Cardiac Interventional Radiography

The purpose of continuing qualifications requirements (CQR) is to assist registered technologists in documenting their continued qualifications in the disciplines of certification and registration held. To accomplish this purpose the continuing qualifications requirements are presented in three parts: the professional profile, the structured self assessment (SSA), and continuing education (CE).

The purpose of the CQR SSA is to assist registered technologists to identify gaps in the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required for practice within the disciplines of certification and registration held and help direct their professional development efforts.

The *Structured Self Assessment Content Specifications for Cardiac Interventional Radiography* is provided to assist cardiac interventional radiographers during their CQR compliance period. Its purpose is to prepare cardiac interventional radiographers for the SSA and to help education providers develop coursework for the cardiac interventional radiographers who need to address specified areas with targeted continuing education. Targeted CE is assigned only if a standard is not met in a category on the SSA.

The SSA is composed of sets of questions that are designed to evaluate an individual's knowledge in topics related to current practice. Participants have a maximum of 40 minutes to complete the SSA. Please allow an additional eight minutes for the tutorial, two minutes for the nondisclosure agreement (NDA), and 10 minutes for a follow-up survey.

The table below presents the major categories and subcategories covered on the SSA. The number of questions in each category are listed in bold and number of questions in each subcategory in parentheses. The potential number of targeted CE credits that would be prescribed if the standard is not met, are across from each subcategory, with the maximum amount listed at the bottom. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

Content Category	Number of Questions	Potential CE Credits
Patient Care	**10**	
Patient Interactions and Management (10)		7
Image Production	**10**	
Image Acquisition and Equipment (10)		4
Procedures	**20**	
Diagnostic and Electrophysiology Procedures (10)		6
Interventional Procedures (10)		9
	Total 40	**Maximum CE 26**

Patient Care

1. Patient Interactions and Management

A. Patient Communication
1. preprocedure
   a. explanation of procedure
   b. explanation of radiation risk
   c. preprocedure time-out
2. intraprocedure
3. postprocedure care instructions (*e.g., discharge instructions)

B. Patient Assessment and Preparation
1. patient history
   a. clinical notes
      1. medications
      2. allergies
   b. prior imaging
2. interpersonal communication (e.g., patient care team, physician)
3. scheduling and screening
   a. sequencing of imaging
   b. pre/post procedure (e.g., contrast administration, NPO status)
4. patient education (e.g., preparation, diet, medications)
5. consent
   a. informed (e.g., written, verbal)
   b. emergent (e.g., implied)
6. patient positioning (e.g., Velcro® straps, padding, wedges, arm boards)
7. access assessment
   a. vascular patency (e.g., ultrasound, Allen test, Barbeau test)
   b. peripheral pulses (e.g., palpation, Doppler)
   c. anatomical location (e.g., femoral artery/vein, radial artery, jugular vein)
   d. imaging (e.g., ultrasound, fluoroscopy)
8. lab values (normal and abnormal values)
   a. chemistry
      1. glucose
      2. blood urea nitrogen (BUN)
      3. creatinine
      4. electrolytes
      5. cardiac enzymes (e.g., troponin)
   b. hematology
      1. hematocrit
      2. hemoglobin
      3. platelet count
      4. white blood count (WBC)
   c. coagulation
      1. prothrombin time (PT)
      2. partial thromboplastin time (PTT)
      3. international normalized ratio (INR)
      4. activated clotting time (ACT)
   d. arterial blood gas
      1. pH
      2. PaCO2
      3. HCO2

C. Patient Monitoring
1. physiologic monitoring
   a. temperature
   b. ECG
   c. respiration
   d. noninvasive blood pressure
   e. intravascular pressure
   f. pulse oximetry
   g. capnography
   h. level of consciousness (LOC)
2. monitor and maintain medical equipment
   a. oxygen delivery systems
   b. chest tubes
   c. indwelling catheters
   d. drainage bags
   e. IVs
   f. suction

* The abbreviation “e.g.,” is used to indicate that examples are listed in parentheses, but that it is not a complete list of all possibilities.

(Patient Care continues on the following page.)

Patient Care (continued)

3. documentation
   a. radiographic exposure factors
   b. contrast administration parameters
   c. fluoroscopy time
   d. cumulative dose or air kerma (e.g., mGy)
   e. dose area product (DAP) (e.g., mGy-cm2)
   f. physiologic monitoring
   g. medications
   h. complications
   i. implantable devices

D. Contrast Administration
   1. types and properties of contrast agents
      a. nonionic low osmolar
      b. nonionic iso-osmolar
      c. CO2
   2. indications and contraindications

E. Medications
   1. types
      a. anticoagulants
      b. thrombolytics
      c. vasoactives (e.g., constrictors, dilators)
      d. emergency medications
      e. other (e.g., analgesics, antiemetics, antihypertensives, antiarrhythmics, antiplatelets, moderate sedation medications)
   2. indications and contraindications
   3. safety and complications
   4. preparation
   5. reactions

F. Asepsis and Sterile Technique
   1. disinfection and cleaning
      a. medical asepsis
      b. sterile technique
         1. patient preparation
         2. procedural tray (e.g., sterile supplies)
         3. maintenance of sterile fields
         4. scrubbing

G. Handling and Disposal of Hazardous Materials
   1. biohazardous (e.g., sharps, blood)
   2. tissue samples
   3. chemotherapeutic agents
   4. radioactive material

H. Emergency Care
   1. contrast reactions and complications
      a. allergy type
         1. mild
         2. moderate
         3. severe
      b. adverse
         1. nephrotoxicity
         2. physiological responses (e.g., airway, hemodynamic, CNS)
      c. treatment and medications
         1. types (e.g., steroids, antihistamines)
         2. indications and contraindications
   2. symptoms and treatment of the following medical emergencies
      a. cerebral vascular accident (CVA)/ transient ischemic attack (TIA)
      b. embolism
         1. air
         2. thrombotic
      c. thrombosis
      d. respiratory arrest
      e. myocardial infarction
      f. congestive heart failure
      g. cardiac arrhythmias
      h. vasovagal response
      i. anaphylaxis
      j. hypotensive/ hypertensive episodes
      k. shock (e.g., cardiogenic, hypovolemic, septic)
      l. cardiac tamponade
      m. dissection/perforation
      n. access site management
      o. bleeding (e.g., hemothorax, hematoma)
      p. pneumothorax
      q. flash pulmonary edema

Image Production

1. Image Acquisition and Equipment

A. Data Acquisition and Processing
   1. fluoroscopy
      a. high/low dose rate
      b. pulse rate
   2. digital acquisition
      a. exposure technique
      b. frame rate
   3. roadmapping
      a. digital subtraction
      b. field of view
         (e.g., magnification, collimation)
      c. compensating filters
         (e.g., wedge, soft)
      d. 3D imaging
   4. projections/positions
   5. post processing
      (e.g., reconstruction)
   6. archiving/PACS

B. Automatic Pressure Injectors
   1. parts
   2. function and safety
   3. operation
   4. cleaning

C. Procedural Imaging Equipment**
   1. ultrasound unit
   2. intravascular ultrasound (IVUS)
   3. optical coherence tomography (OCT)
   4. intracardiac echocardiography (ICE)

D. Radiation Protection
   1. patients
      a. collimation (e.g., shutters, virtual collimation)
      b. magnification
      c. frame rates
      d. geometry (e.g., SID, OID, tube angle)
      e. pulsed or continuous
      f. last image hold
      g. dose rate
   2. personnel (ALARA)
      a. shielding
      b. monitoring devices
      c. occupational exposure reports
      d. promote radiation awareness
   3. quality control
      a. aprons
      b. role of dose calibration

**The cardiac interventional radiographer is expected to have the basic knowledge of this equipment and its operation.

Procedures

1. Diagnostic and Electrophysiology Procedures

A. Cardiac Diagnostic Procedures
   1. right and left heart hemodynamics
   2. angiography
      a. coronary
      b. bypass graft
      c. pulmonary
      d. aortography
      e. ventriculography
   3. intracardiac echocardiography (ICE)
   4. flow reserve (e.g., FFR, IFR, RFR)
   5. intravascular imaging (e.g., OCT, IVUS)
   6. biopsy

B. Peripheral Angiography
   1. femoral
   2. carotid
   3. renal
   4. great vessel
   5. radial
   6. brachial
   7. jugular
   8. axillary
   9. internal mammary

C. Hemodynamic Calculations
   1. stroke volume measurement
   2. valve area (e.g., Gorlin, Hakki)
   3. shunt detection and calculation
   4. cardiac output calculation and measurement
      a. Fick
      b. thermodilution
      c. angiographic
   5. flow reserve (e.g., FFR, IFR, RFR)

FOCUS OF QUESTIONS

Questions for each section of the exam may address any of the following factors, as appropriate:

1. Anatomy and Pathophysiology
2. Indications for Procedure
3. Contraindications for Procedure
4. Image Analysis and Utilization
5. Access Methods
6. Ultrasound Guidance
7. Equipment and Devices Used
   A. Types (e.g., sheaths, catheters, guidewires, needles, manifold/pressure transducers)
   B. Indications for Use
   C. Preparation, Set Up, and Operation
8 Complications
   A. Recognition
   B. Treatment
9. Closure Devices, Puncture Site Pressure, and Dressing (e.g., manual, external, permanent, nonpermanent, surgical glue)
10. Interventional Suite and Hybrid OR

(Procedures continue on the following page.)

Procedures (continued)

D. Electrophysiology
   1. arrhythmia detection
   2. arrhythmia ablation
      a. atrial fibrillation
      b. atrial flutter
      c. ventricular tachycardia
   3. cardioversion
   4. implants
      a. pacemaker
         1. permanent insertion
         2. temporary
         3. leadless
      b. internal cardiac defibrillator (ICD) insertion
      c. biventricular pacemaker
      d. lead extraction

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(Procedures continue on the following page.)

Procedures (continued)

2. Interventional Procedures

A. Percutaneous Intervention
1. angioplasty
   a. coronary
   b. peripheral
2. coronary atherectomy
   a. directional
   b. rotational
   c. laser
   d. orbital
3. peripheral atherectomy
   a. directional
   b. rotational
   c. laser
   d. orbital
4. stent placement
   a. coronary
   b. peripheral
5. thrombectomy
   a. mechanical
   b. pharmacological
   c. aspiration
6. inferior vena cava (IVC) filter placement/retrieval
7. pericardiocentesis
8. intra-aortic balloon pump (IABP)
9. foreign body removal/retrieval
10. catheter-based ventricular assist device
    a. left ventricle
    b. right ventricle
11. intravascular lithotripsy
12. extracorporeal membrane oxygenation system placement (ECMO)
13. distal embolic protection device placement/retrieval

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5. Access Methods
6. Ultrasound Guidance
7. Equipment and Devices Used
   A. Types (e.g., sheaths, catheters, guidewires, needles, manifold/pressure transducers)
   B. Indications for Use
   C. Preparation, Set Up, and Operation
8 Complications
   A. Recognition
   B. Treatment
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(Procedures continue on the following page.)

Procedures (continued)

B. Structural Heart Procedures
   1. patent foramen ovale/ atrial septal defect closure
   2. ventricular septal defect closure
   3. transcatheter aortic valve implantation/replacement (TAVI/TAVR)
   4. valvuloplasty
   5. transcatheter mitral valve repair
   6. atrial appendage closure device implantation

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