



Computed Tomography

The purpose of the computed tomography examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of computed tomography technologists at entry into the profession. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of computed tomography technologists.¹ The *Task Inventory for Computed Tomography* may be found on the ARRT's website (www.arrt.org).

The *Examination Content Specifications for Computed Tomography* identifies the knowledge areas underlying performance of the tasks on the *Task Inventory for Computed Tomography*. Every content category can be linked to one or more activities on the task inventory.

The table below presents the major content categories and subcategories covered on the examination. The number of test questions in each category are listed in bold and number of test questions in each subcategory in parentheses. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

Content Category	Number of Scored Questions²
Patient Care	22
<i>Patient Interactions and Management (22)</i>	
Safety³	20
<i>Radiation Safety and Dose (20)</i>	
Image Production	55
<i>Image Formation (30)</i>	
<i>Image Evaluation and Archiving (25)</i>	
Procedures	68
<i>Head, Spine, and Musculoskeletal (24)</i>	
<i>Neck and Chest (20)</i>	
<i>Abdomen and Pelvis (24)</i>	
Total	165

¹. A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.

². The exam includes an additional 20 unscored (pilot) questions.

³. SI units are the primary (principal) units of radiation measurement used on the computed tomography examination.



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
- drainages
- 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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