



Vascular-Interventional Radiography

The purpose of structured education is to provide the opportunity for individuals to develop mastery of discipline-specific knowledge that, when coupled with selected clinical experiences, helps to document qualifications. The *Structured Education Requirements for Vascular-Interventional Radiography* is provided to assist candidates with these requirements.

Candidates for vascular-interventional radiography certification and registration must document at least 16 hours of structured education¹. The activities must be earned within the 24-month period immediately prior to submission of an application for certification and registration. Structured education activities may be academic courses from an institution accredited by a mechanism recognized by the ARRT², CE opportunities approved by a RCEEM or RCEEM+, or a combination of the two.

Structured education documentation must include at least one CE credit or its equivalent in each content category listed below (i.e., Patient Care, Safety, Image Production, and Procedures). The remaining hours may be earned from any one or more of the content areas. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

Content Category	Minimum Credit Hours
Patient Care (includes) <i>Patient Interactions and Management</i>	1
Image Production (includes) <i>Image Acquisition and Equipment</i>	1
Procedures (includes) <i>Vascular Diagnostic Procedures</i> <i>Vascular Interventional Procedures</i> <i>Nonvascular Procedures</i>	1
Total	16

Acceptable Examples:

Example 1	Example 2	Example 3
Patient Care – 3 hours Image Production – 6 hours Procedures – 7 hours	Patient Care – 1 hour Image Production – 1 hour Procedures – 14 hours	Patient Care – 1 hour Image Production – 10 hours Procedures – 5 hours
TOTAL – 16 hours	TOTAL – 16 hours	TOTAL – 16 hours

¹. If there is a structured education requirement document with a newer effective date, you may either use the new document or continue to use this document if you have completed at least one educational activity prior to the effective date of the new version. For more information access the online clinical experience tool, where structured education is also reported.

². Activities meeting the definition of an approved academic course will be awarded credit at the rate of 12 CE credits for each academic **quarter** credit or 16 CE credits for each academic **semester** credit. See the ARRT *Continuing Education Requirements* document for additional information.



Patient Care

1. Patient Interactions and Management

- A. Patient Communication
 - 1. pre-procedure
 - a. explanation of procedure
 - b. informed consent
 - c. explanation of radiation risk
 - d. pre-procedure time-out
 - 2. intra-procedure
 - 3. post-procedure care instructions
- B. Patient Assessment and Monitoring (normal and abnormal values; implication for imaging, equipment)
 - 1. physiologic monitoring
 - a. temperature
 - b. ECG
 - 1. equipment and patient preparation
 - 2. interpretation (sinus rhythm, common arrhythmias)
 - c. respiration
 - d. blood pressure
 - e. intravascular pressure
 - f. pulse oximetry
 - 2. 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)
 - 3. lab values
 - a. chemistry (e.g., BUN, creatinine, eGFR, liver function tests (LFT), potassium)
 - b. blood coagulation (e.g., PT, PTT, INR, ACT)
 - c. hematology (e.g., Hgb, WBC, platelet)
 - 4. monitor and maintain medical equipment used during a procedure
 - a. oxygen delivery systems
 - b. chest tubes
 - c. in-dwelling catheters
 - d. drainage bags
 - e. IV's
 - f. suction
- 5. documentation
 - a. radiographic exposure factors
 - b. contrast administration parameters
 - c. fluoroscopy time
 - d. radiation dose
 - e. physiologic monitoring
 - f. medications
 - g. complications
 - h. implantable devices
- C. Contrast Administration
 - 1. types and properties of contrast agents
 - a. ionic
 - b. nonionic low-osmolar
 - c. nonionic iso-osmolar
 - d. CO₂
 - e. gadolinium
 - 2. indications and contraindications
- D. Medications
 - 1. types and administration routes
 - a. analgesics/antiemetics including reversal agents (e.g., fentanyl, versed, naloxone, flumazenil)
 - b. anticoagulants
 - c. thrombolytics
 - d. vasoconstrictors
 - e. vasodilators
 - 2. indications and contraindications
 - 3. preparation
 - 4. complications

* 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)

E. Asepsis and Sterile Technique

1. disinfection and cleaning
 - a. medical asepsis
 - b. sterile technique
 1. patient preparation
 2. procedural tray
 3. maintenance of sterile fields
2. infection control
 - a. CDC Standard Precautions
 - b. transmission precautions
 1. contact
 2. airborne
 3. droplet

F. Handling and Disposal of Hazardous Materials

1. biohazardous (e.g., sharps, blood)
2. chemotherapeutic agents
3. radioactive material (e.g., Y-90)

G. Emergency Care

1. contrast reactions and complications
 - a. allergic-type
 1. minor
 2. intermediate
 3. severe
 - b. adverse
 1. hemodynamic responses
 2. nephrotoxicity
 3. CNS reactions
2. treatment and medications
 - a. types (e.g., steroids, antihistamines)
 - b. indications and contraindications
3. symptoms and treatment of the following medical emergencies
 - a. air embolism
 - b. anaphylaxis
 - c. bleeding
 - d. cardiac arrhythmias
 - e. congestive heart failure
 - f. hemothorax
 - g. hypertensive episodes
 - h. hypotensive episodes
 - i. myocardial infarction
 - j. pneumothorax
 - k. respiratory arrest
 - l. sepsis
 - m. thrombosis
 - n. thrombotic embolism
 - o. TIA
 - p. vasovagal response



Image Production

1. Image Acquisition and Equipment

- A. Data Acquisition and Processing
 - 1. fluoroscopy
 - a. pulse rate
 - b. high/low dose
 - c. roadmapping
 - d. field of view (e.g., magnification, collimation)
 - e. compensating filters (e.g. wedge, soft)
 - 2. digital angiography
 - a. exposure technique
 - b. frame rate
 - c. digital subtraction
 - d. field of view (e.g., magnification, collimation)
 - e. compensating filters (e.g. wedge, soft)
 - f. 3D imaging
 - 3. projections/positions
 - 4. archiving
 - 5. quality control
- B. Automatic Pressure Injectors
 - 1. parts
 - 2. function
 - 3. operation

- C. 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. shielding
 - g. last image hold
 - h. dose rate
 - 2. personnel (ALARA)
 - a. shielding
 - b. monitoring devices
 - c. occupational exposure reports
 - d. promote radiation awareness



Procedures

CATEGORY

1. Vascular Diagnostic Procedures

- A. Neurologic Angiography
 - 1. intracranial arteriography
 - 2. extracranial arteriography
 - 3. spinal arteriography
- B. Thoracic Angiography
 - 1. thoracic aortography
 - 2. pulmonary arteriography
 - 3. bronchial arteriography
- C. Abdominal Angiography
 - 1. abdominal aortography
 - 2. pelvic arteriography
 - 3. renal arteriography
 - 4. adrenal arteriography
 - 5. celiac arteriography
 - 6. superior mesenteric artery (SMA) arteriography
 - 7. inferior mesenteric artery (IMA) arteriography
- D. Peripheral Angiography
 - 1. upper extremity arteriography
 - 2. lower extremity arteriography
- E. Venography
 - 1. pelvic venography
 - 2. superior vena cavagram
 - 3. inferior vena cavagram
 - 4. renal venography
 - 5. adrenal venography
 - 6. gonadal venography
 - 7. hepatic venography
 - 8. portal venography
 - 9. upper extremity venography
 - 10. lower extremity venography
 - 11. venous sampling
- F. Miscellaneous Studies
 - 1. hemodialysis graft/fistula study
 - 2. physiologic pressure measurements
 - 3. central venous device check (e.g., port, PICC, hemodialysis catheter)

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
 - A. Arterial
 - B. Venous
- 6. Equipment and Devices Used
 - A. Types (e.g., sheaths, catheters, guidewires, needles)
 - B. Indications for Use
- 7. Ultrasound Guidance
- 8. Closure Devices, Puncture Site Pressure and Dressing
- 9. Complications
 - A. Recognition
 - B. Treatment

(Procedures continues on the following page.)



Procedures (continued)

CATEGORY

2. Vascular Interventional Procedures

- A. Angioplasty
 - 1. neurologic
 - 2. body
- B. Stent Placement
 - 1. neurologic
 - 2. body
- C. Embolization
 - 1. neurologic
 - 2. body
- D. Thrombolysis/Thrombectomy
 - 1. neurologic
 - 2. body
- E. Atherectomy
- F. Distal Protection Device Placement
- G. Foreign Body Retrieval
- H. Endograft Placement
- I. Caval Filter Placement/Removal
- J. Transjugular Intrahepatic Portosystemic Shunt (TIPS) Placement or Revision
- K. Transvenous Biopsy
- L. Chemoembolization
- M. Radioembolization
- N. Venous Access
 - 1. tunneled catheter
 - 2. non-tunneled catheter
 - 3. port
 - 4. peripheral IV

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
 - A. Arterial
 - B. Venous
- 6. Equipment and Devices Used
 - A. Types (e.g., catheters, balloons, stents, snares, embolics, filters)
 - B. Indications for Use
- 7. Ultrasound Guidance
- 8. Closure Devices, Puncture Site Pressure and Dressing
- 9. Complications
 - A. Recognition
 - B. Treatment

(Procedures continues on the following page.)



Procedures (continued)

CATEGORY

3. Nonvascular Procedures

- A. Nephrostomy
- B. Ureteral Dilation/Stents
- C. Percutaneous Stone Extraction (e.g., renal, biliary)
- D. Drainage Procedures
- E. Percutaneous Radiofrequency (RFA) Ablation
- F. Percutaneous Transhepatic Cholangiogram
- G. Biliary Internal/External Drainage
- H. Cholecystostomy
- I. Gastrostomy/Gastrojejunostomy
- J. Vertebroplasty/Kyphoplasty
- K. Discography
- L. Chest Tube/Drain Placement
- M. Thoracentesis
- N. Percutaneous Biopsy
- O. Paracentesis
- P. Tunneled Drainage Catheter Placement
 - 1. thoracic
 - 2. abdominal

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. Equipment and Devices Used
 - A. Types (e.g., sheaths, drainage catheters, guidewires, needles)
 - B. Indications for Use
6. Complications
 - A. Recognition
 - B. Treatment