Sonography

The purpose of continuing qualifications requirements (CQR) is to assist 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 Structured Self Assessment Content Specifications for Sonography is provided to assist technologists during their CQR compliance period. Its purpose is to prepare technologists for the SSA and to help education providers develop coursework for the technologists 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 are allowed a maximum of two hours and 45 minutes to complete the SSA for Sonography.

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.

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<td><strong>Total 90</strong></td>
<td><strong>Maximum CE 36</strong></td>
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1 The SSA includes an additional 45 unscored (pilot) questions.
Patient Care

1. Patient Interactions and Management

A. Confirmation of Exam Requisition
   1. verification of patient identification
   2. comparison of request to clinical indications
   3. verification of exam coding

B. Legal Issues
   1. common terminology
      (*e.g., negligence, malpractice)
   2. legal doctrines (e.g., respondeat superior, res ipsa loquitur)

C. Patient’s Rights
   1. informed consent (written, oral, implied)
   2. confidentiality (HIPAA)
   3. Patient’s Bill of Rights
      (e.g., privacy, access to information, health care proxy, research participation)

D. ARRT Standards of Ethics

E. Interpersonal Communications
   1. modes of communication
      a. verbal, written
      b. nonverbal
         (e.g., eye contact, touching)
   2. challenges in communication
      a. patient characteristics
         (e.g., cultural factors, physical or emotional status)
      b. strategies to improve understanding
   3. patient education
      a. pre-procedural preparation
      b. explanation of procedure
         (e.g., risks, benefits)
      c. follow-up instructions
      d. referral to other services
   4. medical terminology

F. Patient Monitoring and Safety

   1. ultrasound bioeffects and safety
      a. pressure and intensity measurement
         1. thermal index (soft tissue, cranium, bone)
      2. mechanical index
      b. research on biological effects
      c. AIUM recommendations
   2. routine monitoring
      a. fall prevention
      b. vital signs
      c. physical signs and symptoms
   3. interventional procedures
      a. patient preparation
      b. time-out
      c. informed consent
      d. sterile technique
      e. follow-up instructions
   4. patient transfer and movement
      a. operator ergonomics
      b. body mechanics (balance, alignment, movement)
      c. patient transfer
   5. assisting patients with medical equipment
      a. infusion catheters and pumps
      b. pacemakers
      c. oxygen delivery systems
      d. other (e.g., nasogastric tubes, urinary catheters)
   6. response to common emergencies
      a. allergic reactions
         (e.g., contrast, latex)
      b. cardiac/respiratory arrest
         (e.g., CPR)
      c. physical injury or trauma
      d. other medical disorders
         (e.g., seizures, diabetic reactions)
Patient Care (continued)

G. Infection Control
1. terminology and basic concepts
   a. types of asepsis
   b. sterile technique
   c. pathogens
      (e.g., fomites, vehicles, vectors)
   d. nosocomial infections
2. cycle of infection
   a. pathogen
   b. source or reservoir of infection
   c. susceptible host
   d. method of transmission (contact, droplet, airborne, common vehicle, vector-borne)
3. CDC Standard Precautions (general patient contact)
   a. handwashing
   b. gloves, gowns
   c. masks
   d. medical asepsis/disinfection
4. additional or transmission-based precautions (e.g., hepatitis B, HIV, MRSA, tuberculosis)
   a. blood borne
   b. airborne (e.g., negative ventilation)
   c. droplet (e.g., mask)
   d. contact (e.g., gloves, gown)
5. reverse isolation
6. disposal of contaminated materials
   a. linens
   b. needles
   c. patient supplies
   d. blood and body fluids
7. equipment
   a. sterilization
   b. disinfection
Image Production

1. Basic Principles of Ultrasound and Equipment
   A. Generation of Signal
      1. transducers
         a. construction and properties
            1. crystal thickness, wavelength
            2. frequency spectrum, resonance
            3. damping
         b. operation
            1. focusing
            2. beam diameter
            3. piezoelectric effect
data_types
      2. beam configuration
         a. near and far field
         b. focal zone
         c. beam profile
      3. pulse characteristics
         a. pulse repetition frequency
         b. pulse repetition period
         c. spatial pulse length
         d. duty factor
         e. frequency
         f. resolution
            1. axial
            2. lateral
            3. temporal
            4. elevational
            5. contrast
data_types
      g. transducer malfunctions
   4. technical factors
      a. frequency, bandwidth, Q factor
      b. power
      c. pressure
      d. intensity
      e. amplitude
   5. modes
      a. B-mode
      b. M-mode
      c. Doppler
         1. color
         2. spectral
         3. power/energy

2. Image Formation
   A. Tissue Interactions
      1. beam interactions
         a. speed of sound in soft tissue
         1. density
         2. stiffness
         b. time and distance - range equation
         c. acoustic impedance
         d. normal and oblique incidence
         e. reflection
         f. transmitted/refracted waves
         g. intensity
         h. causes of artifacts
      2. attenuation of signal
         a. frequency dependence
         b. absorption
         c. scattering
      3. bioeffects
         a. thermal
         b. mechanical (e.g., cavitation)
         c. output measures
            (e.g., MI, TIS, TIC, TIB, SPTA)
         d. ALARA
   B. Technical Factors for Diagnostic Quality Images
      1. power
      2. focal zone
      3. depth
      4. gain
      5. compensation
      6. harmonics
      7. spatial compounding
   C. Detection and Display of Echoes
      1. transducer
      2. receiver
      3. amplitude
      4. dynamic range and compression
      5. analog-to-digital converter (ADC)
      6. digital-to-analog converter (DAC)
      7. brightness
      8. contrast
      9. write magnification
     10. post-processing
         (e.g., smoothing, edge enhancement, filtering, read magnification)
     11. emerging technologies
         (e.g., 3D imaging, panoramic imaging)

(Image Production continues on the following page.)
Image Production (continued)

3. Evaluation and Selection of Representative Images

A. Display Modes
   1. real-time imaging
      a. echogenicity of reflectors
      b. echotextures
      c. artifacts
   2. Doppler
      a. angle of incidence
      b. flow direction
      c. flow velocity
      d. spectral display (e.g., RI, PI, scale, wall filter)
      e. hemodynamics

B. Appearance and Causes of Artifacts
   1. gray scale (e.g., reverberation mirror imaging, shadowing, posterior enhancement, comet tail)
   2. Doppler (e.g., aliasing, twinkle, mirror image)

C. Improvement of Suboptimal Images

D. Image Archiving
Procedures

**TYPE OF EXAM**

1. Abdominal and Transplant Vasculature
   A. Aorta and Branches
   B. Inferior Vena Cava (IVC) and Confluences
   C. Portal Veins and Confluences
   D. Transplants (i.e., kidney, liver)
   E. Abdominal Organs
      1. biliary system
         a. gallbladder
         b. bile ducts
            (e.g., CBD, extra-hepatic)
      2. urinary tract
         a. kidneys
         b. ureters
         c. bladder
      3. spleen
      4. pancreas
      5. liver
      6. other
         a. lymph nodes
         b. adrenal glands
         c. gastrointestinal tract
         d. prostate
         e. peritoneal cavity

**FOCUS OF QUESTIONS**

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

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. First Trimester Obstetrics
A. Standard Measurements
   (e.g., heart rate, CRL, MSD)
B. Maternal Anatomy (e.g., uterus, cervix, adnexa, corpus luteum)
C. Embryonic Anatomy and Physiology
   1. fetal number
   2. gestational age
   3. gestational sac
   4. decidual layer
   5. amnion
   6. chorion
   7. yolk sac
   8. embryonic pole
   9. cardiac activity
   10. nuchal translucency
D. Key Abnormalities (e.g., anembryonic pregnancy, spontaneous abortion, ectopic pregnancy, embryonic demise)

3. Second/Third Trimester and High Risk Obstetrics
A. Standard Measurements
   (e.g., BPD, HC, AC, FL)
B. Maternal Anatomy
   (e.g., uterus, cervix, adnexa)
C. Fetal Anatomy and Physiology
   1. fetal number
   2. position, presentation, and lie
   3. gestational age and weight
   4. amniotic fluid volume
   5. cord
   6. placenta
   7. cardiac activity
   8. anatomic systems visualized
      (e.g., GI, CNS, cardiovascular)
   9. nuchal fold
D. Chromosomal Abnormalities
   (e.g., trisomies, triploidy)
E. Genetic Abnormalities
   (e.g., polycystic kidney disease, skeletal dysplasia)
F. Infection (e.g., TORCH)

FOCUS OF QUESTIONS

1. Practice Guidelines (e.g., AIUM, ACR)
   • clinical indications
   • patient preparation
   • patient positioning
   • instrumentation (e.g., transducer, stand-off pads)
   • technical factors
   • evaluation and documentation of visualized anatomy
   • optimizing image quality

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)

<table>
<thead>
<tr>
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</table>
| G. Abnormal Growth and Development (e.g., club foot, atresia, anencephaly, renal agenesis, gastrochisis, VSD) | 1. Practice Guidelines (e.g., AIUM, ACR)  
- clinical indications  
- patient preparation  
- patient positioning  
- instrumentation (e.g., transducer, stand-off pads)  
- technical factors  
- evaluation and documentation of visualized anatomy  
- optimizing image quality |
| H. Neoplasm (e.g., teratoma) | 2. Anatomy and Physiology  
- normal  
- normal variant  
- abnormal  
- measurements |
| I. Multiple Gestations (e.g., chorionicity, amnionicity, twin-to-twin transfusion syndrome, conjoined) | 3. Abnormalities  
- pathology  
- congenital anomalies  
- lab values  
- differential diagnosis |
| K. Amniocentesis | (Procedures continue on the following page.) |
| L. Fetal Biophysical Profile | |
| M. Placenta (e.g., trophoblastic disease, previa, accreta, insufficiency, abruption, hematoma) | |
| N. Amniotic Fluid (e.g., polyhydramnios, oligohydramnios, PROM) | |
| O. Hydrops (immune & non-immune) | |
| P. Intrauterine Growth Restriction (symmetric and asymmetric) | |
| Q. Umbilical Cord (e.g., 2-vessel cord, knots, vasa previa, prolapse) | |
| R. Cervical Incompetence | |
| S. Maternal Disease and Abnormality (e.g., diabetes, uterine anomaly) | |

4. Gynecologic Structures

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<thead>
<tr>
<th>TYPE OF EXAM</th>
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<tr>
<td>A. Uterus</td>
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</tr>
<tr>
<td>1. myometrium</td>
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<td>2. endometrium</td>
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<td>3. cervix</td>
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<td>B. Adnexa</td>
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<td>1. ovaries</td>
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<td>2. fallopian tubes</td>
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<td>3. para-ovarian structures</td>
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<tr>
<td>C. Cul-de-Sac</td>
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<td>D. Vagina</td>
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</tbody>
</table>
Procedures (continued)

### TYPE OF EXAM

5. **Superficial Structures and Other Sonographic Procedures**
   
   A. Neck, Thyroid, and Parathyroid
   
   B. Scrotum and Testes
   
   C. Breasts
   
   D. Other Sonographic Procedures
      
      1. vascular exams
         
         a. venous extremity Doppler (lower and upper)
         
         b. carotid Doppler
         
         c. post catheterization complications
      
      2. pediatric exams
         
         a. neonatal (head, spine, hips)
         
         b. gastrointestinal tract (e.g., appendix, pylorus, intussusceptions)
         
         c. adrenal/renal
      
      3. ultrasound guided interventional procedures (e.g., fine needle aspiration, biopsy, catheter placement)
      
      4. miscellaneous
         
         a. musculoskeletal
         
         b. superficial masses
         
         c. noncardiac chest
            (e.g., pleural space)
         
         d. abdominal wall

### FOCUS OF QUESTIONS

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

2. Anatomy and Physiology
   
   - normal
   
   - normal variant
   
   - abnormal
   
   - measurements

3. Abnormalities
   
   - pathology
   
   - congenital anomalies
   
   - lab values
   
   - differential diagnosis

4. Doppler Applications/Blood Flow Characteristics