



Vascular Interventional Radiography

The purpose of the examination requirement is to assess whether individuals have obtained the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required in vascular interventional radiography for practice at entry level. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of vascular interventional radiographers¹. The *Task Inventory for Vascular Interventional Radiography* may be found on the ARRT's website (www.arrt.org).

The *Examination Content Specifications for Vascular Interventional Radiography* and attached content outline identify the knowledge areas underlying performance of the tasks on the *Task Inventory for Vascular Interventional Radiography*. Every content category can be linked to one or more tasks on the task inventory.

The table below presents the major content categories covered on the examination. The number of test questions in each category are listed in bold and the number of test questions in each subcategory in parentheses. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

Content Category	Number of Scored Questions²
Patient Care	22
<i>Patient Interactions and Management (22)</i>	
Image Production	26
<i>Image Acquisition and Equipment (26)</i>	
Procedures	112
<i>Vascular Diagnostic Procedures (41)</i>	
<i>Vascular Interventional Procedures (41)</i>	
<i>Nonvascular Procedures (30)</i>	
Total	160

¹ A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.

² The exam includes an additional 50 unscored (pilot) questions.



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)
 - 8. lab values (normal and abnormal values)
 - a. chemistry (e.g., BUN, creatinine, eGFR, liver function tests [LFT], potassium)
 - b. blood coagulation
 - 1. prothrombin time (PT)
 - 2. partial thromboplastin time (PTT)
 - 3. international normalized ratio (INR)
 - 4. activated clotting time (ACT)
 - c. hematology (e.g., Hgb, WBC, platelet)
- C. Patient Monitoring
 - 1. physiologic monitoring
 - a. temperature
 - b. ECG
 - 1. equipment and patient preparation
 - 2. interpretation (e.g., sinus rhythm, common arrhythmias)
 - c. respiration
 - d. blood pressure
 - e. intravascular pressure
 - f. pulse oximetry
 - g. capnography
 - 2. monitor and maintain medical equipment
 - a. oxygen delivery systems
 - b. chest tubes
 - c. indwelling catheters
 - d. drainage bags
 - e. IVs
 - f. suction
 - 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

* 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)

D. 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

E. Medications

1. types
 - a. anticoagulants
 - b. thrombolytics
 - c. vasoactives
(e.g., constrictors, dilators)
 - d. analgesics/anxiolytics including reversal agents (e.g., fentanyl, versed, naloxone, flumazenil)
2. indications and contraindications
3. preparation
4. complications and reactions
5. administration routes
6. controlled substance wasting

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 (e.g., Y-90)

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, epinephrine)
 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. cardiac events
(e.g., arrhythmias, congestive heart failure, hypotensive/hypertensive episodes, myocardial infarction)
 - f. vasovagal response
 - g. anaphylaxis
 - h. shock
 - i. sepsis
 - j. dissection/perforation
 - k. bleeding
(e.g., hemothorax, hematoma)
 - l. pneumothorax



Image Production

1. Image Acquisition and Equipment

A. Data Acquisition and Processing

1. fluoroscopy
 - a. high/low dose rate
 - b. pulse rate
 - c. roadmapping
 - d. field of view
(e.g., magnification, collimation)
 - e. compensating filters
(e.g., wedge, soft)
2. digital acquisition
 - 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. post processing
(e.g., reconstruction, pixel shift)
5. PACS

B. Automatic Pressure Injectors

1. parts
2. function and safety
3. operation
4. cleaning

C. Procedural Equipment**

1. ultrasound unit
2. intravascular ultrasound (IVUS)
3. ablation (e.g., cryo, microwave)
4. thrombectomy
5. thrombolysis
6. atherectomy
7. laser
8. lithotripsy (balloon or catheter)
9. pressure transducers

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
4. mandatory radiation reporting
 - a. Substantial Radiation Dose Level (e.g., National Council on Radiation Protection and Measurements [NCRP 168])
 - b. cumulative air kerma
(e.g., 5 Gy)

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



Procedures

1. Vascular Diagnostic Procedures

- A. Neurologic Angiography
 - 1. intracranial arteriography
 - 2. carotid/vertebral 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. lymphangiography (general mapping)
 - 3. physiologic pressure measurements
 - 4. 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. Ultrasound Guidance
- 7. Equipment and Devices Used
 - A. Types (e.g., sheaths, catheters, guidewires, needles, IVUS)
 - B. Indications for Use
- 8. Complications
 - A. Recognition
 - B. Treatment
- 9. Closure Devices, Puncture Site Pressure, and Dressing (e.g., manual, external, permanent, nonpermanent, surgical glue)

(Procedures continues on the following page.)



Procedures (continued)

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
 - 1. neurologic
 - 2. body
- E. Thrombectomy
 - 1. neurologic
 - 2. body
- F. Atherectomy
- G. Percutaneous Thrombin Injection
- H. Distal Protection Device Placement
- I. Foreign Body Retrieval (e.g., broken catheter, bullet, guidewire, filter piece)
- J. Endograft Placement
- K. Caval Filter Placement/Removal
- L. Transjugular Intrahepatic Portosystemic Shunt (TIPS) Placement or Revision
- M. Transvenous Biopsy
- N. Chemoembolization
- O. Radioembolization
- P. Venous Access
 - 1. tunneled catheter
 - 2. nontunneled catheter
 - 3. port placement
 - 4. port removal
 - 5. PICC line placement
 - 6. 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. Ultrasound Guidance
7. Equipment and Devices Used
 - A. Types (e.g., catheters, balloons, stents, snares, embolics, filters, IVUS)
 - B. Indications for Use
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 versus Hybrid OR

(Procedures continues on the following page.)



Procedures (continued)

3. Nonvascular Procedures

- A. Nephrostomy
- B. Ureteral Dilatation/Stents
- C. Antegrade Urography Through an Existing Catheter
- D. Suprapubic Catheter Placement
- E. Percutaneous Ablation (e.g., radiofrequency [RFA], microwave, cryo)
- F. Percutaneous Transhepatic Cholangiogram
- G. Biliary Internal/External Drainage
- H. Cholecystostomy
- I. Gastrostomy/Gastrojejunostomy Placement
- J. Percutaneous Enteric Tube Evaluation (verification with contrast)
- K. Vertebroplasty/Kyphoplasty
- L. Epidural Steroid Injection
- M. Lumbar Puncture
- N. Myelogram
- O. Chest Tube/Drain Placement
- P. Thoracentesis
- Q. Percutaneous Biopsy
- R. Paracentesis
- S. Abscess, Fistula, or Sinus Tract Study
- T. Tunneled Drainage Catheter Placement
 - 1. thoracic
 - 2. abdominal
- U. Percutaneous Drainage With or Without Placement of Catheter (excluding thoracentesis or paracentesis)
- V. Removal of Percutaneous Drainage Catheter (e.g., tunneled, nontunneled)
- W. Change of Percutaneous Tube or Drainage 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. Ultrasound Guidance
6. Equipment and Devices Used
 - A. Types (e.g., sheaths, drainage catheters, guidewires, needles)
 - B. Indications for Use
7. Complications
 - A. Recognition
 - B. Treatment