



Cardiac-Interventional Radiography Examination

The purpose of *The American Registry of Radiologic Technologists® (ARRT®) Cardiac-Interventional Radiography Examination* is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of cardiac-interventional radiographers at entry into the profession. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of cardiac-interventional radiographers. The results of the most recent practice analysis are reflected in this document.¹

The *Task Inventory for Cardiac-Interventional Radiography* may be found on the ARRT’s website (www.arrt.org). The content specifications identify the knowledge areas underlying performance of the tasks on the *Task Inventory for Cardiac-Interventional Radiography*. Every content category can be linked to one or more activities on the task inventory.

The table below presents the three major categories covered on the examination, along with the number of test questions in each major category. The remaining pages of this document list the specific topics addressed within each major content category. The approximate number of test questions allocated to each topic appears in parentheses.

Content Category	Number of Scored Questions ²
Patient Care	35
Patient Interactions and Management	
Image Production	30
Image Acquisition and Equipment	
Procedures	80
Diagnostic and Conduction System Studies	
Hemodynamics, Calculations, and Percutaneous Intervention	
Total	145

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. Each exam includes an additional 25 unscored (pilot) questions. On the pages that follow, the approximate number of test questions allocated to each content category appears in parentheses.



Patient Care (35)

1. Patient Interactions and Management (35)

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 (*e.g., normal and abnormal values, implication for imaging, equipment)

1. physiologic monitoring
 - a. temperature
 - b. ECG
 - c. respiration
 - d. non-invasive blood pressure
 - e. intravascular pressure
 - f. pulse oximetry
2. access assessment
 - a. vascular patency
 1. peripheral pulse (e.g., palpation, Doppler)
 2. Allen test
 3. Barbeau test
 - b. anatomical location
 1. femoral
 2. radial
 3. brachial
 4. axillary
 5. jugular
 6. subclavian
 - c. imaging (e.g., ultrasound, fluoroscopy)
3. lab values
 - a. chemistry
 1. glucose
 2. blood urea nitrogen (BUN)
 3. creatinine
 4. electrolytes
 5. enzymes
 - 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 normalization ratio (INR)
 4. activated clotting time (ACT)
- #### d. arterial blood gas
1. pH
 2. PaCO₂
 3. HCO₂

4. monitor and maintain medical equipment (e.g., IVs, oxygen) used during a procedure

5. documentation

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

C. Contrast Administration

1. properties of nonionic contrast agents
2. indications and contraindications

D. Medications

1. types and administration routes
 - a. narcotics
 - b. anticoagulants
 - c. thrombolytics
 - d. vasoactives (constrictors, dilators)
 - e. emergency medications
 - f. platelet inhibitors
 - g. beta blockers
 - h. calcium channel blockers
2. indications and contraindications
3. complications

* e.g., This is used here and in the remainder of this document to indicate examples of the topics covered, but not a complete list.

(Patient Care continues on the following page.)



Patient Care (continued)

- E. Infection Control and Prevention
 - 1. disinfection and cleaning
 - a. medical asepsis
 - b. sterile technique
 - 2. CDC isolation precautions
 - a. transmission of infection
 - 1. contact
 - 2. airborne
 - 3. droplet
 - b. types of precautions
 - 1. CDC Standard Precautions (formerly Universal Precautions)
 - 2. transmission-based precautions (additional precautions)
 - 3. handling and disposal of biohazardous materials
- F. Emergency Care
 - 1. contrast reactions and complications
 - a. allergic-type
 - 1. minor
 - 2. intermediate
 - 3. severe
 - b. adverse
 - 1. hemodynamic responses
 - 2. nephrotoxicity
 - 3. central nervous system (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. cerebral vascular accident (CVA)
 - b. embolism
 - c. thrombosis
 - d. respiratory arrest
 - e. myocardial infarction
 - f. congestive heart failure
 - g. cardiac arrhythmias
 - h. vasovagal response
 - i. anaphylaxis
 - j. hypotensive episodes
 - k. hypertensive episodes
 - l. cardiogenic shock
 - m. cardiac tamponade
 - n. aortic dissection



Image Production (30)

1. Image Acquisition and Equipment (30)

- A. Angiography
 - 1. data acquisition and processing
 - a. modes
 - 1. fluoroscopy
 - a. dose rate
 - b. pulse rate
 - 2. acquisition angiography (cine)
 - a. dose per frame (e.g., low, med, high)
 - b. frame rate
 - 3. roadmapping
 - 4. digital subtraction
 - 5. 3D imaging
 - b. compensating filters (e.g., wedge, soft)
 - c. electronic magnification
 - d. geometric magnification
 - e. collimation
 - 2. projections/positions
- B. Intracardiac Imaging
 - 1. optical coherence tomography (OCT)
 - 2. intravascular ultrasound (IVUS)
 - 3. Intracardiac echocardiography (ICE)
- C. Archiving
- D. Quality Control
- E. Automatic Pressure Injectors
 - 1. parts
 - 2. function
 - 3. operation

F. 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 (80)

CATEGORY

1. Diagnostic and Conduction System Studies (36)

- A. Diagnostic Studies
 - 1. pulmonary arteriography
 - 2. aortography
 - 3. coronary angiography
 - 4. internal mammary angiography
 - 5. saphenous vein graft angiography
 - 6. femoral angiography
 - 7. carotid angiography
 - 8. renal angiography
 - 9. ventriculography
 - 10. biopsy
- B. Conduction System Studies
 - 1. arrhythmia detection
 - 2. arrhythmia ablation
 - a. atrial fibrillation
 - b. atrial flutter
 - c. ventricular tachycardia
 - 3. cardioversion
 - 4. implants
 - a. pacemaker, permanent insertion
 - b. internal cardiac defibrillator (ICD) insertion
 - c. biventricular pacemaker
 - 5. pacemaker, temporary insertion

FOCUS OF QUESTIONS

- 1. Anatomy and Pathophysiology
- 2. Indications for Procedure
- 3. Contraindications for Procedure
- 4. Image Analysis and Utilization
- 5. Access Methods and Closure Devices
- 6. Equipment and Devices Used
- 7. Complications
 - A. Recognition
 - B. Treatment

(Procedures continues on the following page.)



Procedures (continued)

CATEGORY

2. Hemodynamics, Calculations, and Percutaneous Intervention (44)

- A. Hemodynamics and Calculations
 - 1. ventricular volume measurement
 - 2. stenotic valve area (Gorlin Method)
 - 3. shunt detection and calculation
 - 4. cardiac output calculation and measurement
 - a. Fick
 - b. thermodilution
 - c. angiographic
 - 5. right and left heart hemodynamics
 - 6. fractional flow reserve
- B. Percutaneous Intervention
 - 1. angioplasty
 - 2. atherectomy
 - a. directional (peripheral)
 - b. rotational
 - 3. stent placement
 - 4. thrombectomy
 - a. mechanical
 - b. pharmacological
 - 5. inferior vena cava (IVC) filter placement/retrieval
 - 6. pericardiocentesis
 - 7. intra-aortic balloon counterpulsation
 - 8. removal of foreign bodies
 - 9. ventricular assist device implantation
 - 10. patent foramen ovale/atrial septal defect closure
 - 11. transcatheter aortic valve implantation (TAVI/TAVR)
 - 12. valvuloplasty

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