



Vascular Sonography

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 Sonography* is provided to assist candidates with these requirements.

Candidates for vascular sonography 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
Image Production (includes)	1
<i>Basic Principles of Ultrasound and Equipment</i>	
<i>Image Formation</i>	
<i>Evaluation and Selection of Representative Images</i>	
Procedures (includes)	1
<i>Abdominal/Pelvic Vasculature</i>	
<i>Arterial Peripheral Vasculature</i>	
<i>Venous Peripheral Vasculature</i>	
<i>Extracranial Cerebral Vasculature and Other Sonographic Procedures</i>	
Total	16

Acceptable Examples:

Example 1	Example 2	Example 3
Image Production – 8 hours Procedures – 8 hours	Image Production – 2 hour Procedures – 14 hours	Image Production – 10 hours Procedures – 6 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.



Image Production

1. Basic Principles of Ultrasound and Equipment

- 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

- 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

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

* 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.



Procedures

TYPE OF EXAM

1. Abdominal/Pelvic Vasculature

- 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

Questions for each section of the exam may address any of the following factors, as appropriate:

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

- 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

Questions for each section of the exam may address any of the following factors, as appropriate:

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

- 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

Questions for each section of the exam may address any of the following factors, as appropriate:

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

- 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

Questions for each section of the exam may address any of the following factors, as appropriate:

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