



# Cardiac Interventional Radiography

Certification and registration requirements for cardiac interventional radiography are based on the results of a comprehensive practice analysis conducted by The American Registry of Radiologic Technologists (ARRT) staff and the Cardiac Interventional Radiography Practice Analysis Committee. The purpose of the practice analysis is to identify job responsibilities typically required of cardiac interventional radiographers at entry into the profession. The results of the practice analysis are reflected in this document. The attached task inventory is the foundation for the clinical experience requirements and the content outline which, in turn, is the foundation for the content specifications and the CQR SSA content specifications.

## Basis of Task Inventory

In 2021, the ARRT surveyed a large, national sample of cardiac interventional radiographers to identify their responsibilities. When evaluating survey results, the committee applied a 40% criterion. That is, to be included on the task inventory, an activity must have been performed by at least 40% of cardiac interventional radiographers. The committee could include an activity that did not meet the 40% criterion if there was a compelling rationale to do so (\*e.g., a task that falls below the 40% criterion but is expected to rise above the 40% criterion in the near future).

## Application to Clinical Experience Requirements

The purpose of the clinical experience requirements is to document that candidates have performed a subset of the clinical procedures within a discipline. Successful performance of these fundamental procedures, in combination with mastery of the cognitive knowledge and skills as documented by the examination requirement, provides the basis for the acquisition of the full range of clinical skills required in a variety of settings. An activity must appear on the task inventory to be considered for inclusion in the clinical experience requirements. If an activity is designated as a mandatory requirement, survey results had to indicate that cardiac interventional radiographers performed that activity. The committee may designate clinical activities performed by fewer cardiac interventional radiographers, or which are carried out only in selected settings, as elective. The *Cardiac Interventional Clinical Experience Requirements* are available from ARRT's website ([www.arrt.org](http://www.arrt.org)).

## Application to Content Specifications

The purpose of the examination requirements is to assess whether individuals have obtained the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required in cardiac interventional radiography for practice at entry level. The content specifications identify the knowledge areas underlying performance of the tasks on the task inventory. Every content category can be linked to one or more activities on the task inventory. Note that each activity on the task inventory is followed by a content category that identifies the section of the content specifications corresponding to that activity. The *Cardiac Interventional Radiography Content Specifications* are available from ARRT's website ([www.arrt.org](http://www.arrt.org)).

\* 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.



**Content Categories**

PC = Patient Care

IP = Image Production

P = Procedures

FOQ = Focus of Questions

**Activity**

- |  |                                   |
|--|-----------------------------------|
| 1. Verify package integrity and expiration date of sterile supplies.   | PC.1.F.                           |
| 2. Verify the type, concentration, amount, and expiration date of medications.   | PC.1.D., PC.1.E.                  |
| 3. Check emergency cart to ensure appropriate emergency supplies.  | PC.1.C.2., PC.1.H.                |
| 4. Prepare equipment or trays with medications and supplies.   | PC.1.E., PC.1.F.                  |
| 5. Prepare equipment for sterilization.  | PC.1.F.                           |
| 6. Clean and disinfect or sterilize facilities and equipment.  | PC.1.F.                           |
| 7. Ensure proper function and cleanliness of the automatic contrast injector.  | IP.1.B.                           |
| 8. Evaluate sequencing of imaging procedures and inform physician of concerns (e.g., NPO status, contrast administration).   | PC.1.B.3.                         |
| 9. Address the patient's ability to tolerate the requested procedure (e.g., physical, sensory, or cognitive impairments).  | PC.1.A.1.                         |
| 10. Obtain pertinent medical history (e.g., clinical notes, labs, prior imaging, allergies).   | PC.1.B.                           |
| 11. Confirm the patient's preparation (e.g., diet restrictions, preparatory medications) prior to procedure.   | PC.1.B.4.                         |
| 12. Communicate with and update the patient, the patient's family, or authorized representative regarding scheduling delays, exam duration, and additional imaging procedures. | PC.1.A.                           |
| 13. Verify presence of appropriate signed informed procedural consent.   | PC.1.B.5.                         |
| 14. Recognize abnormal or missing lab values relative to the procedure ordered.  | PC.1.B.8.                         |
| 15. Prior to administration of a contrast agent or medication, determine if the patient is at risk for an adverse event.   | PC.1.E.2., PC.1.E.3.<br>PC.1.D.2. |
| 16. Obtain baseline vital signs, monitor changes, record, and recognize abnormalities.   | PC.1.C.                           |
| 17. Record vital signs.  | PC.1.C.3.                         |
| 18. Observe ECG for changes and recognize abnormal rhythms.  | PC.1.C.1.B.                       |
| 19. Assess distal pulses pre- and postprocedure.   | PC.1.B.7.B.                       |
| 20. Participate in preprocedural time-out activity.  | PC.1.A.1.C.                       |
| 21. Prepare and drape the access site(s).  | PC.1.F.                           |
| 22. Explain the procedure instructions to the patient, patient's family, or authorized representative (e.g., preprocedure, postprocedure).                                     | PC.1.A.                           |
| 23. Prepare the patient for the examination to include physiological monitoring equipment.   | PC.1.C.1.                         |



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24.	In conjunction with the physician, select the appropriate contrast agent:	PC.1.D.
	a. nonionic low osmolar	PC.1.D.1.A.
	b. nonionic iso-osmolar	PC.1.D.1.B.
	c. CO <sub>2</sub>	PC.1.D.1.C.
25.	Set up and operate the contrast delivery system (e.g., power injector).	IP.1.B.
26.	Set up and operate the manifold.	IP.1.B., P.1-2. FOQ
27.	Prepare or assist in administering the following types of medications according to physician's orders:	
	a. anticoagulants	PC.1.E.
	b. thrombolytics	PC.1.E.
	c. vasoactives (i.e., constrictors, dilators)	PC.1.E.
	d. emergency medications	PC.1.E.
	e. other (e.g., analgesics, antibiotics, antiemetics, antihypertensive, antiarrhythmics, antiplatelets)	PC.1.E.
28.	Recognize and communicate the need for prompt medical attention.	PC.1.H., PC.1.C.1.
29.	Recognize the need for, and administer, emergency care.	PC.1.H.
30.	Monitor and maintain medical equipment (e.g., IVs, oxygen) used during the procedure.	PC.1.C.2.
31.	Use sterile or aseptic technique when indicated.	PC.1.F.
32.	Follow environmental protection standards for handling and disposing of biohazardous materials (e.g., sharps, blood, body fluids).	PC.1.G.
33.	Handle, label, and submit laboratory specimens (e.g., body fluid, tissue samples).	PC.1.G.
34.	Identify characteristics of interventional and diagnostic nonimaging equipment (e.g., balloons, wires, appropriate sizing).	P.1-2. FOQ
35.	Adjust and calibrate pressure transducers.	P.1-2. FOQ
36.	Scrub in for the procedure.	PC.1.F.4.
37.	Take appropriate precautions to minimize radiation exposure to the patient.	IP.1.D.1.
38.	Take appropriate precautions to minimize occupational radiation exposure.	IP.1.D.2.
39.	Advocate radiation safety and protection.	IP.1.D.2.
40.	Describe the potential risk of radiation exposure when asked.	PC.1.A.1.B.
41.	Wear a radiation monitoring device while on duty.	IP.1.D.2.B.
42.	Position the patient and/or imaging equipment to achieve desired projections.	IP.1.A.4.



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- |     |   |                             |
|-----|---|-----------------------------|
| 43. | Select appropriate imaging protocols (e.g., frame rates, high/low level fluoroscopy) to optimize image quality while minimizing dose. | IP.1.A.1-4.                 |
| 44. | Employ image enhancement techniques (e.g., magnification, filtration, collimation) during procedure to improve image quality.         | IP.1.A.1-3.                 |
| 45. | Initiate the radiographic exposure.   | IP.1.A.1-3.                 |
| 46. | Monitor procedure dose metrics against the significant dose reference level (NCRP report #168).                                       | IP.1.D.                     |
| 47. | Document and assess accuracy of dose metrics for patient exams per compliance regulations.  | PC.1.C.3.D.,<br>PC.1.C.3.E. |
| 48. | Adjust digital images (e.g., roadmapping, subtraction, magnification).  | IP.1.A.1-3.                 |
| 49. | Postprocess images (e.g., 3D reconstruction, annotation).   | IP.1.A.5-6.                 |
| 50. | Assist with ultrasound guidance.  | PC.1.B.7.D.,<br>P.1-2. FOQ  |
| 51. | Assist in hybrid OR suite.  | P.1-2. FOQ                  |
| 52. | Use interventional and diagnostic nonimaging equipment (e.g., balloons, wires).   | P.1-2. FOQ                  |
| 53. | Operate interventional procedural equipment:  | IP.1.C., P.1-2. FOQ         |
|     | a. ultrasound unit  | IP.1.C.1.                   |
|     | b. intravascular ultrasound (IVUS)  | IP.1.C.2., P.1.A.5.         |
|     | c. optical coherence tomography (OCT)   | IP.1.C.3., P.1.A.5.         |
|     | d. intracardiac echocardiography (ICE)  | IP.1.C.4., P.1.A.3.         |
|     | e. fractional flow reserve (FFR)/instantaneous wave-free ratio (IFR)  | P.1.A.4., P.1.C.5.          |
|     | f. cryo/microwave ablation  | P.1.D.2.                    |
|     | g. thrombectomy   | P.2.A.5.                    |
|     | h. thrombolysis   | P.2. FOQ                    |
|     | i. atherectomy  | P.2.A.2., P.2.A.3.          |
|     | j. intra-aortic balloon pump (IABP)   | P.2.A.8.                    |
|     | k. catheter-based ventricular assist device   | P.2.A.10.                   |
|     | l. extracorporeal membrane oxygenation (ECMO)   | P.2.A.12.                   |
|     | m. laser  | P.2.A.2., P.2.A.3.          |
|     | n. lithotripsy (balloon or catheter)  | P.2.A.11.                   |
| 54. | Monitor and record procedural data (e.g., injection data, physiologic data, administered medications, complications).                 | PC.1.C.                     |
| 55. | Evaluate individual occupational exposure reports to determine if values for the reporting period are within established limits.      | IP.1.D.2.                   |



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**Assist with the following procedures:**

**Vascular Access Assessment**

56.	Femoral angiography	P.1.B.1.
57.	Carotid angiography	P.1.B.2.
58.	Radial angiography	P.1.B.5.
59.	Brachial angiography	P.1.B.6.
60.	Jugular angiography	P.1.B.7.
61.	Axillary angiography	P.1.B.8.
62.	Subclavian angiography	P.1.B.
63.	Ulnar angiography	P.1.B.
64.	Vascular patency (e.g., Allen test, Barbeau test)	PC.1.B.7.A.

**Vascular Diagnostic Procedures**

65.	Pulmonary angiography	P.1.A.2.C.
66.	Pulmonary pressure measurement	P.1.A.2.C.
67.	Aortography	P.1.A.2.D.
68.	Great vessel angiography	P.1.B.4.
69.	Coronary angiography	P.1.A.2.A.
70.	Renal angiography	P.1.B.3.
71.	Femoral angiography	P.1.B.1.
72.	Internal mammary angiography	P.1.B.9.
73.	Carotid angiography	P.1.B.2.
74.	Ventriculography	P.1.A.2.E.
75.	Coronary bypass graft angiography	P.1.A.2.A.
76.	Intravascular ultrasound (IVUS)	P.1.A.5.
77.	Optical coherence tomography (OCT)	P.1.A.5.
78.	Cardiac output calculations and measurement	P.1.C.4.
79.	Point of care blood sampling (e.g., ACT, ABG)	PC.1.B.8.
80.	Biopsies (e.g., transvenous endomyocardial biopsy)	PC.1.G.2., P.1.A.6.
81.	Intracardiac echocardiography (ICE)	P.1.A.3.
82.	Right heart catheterization	P.1.A.1.
83.	Fractional flow reserve (FFR)	P.1.A.4.
84.	Shunt detection	P.1.C.3.
85.	Ventricular volume measurement (ejection fraction)	P.1.C.1.



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**Activity**

- 86. Cardiac valve area calculations and measurements
- 87. Electrophysiology studies

P.1.C.2.  
P.1.D.

**Interventional Procedures**

- 88. Coronary angioplasty
- 89. Peripheral angioplasty
- 90. Coronary atherectomy:
  - a. directional
  - b. rotational
  - c. laser
  - d. orbital (e.g., CSI®)
- 91. Peripheral atherectomy:
  - a. directional
  - b. rotational
  - c. laser
  - d. orbital (e.g., CSI®)
- 92. Intravascular lithotripsy (e.g., Shockwave®)
- 93. Pulmonary thrombectomy
- 94. Coronary stent placement
- 95. Peripheral stent placement
- 96. Coronary thrombectomy:
  - a. mechanical
  - b. pharmacological
- 97. Arrhythmia ablation
- 98. Atrial fibrillation
- 99. Atrial flutter
- 100. Ventricular tachycardia
- 101. Cardioversion
- 102. Pacemaker:
  - a. permanent
  - b. temporary
  - c. leadless
- 103. Pericardiocentesis
- 104. Defibrillator implantation

P.2.A.1.A.  
P.2.A.1.B.  
P.2.A.2.  
P.2.A.2.A.  
P.2.A.2.B.  
P.2.A.2.C.  
P.2.A.2.D.  
P.2.A.3.  
P.2.A.3.A.  
P.2.A.3.B.  
P.2.A.3.C.  
P.2.A.3.D.  
P.2.A.11.  
P.2.A.5.  
P.2.A.4.A.  
P.2.A.4.B.  
P.2.A.5.  
P.2.A.5.A.  
P.2.A.5.B.  
P.1.D.2.  
P.1.D.2.A.  
P.1.D.2.B.  
P.1.D.2.C.  
P.1.D.3.  
P.1.D.4.A.  
P.1.D.4.A.1.  
P.1.D.4.A.2.  
P.1.D.4.A.3.  
P.2.A.7.  
P.1.D.4.B.



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### Activity

105. Lead extraction	P.1.D.4.D.
106. Patent foramen ovale/atrial septal defect closure	P.2.B.1.
107. Ventricular septal defect closure	P.2.B.2.
108. Ventricular assist device implantation:	P.2.A.10.
a. left ventricle	P.2.A.10.A.
b. right ventricle	P.2.A.10.B.
109. Intra-aortic balloon counterpulsation	P.2.A.8.
110. Distal protection device placement/retrieval	P.2.A.13.
111. Foreign body removal	P.2.A.9.
112. IVC filter placement/retrieval	P.2.A.6.
113. Transcatheter aortic valve implantation/replacement	P.2.B.3.
114. Transcatheter mitral valve repair	P.2.B.5.
115. Atrial appendage closure device implantation	P.2.B.6.
116. Extracorporeal membrane oxygenation system placement (ECMO)	P.2.A.12.
117. Valvuloplasty	P.2.B.4.

### Postprocedure Patient Care

118. Vascular closure device placement:	P.1-2. FOQ
a. permanent	P.1-2. FOQ
b. nonpermanent	P.1-2. FOQ
119. Apply pressure to arterial or venous puncture site:	P.1-2. FOQ
a. manual pressure	P.1-2. FOQ
b. external device	P.1-2. FOQ
120. Apply dressing (e.g., surgical glue, hemostatic dressing, external fixation).	P.1-2. FOQ
121. Assist with access site complication management.	P.1-2. FOQ