XI. Radiation Safety Guidelines, Dose Limits, Safety, & Biology

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