



# Breast Sonography

The purpose of continuing qualifications requirements (CQR) is to assist registered technologists in documenting their continued qualifications in the disciplines of certification and registration held. To accomplish this purpose the continuing qualifications requirements are presented in three parts: the professional profile, the structured self assessment (SSA) and continuing education (CE).

The purpose of the CQR SSA is to assist registered technologists identify gaps in the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required for practice within the disciplines of certification and registration held and help direct their professional development efforts.

The *Structured Self Assessment Content Specifications for Breast Sonography* is provided to assist breast sonographers during their CQR compliance period. Its purpose is to prepare breast sonographers for the SSA and to help education providers develop coursework for the breast sonographers who need to address specified areas with targeted continuing education. Targeted CE is assigned only if a standard is not met in a category on the SSA.

The SSA is composed of sets of questions that are designed to evaluate an individual's knowledge in topics related to current practice. Participants have a maximum of 70 minutes to complete the SSA. Please allow an additional eight minutes for the tutorial, two minutes for the non-disclosure agreement (NDA), and 10 minutes for the survey.

The table below presents the major categories and subcategories covered on the SSA. The number of questions in each category are listed in bold and number of questions in each subcategory in parentheses. The potential number of targeted CE credits that would be prescribed if the standard is not met, are across from each subcategory, with the maximum amount listed at the bottom. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

<b>Content Category</b>	<b>Number of Questions</b>	<b>Potential CE Credits</b>
<b>Patient Care</b>	<b>10</b>	
<i>Patient Interactions and Management (10)</i>		3
<b>Image Production</b>	<b>30</b>	
<i>Basic Principles of Ultrasound (10)</i>		7
<i>Image Formation (10)</i>		6
<i>Evaluation and Selection of Representative Images (10)</i>		6
<b>Procedures</b>	<b>30</b>	
<i>Anatomy and Physiology (10)</i>		3
<i>Pathology (10)</i>		6
<i>Breast Interventions (10)</i>		3
	<b>Total 70</b>	<b>Maximum CE 34</b>



## Patient Care

### 1. Patient Interactions and Management

- A. Patient Communication
  - 1. explanation of procedure
    - a. diagnostic ultrasound
    - b. screening ultrasound
  - 2. patient assessment
    - a. physical observations and symptoms (\*e.g., breast changes, palpation findings, scarring)
    - b. medical history and clinical indications
      - 1. previous surgery
      - 2. previous imaging
      - 3. family history
  - 3. review and respond to inquiries regarding benefits and limitations of breast imaging studies
    - a. breast sonography
    - b. automated whole breast ultrasound
    - c. mammography
    - d. breast MRI
    - e. nuclear medicine (e.g., BSGI, PET/CT)
    - f. CT
  - 4. patient positioning
  - 5. explanation of findings and follow-up recommendations (ACR guidelines)
    - a. ACR BI-RADS®
    - b. tissue composition (breast density)
- B. Accreditation of Ultrasound Facilities and Personnel Certification Requirements
- C. Verification of Requested Examination
  - 1. determination of appropriate sequence of imaging studies
  - 2. correlation of imaging request to clinical indications for appropriateness
  - 3. correlation of other imaging with breast ultrasound
    - a. mammography
      - 1. quadrant (triangulation)
      - 2. depth
      - 3. size
      - 4. margin
    - b. breast MR
      - 1. quadrant
      - 2. depth
      - 3. size
      - 4. margin
    - c. CT
    - d. PET/CT

- D. Breast Cancer
  - 1. epidemiology
    - a. incidence
    - b. risk factors
  - 2. signs and symptoms
- E. Communication of Imaging to Supervising Physician (radiologist, surgeon)
  - 1. evaluation of echo patterns (e.g., anechoic, hypoechoic, hyperechoic, isoechoic)
  - 2. review of findings

\*e.g., The abbreviation "e.g.," is used to indicate that examples are listed in parenthesis, but that is not a complete list of all possibilities.



## Image Production

### 1. Basic Principles of Ultrasound

- A. Generation of Signal
  - 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. types
- B. Ultrasound Wave Characteristics
  - 1. speed of sound (propagation speed)
  - 2. frequency
  - 3. 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 between 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
  - 5. acoustic transmission media (e.g., gel)

### 2. Image Formation

- A. Selection and Adjustment of Technical Factors
  - 1. power
  - 2. focal zone
  - 3. field of view (depth)
  - 4. time-gain compensation (TGC)
  - 5. overall gain
  - 6. dynamic range
  - 7. harmonic imaging
  - 8. spatial compounding
- B. Safety
  - 1. sonographer ergonomics<sup>1</sup>
    - a. equipment
    - b. work environment
    - c. sonographer body mechanics
  - 2. patient bioeffects
- C. Image Orientation and Transducer Manipulation
  - 1. superior and inferior
  - 2. lateral and medial
- D. Image Documentation (ACR Guidelines)
  - 1. patient identification
  - 2. laterality
  - 3. transducer orientation (e.g., radial or antiradial, transverse or longitudinal)
  - 4. clock position
  - 5. distance from the nipple
  - 6. lesion measurements
- E. Other Imaging Tools
  - 1. Doppler
    - a. color
    - b. power
  - 2. fremitus
  - 3. panoramic imaging
  - 4. stand-off pad
  - 5. cine loop

<sup>1</sup> Operator ergonomics is referenced in the "[Industry Standards for the Prevention of Work Related Musculoskeletal Disorders in Sonography.](#)"

(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
  - 4. improvement of suboptimal images
- B. Artifact Recognition
  - 1. posterior shadowing
  - 2. edge shadowing
  - 3. posterior enhancement
  - 4. reverberation
  - 5. color Doppler flash
  - 6. speed propagation
  - 7. ring-down
- C. Image Display and Storage
  - 1. post-processing
    - a. dynamic range
    - b. cine loop
    - c. gain
    - d. annotations and measurements
  - 2. PACS
- D. 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<sup>2</sup>, keyboard, monitor, filters)

<sup>2</sup>Transducer infection control is referenced in the ["Guidelines for Infection Prevention and Control in Sonography: Reprocessing the Ultrasound Transducer."](#)



## Procedures

### 1. Anatomy and Physiology

- A. Ducts
- B. Lobules
- C. Fibroglandular Tissue
- D. Fat
- E. Skin
- F. Cooper Ligament
- G. Fascia
- H. Pectoralis Muscle
- I. Ribs
- J. Pregnancy Induced Changes
- K. Nipple
  - 1. areola
  - 2. Montgomery glands
- L. Vascular System
- M. Lymphatic System
  - 1. axilla
  - 2. regional lymph nodes

### 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 tumor
  - 16. gynecomastia
  - 17. 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 with atypia
  - 5. radial scar
- C. Malignant Conditions and Sonographic Features (e.g., echogenicity, posterior acoustic features)
  - 1. ductal carcinoma in situ (DCIS)
  - 2. invasive ductal carcinoma
    - a. medullary carcinoma
    - b. mucinous (colloid) carcinoma
    - c. papillary carcinoma
    - d. tubular carcinoma
  - 3. invasive lobular carcinoma
  - 4. inflammatory carcinoma
  - 5. Paget disease
  - 6. phyllodes
  - 7. lymphoma
  - 8. metastasis
  - 9. metastatic lymph nodes

### 3. Breast Interventions

- A. Surgical Procedures\*
  - 1. lumpectomy
  - 2. axillary dissection
  - 3. mastectomy
  - 4. augmentation
  - 5. reduction
  - 6. reconstruction
- B. Postoperative Breast Changes
  - 1. hematoma
  - 2. seroma
  - 3. surgical scarring
- C. Therapeutic Treatment Changes\*
  - 1. chemotherapy
  - 2. hormonal therapy (e.g., antiestrogen therapy)
  - 3. post-radiation changes

\*The breast sonographer is expected to have basic knowledge of these procedures and treatment changes.

(Procedures continues on the following page.)



## Procedures (continued)

### D. Image-Guided Breast Procedures

1. Fluid Aspiration (e.g., abscess, seroma, cyst)
2. Fine Needle Aspiration Biopsy
3. Needle Core Biopsy (e.g., spring-loaded)
4. Vacuum-Assisted Core Biopsy
5. Clip Placement
6. Needle/Wire 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. Consent (e.g., informed, oral, implied)
- 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. Communicate with Performing Physician
- I. Provide Post-Procedural Care and Instructions
- J. Hemostasis