



Computed Tomography

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.

Candidates for Computed Tomography Certification and Registration must document at least 16 hours of structured education. Structured education activities may be academic courses from an institution accredited by a mechanism recognized by the ARRT¹, 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 area 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.

Content Areas *	Minimum Credits
Patient Care (includes) 1. Patient Interactions and Management 2. Contrast Administration	1
Safety (includes) 1. Radiation Safety and Dosimetry	1
Image Production (includes) 1. Physics and Instrumentation	1
Procedures (includes) 1. Neuro 2. Body 3. Musculoskeletal	1
Total	16

Acceptable Examples:

Example 1	Example 2	Example 3
Patient Care – 3 hours Safety – 2 hours Image Production – 4 hours Procedures – 7 hours	Patient Care – 1 hour Safety – 1 hour Image Production – 1 hour Procedures – 13 hours	Patient Care – 1 hour Safety – 5 hours Image Production – 5 hours Procedures – 5 hours
TOTAL – 16 hours	TOTAL – 16 hours	TOTAL – 16 hours

*The number of questions and organization of content for the Computed Tomography Examination are located in the *Computed Tomography Examination Content Specifications* document.

¹ 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. Clinical History
- B. Scheduling and Screening
- C. Education
- D. Consent
- E. Immobilization
- F. Monitoring
 - 1. level of consciousness
 - 2. vital signs
 - 3. heart rhythm and cardiac cycle
 - 4. oximetry
- G. Management of Accessory Medical Devices
 - 1. oxygen delivery systems
 - 2. chest tubes
 - 3. in-dwelling catheters
- H. Lab Values
 - 1. renal function
(e.g., BUN, eGFR, creatinine)
 - 2. blood coagulation
(e.g., PT, PTT, platelet, INR)
 - 3. other (e.g., D-dimer, LFT)
- I. Medications and Dosage
 - 1. current (reconciliation)
 - 2. pre-procedure medications
(e.g., steroid, anti-anxiety)
 - 3. post-procedure instructions
(e.g., diabetic patient)

2. Contrast Administration

- A. Contrast Media
 - 1. ionic, nonionic
 - 2. osmolarity
 - 3. barium sulfate
 - 4. water soluble (iodinated)
 - 5. air
 - 6. water
 - 7. other
- B. Special Contrast Considerations
 - 1. contraindications
 - 2. indications
 - 3. pregnancy
 - 4. lactation
 - 5. dialysis patients

- C. Contrast Media
 - 1. types of agents
 - 2. indications
 - 3. contraindications
 - 4. dose calculation
 - 5. administration route
 - 6. scan/prep delay
(e.g., bolus timing, test bolus)
- D. Administration Route and Dose Calculations
 - 1. IV
 - 2. oral
 - 3. rectal
 - 4. intrathecal
 - 5. catheters (e.g., peripheral line, central line, PICC line)
 - 6. other (e.g., stoma, intra-articular)
- E. Venipuncture
 - 1. site selection
 - 2. aseptic and sterile technique
 - 3. documentation (e.g., site, amount, gauge, concentration, rate and number of attempts)
- F. Injection Techniques
 - 1. manual
 - 2. power injector options
 - a. single or dual head
 - b. single phase
 - c. multi-phase
 - d. flow rate
- G. Post-Procedure Care
 - 1. treatment of contrast extravasation
 - 2. documentation
- H. Adverse Reactions
 - 1. recognition and assessment
 - 2. treatment
 - 3. documentation



Safety

1. Radiation Safety and Dosimetry

- A. Radiation Physics
 - 1. radiation interaction with matter
 - 2. acquisition (geometry)
 - 3. physical principles (attenuation)
- B. Technical Factors Affecting Patient Dose
 - 1. kVp
 - 2. mAs
 - 3. pitch
 - 4. collimation/beam width
 - 5. multi-detector configuration
 - 6. gating
- C. Radiation Protection and Shielding
 - 1. traditional (e.g., lead apron)
 - 2. non-traditional (e.g., bismuth)
- D. Dose Measurement
 - 1. CT dose index (CTDI)
 - 2. dose length product (DLP)
 - 3. documentation
- E. Patient Dose Reduction and Optimization
 - 1. pediatric
 - 2. adult
 - 3. dose modulation techniques (e.g., SMART mA, auto mA, CARE dose, and SURE exposure)
 - 4. iterative reconstruction



Image Production

1. Physics and Instrumentation

- A. CT System Principles, Operation and Components
 - 1. tube
 - a. kVp
 - b. mA
 - c. warm-up procedures
 - 2. generator
 - 3. detector configuration
 - 4. data acquisition systems (DAS)
 - 5. collimation/beam width
 - 6. computer and array processor
- B. 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 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)
- C. Imaging Processes
 - 1. isocentric positioning
 - 2. scout
 - 3. acquisition methods (e.g., volumetric, axial or sequential)
 - 4. parameter selection (e.g., image thickness, mA, time, algorithm, pitch)
 - 5. protocol modification for pathology or trauma
- D. Image Display
 - 1. pixel, voxel
 - 2. matrix
 - 3. image magnification
 - 4. field of view (scan, reconstruction, and display)
 - 5. window level, window width
 - 6. cine
 - 7. ROI (e.g., mean, standard deviation [SD])
- E. Informatics
 - 1. hard/electronic copy (e.g., DICOM file format)
 - 2. archive
 - 3. pacs
 - 4. security and confidentiality
 - 5. networking
- F. Image Quality
 - 1. spatial resolution
 - 2. contrast resolution
 - 3. temporal resolution
 - 4. noise and uniformity
 - 5. quality assurance
 - 6. CT number (Hounsfield units)
 - 7. linearity
- G. 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



Procedures

1. Neuro

A. Head

1. cranial nerves
2. internal auditory canal
3. temporal bones
4. pituitary
5. orbits
6. sinuses
7. maxillofacial
8. temporomandibular joint
9. posterior fossa
10. brain
11. cranium
12. vascular

B. Neck

1. larynx
2. soft tissue neck
3. vascular

2. Body

A. Chest

1. mediastinum
2. lung
3. heart
4. airway
5. vascular

B. Abdomen

1. liver
2. biliary
3. spleen
4. pancreas
5. adrenals
6. kidneys and/or ureters
7. GI tract
8. vascular

C. Pelvis

1. bladder
2. colorectal
3. reproductive organs
4. vascular

FOCUS OF QUESTIONS:

1. Sectional Anatomy

- sagittal plane
- transverse plane (axial)
- coronal plane
- off-axis (oblique)
- landmarks
- pathology recognition

2. Special Procedures

- 3D studies
- biopsies
- radiation therapy planning
- drainage
- colonography or virtual colonography
- brain perfusion studies
- transplant studies
- screening

(Procedures continue on the following page.)



Procedures (continued)

3. Musculoskeletal

- A. Upper Extremity
- B. Lower Extremity
- C. Spine
- D. Pelvis and/or Hips
- E. Shoulder Girdle
- F. Sternum and/or Ribs
- G. Vascular
- H. Post Myelography
- I. CT Arthrography
- J. Diskography

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