



Vascular Sonography Examination

The purpose of *The American Registry of Radiologic Technologists® (ARRT®) Vascular Sonography Examination* is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of vascular sonographers. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of vascular sonographers. The results of the most recent practice analysis are reflected in this document.¹

The *Task Inventory for Vascular Sonography* 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 Vascular Sonography*. Every content category can be linked to one or more tasks on the task inventory.

The table below presents the two major content 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 Questions²
Image Production	75
Basic Principles of Ultrasound and Equipment	
Image Formation	
Evaluation and Selection of Representative Images	
Procedures	85
Abdominal/Pelvic Vasculature	
Arterial Peripheral Vasculature	
Venous Peripheral Vasculature	
Extracranial Cerebral Vasculature and Other Sonographic Procedures	
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 Each exam includes an additional 40 unscored (pilot) questions. On the pages that follow, the approximate number of test questions allocated to each content category appears in parentheses.



Image Production (75)

1. Basic Principles of Ultrasound and Equipment (28)

- A. Ultrasound Unit
- B. Transducer
 - 1. selection
 - 2. care
- C. ABI/Pulse Volume Recording Equipment
 - 1. cuff selection
 - 2. treadmill
- D. Recognition of Malfunctions
- E. Generation of Signal
- F. Propagation of Signal
 - 1. speed
 - 2. frequency
 - 3. reflection and refraction
 - 4. intensity
 - 5. acoustic impedance
 - 6. attenuation
 - 7. resolution
- G. Spectral and Continuous Wave Doppler
- H. Color and Power Doppler
- I. Bioeffects

2. Image Formation (12)

- A. Transducer Selection
 - 1. frequency
 - 2. type
- B. Selection and Adjustment of Technical Factors
 - 1. power
 - 2. focal zone
 - 3. depth
 - 4. compensation
 - 5. gain
 - 6. frame rate
 - 7. Doppler gain
 - 8. Doppler angle
 - 9. gate (sample volume) size/placement
 - 10. wall filter
 - 11. scale/pulse repetition frequency (PRF)
 - 12. color box (size and steering)
 - 13. dynamic range
 - 14. line density
 - 15. spectral baseline
- C. Measurements from Spectral Analysis
 - 1. peak systolic velocity (PSV)
 - 2. end diastolic velocity (EDV)
 - 3. resistive index (RI)/pulsatility index (PI)
 - 4. Measure of Systolic Acceleration
 - a. acceleration time (AT)
 - b. acceleration index (AI)
 - c. tardus parvus waveform
 - 5. volume flow

(Image Production continues on the following page)



Image Production (continued)

3. Evaluation and Selection of Representative Images (35)

- A. Arterial and Venous Hemodynamics
 - 1. flow patterns (*e.g., turbulence, phasicity)
 - 2. pressure
 - 3. velocity
 - 4. peripheral vascular resistance
 - 5. compliance
- B. Criteria for Diagnostic Quality
 - 1. proper demonstration of anatomical structure
 - 2. proper demonstration of pathological conditions
 - 3. artifacts
 - 4. improvement of suboptimal images
- C. Color and Spectral Analysis
 - 1. color aliasing
 - 2. direction of flow
 - 3. presence or absence of flow
 - 4. differentiation of normal and abnormal spectral waveforms

*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.



Procedures (85)

TYPE OF EXAM

1. Abdominal/Pelvic Vasculature (20)

A. Arterial

1. aorta
2. celiac
3. hepatic
4. splenic
5. superior mesenteric/inferior mesenteric
6. renal
7. common iliac
8. internal iliac
9. external iliac

B. Venous

1. inferior vena cava
2. hepatic
3. portal
4. splenic
5. superior mesenteric
6. renal
7. pelvic varices
8. common iliac
9. internal iliac
10. external iliac

C. Transplant

1. liver
2. kidney

FOCUS OF QUESTIONS

1. Practice Parameters (e.g., AIUM, ACR, IAC)

- clinical indications
- patient preparation
- patient positioning
- instrumentation (e.g., transducer, stand-off pads)
- technical factors
- evaluation and documentation of visualized anatomy
- optimizing image quality
- annotate images

2. Anatomy and Physiology

- normal
- normal variant
- abnormal
- measurements

3. Abnormalities

- pathology
- congenital anomalies
- lab values
- differential diagnosis

4. Doppler Applications/Blood Flow Characteristics

(Procedures continue on the following page.)



Procedures (continued)

TYPE OF EXAM

2. Arterial Peripheral Vasculature (22)

- A. Upper Extremity
 - 1. subclavian
 - 2. axillary
 - 3. brachial
 - 4. radial
 - 5. ulnar
 - 6. digital (including Allen test)
- B. Lower Extremity
 - 1. external iliac
 - 2. common femoral
 - 3. superficial femoral
 - 4. deep femoral
 - 5. popliteal
 - 6. tibioperoneal trunk
 - 7. posterior tibial
 - 8. anterior tibial
 - 9. peroneal
 - 10. dorsalis pedis
- C. Stress/Pressure Testing
 - 1. PVR (pulse volume recording)
 - 2. segmental pressures – upper extremities
 - 3. segmental pressures – lower extremities
 - 4. ABI (ankle brachial index)
 - 5. post-exercise testing

FOCUS OF QUESTIONS

- 1. **Practice Parameters (e.g., AIUM, ACR, IAC)**
 - clinical indications
 - patient preparation
 - patient positioning
 - instrumentation (e.g., transducer, stand-off pads)
 - technical factors
 - evaluation and documentation of visualized anatomy
 - optimizing image quality
 - annotate images
- 2. **Anatomy and Physiology**
 - normal
 - normal variant
 - abnormal
 - measurements
- 3. **Abnormalities**
 - pathology
 - congenital anomalies
 - lab values
 - differential diagnosis
- 4. **Doppler Applications/Blood Flow Characteristics**

(Procedures continue on the following page.)



Procedures (continued)

TYPE OF EXAM

3. Venous Peripheral Vasculature (20)

- A. Upper Extremity Venous
 - 1. internal jugular
 - 2. subclavian
 - 3. axillary
 - 4. brachial
 - 5. cephalic
 - 6. basilic
 - 7. radial
 - 8. ulnar
- B. Lower Extremity Venous
 - 1. external iliac
 - 2. common femoral
 - 3. femoral
 - 4. deep femoral
 - 5. popliteal
 - 6. great saphenous
 - 7. small saphenous
 - 8. tibioperoneal trunk
 - 9. calf veins
- C. Venous Testing
 - 1. vein mapping (upper and lower)
 - 2. reflux assessment (e.g., perforators, varicose veins, valve competency, ablations)

FOCUS OF QUESTIONS

1. Practice Parameters (e.g., AIUM, ACR, IAC)

- clinical indications
- patient preparation
- patient positioning
- instrumentation (e.g., transducer, stand-off pads)
- technical factors
- evaluation and documentation of visualized anatomy
- optimizing image quality
- annotate images

2. Anatomy and Physiology

- normal
- normal variant
- abnormal
- measurements

3. Abnormalities

- pathology
- congenital anomalies
- lab values
- differential diagnosis

4. Doppler Applications/Blood Flow Characteristics

(Procedures continue on the following page.)



Procedures (continued)

TYPE OF EXAM

4. Extracranial Cerebral Vasculature and Other Sonographic Procedures (23)

- A. Carotid Artery (CCA, ICA, ECA)
- B. Vertebral Artery
- C. Subclavian Artery
- D. Other Sonographic Procedures
 - 1. bypass grafts
 - 2. endografts
 - 3. dialysis access grafts/fistulae
 - 4. stents
 - 5. angioplasty
 - 6. thrombolysis
 - 7. post catheterization (e.g., pseudoaneurysm treatment, compression, guided thrombin injection)
 - 8. IVC filters
 - 9. TIPS
 - 10. lines
 - 11. post endarterectomy

FOCUS OF QUESTIONS

1. Practice Parameters (e.g., AIUM, ACR, IAC)

- clinical indications
- patient preparation
- patient positioning
- instrumentation (e.g., transducer, stand-off pads)
- technical factors
- evaluation and documentation of visualized anatomy
- optimizing image quality
- annotate images

2. Anatomy and Physiology

- normal
- normal variant
- abnormal
- measurements

3. Abnormalities

- pathology
- congenital anomalies
- lab values
- differential diagnosis

4. Doppler Applications/Blood Flow Characteristics