



# Breast 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 Breast Sonography* is provided to assist candidates with these requirements.

Candidates for breast sonography certification and registration must document at least 16 hours of structured education<sup>1</sup>. 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 ARRT<sup>2</sup>, 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
Patient Care (includes) <i>Patient Interactions and Management</i>	1
Image Production (includes) <i>Basic Principles of Ultrasound and Equipment</i> <i>Image Formation</i> <i>Evaluation and Selection of Representative Images</i>	1
Procedures (includes) <i>Anatomy and Physiology</i> <i>Pathology</i> <i>Surgical/Treatment Changes and Interventional Procedures</i>	1
<b>Total</b>	<b>16</b>

## Acceptable Examples:

Example 1	Example 2	Example 3
Patient Care – 3 hours Image Production – 6 hours Procedures – 7 hours	Patient Care – 1 hour Image Production – 1 hour Procedures – 14 hours	Patient Care – 1 hour Image Production – 10 hours Procedures – 5 hours
TOTAL – 16 hours	TOTAL – 16 hours	TOTAL – 16 hours

<sup>1</sup>. 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.

<sup>2</sup>. 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.



## Patient Care

### 1. Patient Interactions and Management

- A. Patient's Rights and Safety
  - 1. verify patient's identity
  - 2. maintain confidentiality (\*e.g., HIPAA)
  - 3. follow American Hospital Association (AHA) Patient Care Partnership (Patient's Bill of Rights)
  - 4. provide safe and sanitary conditions
  - 5. observe and monitor vital signs
  - 6. monitor auxiliary equipment
- B. Respond Regarding Accreditation of Ultrasound Facilities and Personnel
- C. Verification of Requested Examination
  - 1. sequence multiple imaging studies appropriately
  - 2. comparison of request to clinical indications for appropriateness
  - 3. review of pertinent patient history and data (e.g., lab values, allergies, medications, breast imaging studies)
  - 4. document physical observations and breast changes (e.g., palpation findings, scarring)
  - 5. obtain appropriate clinical history
- D. Explanation of Current Procedure
- E. Respond to Inquiries About Breast Sonography Versus Other Breast Imaging Modalities (e.g., 2D/3D mammography, CT, MRI, nuclear medicine)
  - 1. benefits
  - 2. limitations
  - 3. dense parenchyma
  - 4. new cancer diagnosis
- F. Breast Cancer
  - 1. epidemiology
    - a. incidence
    - b. risk factors
  - 2. detection
    - a. screening examinations (e.g., breast sonography, 2D/3D mammography, MRI)
    - b. breast palpation (e.g., patient, health care provider)
    - c. signs and symptoms
- G. Respond to inquiries about breast health referencing ACR and ACS accepted guidelines

\* 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.



## Image Production

### 1. Basic Principles of Ultrasound and Equipment

- A. Generation of Signal
- B. Ultrasound Wave Characteristics
  - 1. speed of sound (propagation speed)
  - 2. frequency
  - 3. geometry – reflection and refraction
  - 4. intensity of signal
  - 5. acoustic impedance
  - 6. attenuation coefficient
  - 7. pulsed
  - 8. Doppler
  - 9. specular reflectors
  - 10. amplitude
- C. Fundamentals
  - 1. relationship of speed of sound, frequency, and wavelength
  - 2. image resolution
    - a. axial
    - b. lateral
    - c. elevational
    - d. temporal
    - e. contrast (soft tissue)
  - 3. range equation
  - 4. dynamic range
- D. Ultrasound Unit
  - 1. console
  - 2. monitor
  - 3. transducers
    - a. piezoelectric effect
    - b. components
    - c. resonance frequency
    - d. beam characteristics (e.g., near zone/field, far zone)
    - e. focusing
    - f. array types

### 2. Image Formation

- A. Transducer Selection
  - 1. frequency
  - 2. type
- B. Selection and Adjustment of Technical Factors
  - 1. power
  - 2. focal zone
  - 3. field of view (depth)
  - 4. time-gain compensation (TGC)
  - 5. overall (coarse) gain
  - 6. dynamic range
  - 7. harmonic imaging
  - 8. spatial compounding
- C. Safety and Bioeffects
- D. Patient Positioning
- E. Acoustic Transmission Media (e.g., stand-off)
- F. Image Orientation
- G. Image Annotation
  - 1. patient identification
  - 2. side (e.g., laterality)
  - 3. scan plane (e.g., radial or antiradial, transverse or longitudinal)
  - 4. clock face
  - 5. centimeters from the nipple
- H. Other Imaging Methods
  - 1. Doppler
    - a. spectral
    - b. color
    - c. power
  - 2. fremitus
  - 3. elastography (e.g., shear wave, strain)
  - 4. panoramic imaging
  - 5. 3D
- I. Image Display and Storage
  - 1. display
    - a. pre- and post-processing
    - b. brightness and contrast
    - c. display mode (e.g., Doppler, brightness)
  - 2. PACS

(Image Production continues on the following page.)



## **Image Production (continued)**

### **3. Evaluation and Selection of Representative Images**

#### **A. Criteria for Diagnostic Quality**

1. demonstration of anatomic structure
2. demonstration of pathologic conditions
3. use of calipers

#### **B. Artifact Recognition**

1. shadowing
2. enhancement
3. reverberation
4. color Doppler flash
5. speed propagation
6. edge shadowing
7. other

#### **C. Modification of Technique to Optimize Images**

#### **D. Correlation with Mammographic Findings**

1. triangulation
2. image concordance
3. ACR BI-RADS® classification

#### **E. Correlation with MR Findings**

1. quadrant
2. depth
3. size
4. margin

#### **F. Correlation with CT**

#### **G. Correlation with PET/CT and/or PEM**

#### **H. Evaluation of Sonographic Equipment and Accessories**

1. equipment quality control
  - a. sensitivity (e.g., contrast resolution, detection of lesion, dead zone)
  - b. vertical and horizontal distance accuracy
  - c. focal zone
  - d. resolution (e.g., lateral, axial)
  - e. TGC characteristics
  - f. overall gain
  - g. dynamic range
2. recognition of equipment malfunctions
3. clean, disinfect, and maintain equipment (e.g., transducers, keyboard, monitor, filters)



## Procedures

### 1. Anatomy and Physiology

- A. Ducts
- B. Fibroglandular Tissue
- C. Fat
- D. Skin
- E. Cooper Ligament
- F. Fascia
- G. Pectoralis Muscle
- H. Ribs
- I. Pregnancy Induced Changes
- J. Nipple
- K. Vascular System
- L. Lymphatic System
  - 1. sentinel lymph node(s)
  - 2. regional lymph nodes
- M. Axilla

### 2. Pathology

- A. Benign Conditions and Sonographic Features (e.g., echogenicity, posterior acoustic features)
  - 1. cyst
  - 2. galactocele
  - 3. sebaceous cyst
  - 4. fibroadenoma
  - 5. papilloma
  - 6. lipoma
  - 7. hamartoma
  - 8. abscess and inflammation
  - 9. traumatic changes
  - 10. fat necrosis
  - 11. ductal ectasia
  - 12. edema
  - 13. diabetic mastopathy
  - 14. pseudoangiomatous stromal hyperplasia (PASH)
  - 15. phyllodes
  - 16. radial scar
  - 17. gynecomastia
  - 18. lymph nodes

- B. High Risk Conditions and Sonographic Features (e.g., echogenicity, posterior acoustic features)

- 1. lobular carcinoma in situ (LCIS)
- 2. atypical ductal hyperplasia (ADH)
- 3. atypical lobular hyperplasia (ALH)
- 4. papilloma

- C. Malignant Conditions and Sonographic Features (e.g., echogenicity, posterior acoustic features)

- 1. ductal carcinoma in situ (DCIS)
- 2. invasive ductal carcinoma
- 3. invasive lobular carcinoma
- 4. medullary carcinoma
- 5. mucinous (colloid) carcinoma
- 6. papillary carcinoma
- 7. tubular carcinoma
- 8. inflammatory carcinoma
- 9. Paget's disease
- 10. phyllodes
- 11. lymphoma
- 12. metastasis
- 13. lymph nodes

### 3. Surgical/Treatment Changes and Interventional Procedures

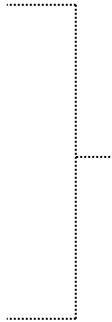
- A. Post-Surgical Changes (i.e., lumpectomy, axillary dissection, and mastectomy)
- B. Hematomas
- C. Breast Reduction
- D. Breast Augmentation
- E. Post-Radiation Changes
- F. Neo-Adjuvant Chemotherapy
- G. Hormonal Therapy (e.g., tamoxifen)
- H. Post Mastectomy Reconstruction (e.g., TRAM flap, latissimus dorsi)

(Procedures continue on the following page.)



## Procedures (continued)

- I. Interventional Breast Sonography Procedures
  - 1. fluid aspiration
  - 2. fine needle aspiration
  - 3. core biopsy
  - 4. vacuum-assisted biopsy
  - 5. clip placement
  - 6. needle localization



### FOCUS OF QUESTIONS

Questions about each of the procedures listed on the left may focus on any of the following factors:

- A. Explain Procedure, Risks, and Benefits
- B. Verify Informed Consent
- C. Select and Prepare Equipment
- D. Perform Time Out Procedure
- E. Position Patient
- F. Practice Infection Control and Prevention
  - 1. aseptic technique
  - 2. sharps disposal
  - 3. biohazard disposal (OSHA Guidelines)
- G. Assist with procedure
- H. Provide Post-Procedural Care and Instructions
- I. Hemostasis