



# Computed Tomography

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 Computed Tomography* is provided to assist computed tomography (CT) technologists during their CQR compliance period. Its purpose is to prepare CT technologists for the SSA and to help education providers develop coursework for the CT 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 have a maximum of 105 minutes to complete the SSA. Please allow an additional 18 minutes for the tutorial, two minutes for the non-disclosure agreement (NDA), and 10 minutes for a follow-up 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<sup>1</sup></b>	<b>Potential CE Credits</b>
<b>Patient Care</b>	<b>10</b>	
<i>Patient Interactions and Management (10)</i>		4
<b>Safety<sup>2</sup></b>	<b>10</b>	
<i>Radiation Safety and Dose (10)</i>		4
<b>Image Production</b>	<b>20</b>	
<i>Image Formation (10)</i>		5
<i>Image Evaluation and Archiving (10)</i>		5
<b>Procedures</b>	<b>30</b>	
<i>Head, Spine, and Musculoskeletal (10)</i>		4
<i>Neck and Chest (10)</i>		4
<i>Abdomen and Pelvis (10)</i>		4
<b>Total 70</b>		<b>Max. CE 30</b>

1. The SSA includes an additional 35 unscored (pilot) questions.

2. SI units are the primary (principal) units of radiation measurement used on the computed tomography SSA.



## Patient Care

### 1. Patient Interactions and Management

- A. Patient Assessment and Preparation
  1. clinical history
  2. scheduling and screening
  3. education
  4. consent
  5. immobilization
  6. monitoring
    - a. level of consciousness
    - b. vital signs
    - c. heart rhythm and cardiac cycle
    - d. oximetry
  7. management of accessory medical devices
    - a. oxygen delivery systems
    - b. chest tubes
    - c. in-dwelling catheters
  8. lab values
    - a. renal function (\*e.g., BUN, eGFR, creatinine)
    - b. other (e.g., d-dimer, LFT, INR)
  9. medications and dosage
    - a. current
    - b. pre-procedure medications (e.g., steroid, anti-anxiety)
    - c. post-procedure instructions (e.g., diabetic patient)
- B. Contrast Administration
  1. contrast media
    - a. ionic, nonionic
    - b. osmolarity
    - c. barium sulfate
    - d. water soluble (iodinated)
    - e. air
    - f. water
    - g. other
  2. special contrast considerations
    - a. contraindications
    - b. indications
    - c. pregnancy
    - d. lactation
    - e. dialysis patients
  3. administration route and dose calculations
    - a. IV
    - b. oral
    - c. rectal
    - d. intrathecal
    - e. catheters (e.g., peripheral line, central line, PICC line)
    - f. other (e.g., stoma, intra-articular)
  4. venipuncture
    - a. site selection
    - b. aseptic and sterile technique
    - c. documentation (e.g., site, amount, gauge, concentration, rate and number of attempts)
  5. injection techniques
    - a. safety
    - b. manual
    - c. power injector options
      1. single or dual head
      2. single phase
      3. multi-phase
      4. flow rate
      5. timing bolus
      6. bolus tracking
  6. post-procedure care
    - a. treatment of contrast extravasation
    - b. documentation
  7. adverse reactions
    - a. recognition and assessment
    - b. treatment
    - c. documentation

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



## Safety

### 1. Radiation Safety and Dose

- A. Radiation Physics
  - 1. radiation interaction with matter
  - 2. acquisition (geometry)
  - 3. physical principles (attenuation)
- B. Radiation Protection
  - 1. minimizing patient exposure
    - a. kVp
    - b. mAs
    - c. pitch
    - d. collimation/beam width
    - e. multi-detector configuration
    - f. gating
  - 2. personnel protection
    - a. controlled access
    - b. education
  - 3. shielding
    - a. traditional (e.g., lead apron)
    - b. non-traditional (e.g., bismuth)
  - 4. dose measurement
    - a. CT dose index (CTDI)
    - b. dose length product (DLP)
    - c. documentation
  - 5. patient dose reduction and optimization
    - a. pediatric
    - b. adult
    - c. dose modulation techniques  
(e.g., SMART mA, auto mA, CARE dose, and SURE exposure)
    - d. iterative reconstruction
    - e. dose notification
    - f. dose alert



## Image Production

### 1. Image Formation

- A. CT System Principles, Operation, and Components
  - 1. tube
    - a. x-ray production
    - b. warm-up procedures
  - 2. collimation/beam width
  - 3. generator
  - 4. detectors
    - a. detector configuration
    - b. detector collimation
  - 5. data acquisition system (DAS)
  - 6. computer and array processor
- B. Imaging Parameters and Data Acquisition
  - 1. parameters
    - a. kVp
    - b. mAs
    - c. pitch
    - d. acquisition thickness
    - e. x, y, z planes
    - f. scan field of view (SFOV)
  - 2. acquisition
    - a. axial/sequential
    - b. helical/spiral
    - c. volumetric
- C. Image Processing
  - 1. reconstruction
    - a. filtered backprojection reconstruction
    - b. iterative reconstruction
    - c. interpolation
    - d. reconstruction algorithm
    - e. raw data versus image data
    - f. prospective/retrospective reconstruction
    - g. reconstruction thickness
    - h. reconstruction interval
  - 2. post-processing
    - a. multi-planar reformation (MPR)
    - b. 3D rendering (MIP, SSD, VR)
    - c. quantitative analysis (e.g., distance, diameter, calcium scoring, ejection fraction)

### 2. Image Evaluation and Archiving

- A. Image Display
  - 1. pixel, voxel
  - 2. matrix
  - 3. image magnification
  - 4. display field of view (DFOV)
  - 5. window level, window width
  - 6. cine
  - 7. geometric distance or region of interest (ROI) (e.g., mean, standard deviation [SD])
- B. Image Quality
  - 1. spatial resolution
  - 2. contrast resolution
  - 3. temporal resolution
  - 4. noise and uniformity
  - 5. quality assurance and accreditation
  - 6. CT number (Hounsfield units)
  - 7. linearity
- C. Artifact Recognition and Reduction
  - 1. beam hardening or cupping
  - 2. partial volume averaging
  - 3. motion
  - 4. metallic
  - 5. edge gradient
  - 6. patient positioning (out-of-field)
  - 7. equipment induced
    - a. rings
    - b. streaks
    - c. tube arcing
    - d. cone beam
    - e. capping
- D. Informatics
  - 1. hard/electronic copy (e.g., DICOM file format)
  - 2. archive
  - 3. PACS and electronic medical record (EMR)
  - 4. security and confidentiality
  - 5. networking



## Procedures

### TYPE OF STUDY

#### 1. Head, Spine, and Musculoskeletal

##### A. Head

1. temporal bones/internal auditory canal (IAC)
2. pituitary fossa
3. orbits
4. sinuses
5. maxillofacial and/or mandible
6. temporomandibular joint (TMJ)
7. base of skull
8. brain
9. cranium
10. brain perfusion

##### B. Spine

1. cervical
2. thoracic
3. lumbar
4. sacrum/coccyx
5. post myelography
6. discography

##### C. Musculoskeletal

1. upper extremity
2. lower extremity
3. bony pelvis and/or hips
4. shoulder and/or scapula
5. sternum and/or ribs
6. arthrography

### FOCUS OF QUESTIONS

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

#### Anatomy

- imaging planes
- pathological considerations/recognition
- protocol considerations
- patient considerations (e.g., pediatric, geriatric, bariatric)
- post-processing presentations
- landmarks

#### Contrast Media

- indications
- scan/prep delay
- effect on images

#### Additional Procedures

- vascular (CTA, CTV) (e.g., PE, dissection, runoff, venogram)
- biopsies
- drainage
- aspirations

(Procedures continue on the following page.)



## Procedures (continued)

### TYPE OF STUDY

#### 2. Neck and Chest

- A. Neck
  - 1. larynx
  - 2. soft tissue neck
- B. Chest
  - 1. mediastinum
  - 2. lung
  - 3. heart
  - 4. airway
  - 5. low dose lung screening

#### 3. Abdomen and Pelvis

- A. Abdomen
  - 1. liver
  - 2. biliary
  - 3. spleen
  - 4. pancreas
  - 5. adrenals
  - 6. kidneys and/or ureters
  - 7. GI tract
- B. Pelvis
  - 1. bladder
  - 2. colorectal
  - 3. reproductive organs

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