



NMTCB Computed Tomography Examination Content Outline

EXAM CONTENT AREAS	Percentage Weight
I. System Operations and Instrumentation	13%
II. Data Acquisition and Post Processing	12%
III. Image Quality and Quality Assurance	13%
IV. Patient Management	8%
V. Medications and Contrast Agents	14%
VI. CT Procedures: Anatomy, Elements, Indications, and Pathology	25%
VII. Radiation Safety	15%

I. System Operations and Instrumentation (13%)

- A. Recognize the essential design and function of CT equipment
 - 1. Host computer/reconstruction station
 - 2. Operator's console/acquisition station
 - 3. CT tube functions and components
 - 4. Gantry/table features
 - 5. Detectors
 - 6. Data acquisition system
 - 7. Array processor
 - 8. CT scanner generation characteristics
- B. Classify beam filtration applications based on system operation
- C. Illustrate the effects and usage of collimation
- D. Distinguish safe operation of power injectors with consideration to their limitations
 - 1. Components of power injectors
 - 2. Equipment operation
- E. Utilize image archiving principles within the communication system
- F. Apply equipment quality assurance measures prior to usage

II. Data Acquisition and Post Processing (12%)

- A. Explain the process of digital CT image production
 - 1. Conversion process
- B. Differentiate among scanning methods
 - 1. Conventional serial scanning
 - 2. Step and shoot scanning
 - 3. Spiral/helical multi-slice scanning
- C. Understand the purpose and application of localizer/scout scans
 - 1. Patient position
 - 2. Tube position
- D. Recognize principles of image reconstruction
 - 1. Data types
 - a. Image data
 - b. Raw data
 - c. Convolved data
 - d. Measurement data
 - 2. Data reconstruction techniques
 - a. Fourier transformation
 - b. Convolution
 - c. Interpolation
 - d. Filtered back projection
 - e. Iterative reconstruction
- E. Apply principles of post-processing techniques
 - 1. MIPs (maximum intensity projection)
 - 2. MPR (multiplanar reconstruction)
 - 3. Volume rendering
 - 4. Quantitative
- F. Differentiate among slice planes
 - 1. Body planes
 - 2. X,Y, Z axes

III. Image Quality and Quality Assurance (13%)

- A. Recognize influences on parameter selection for patient populations
 - 1. Dose modulation
 - 2. kVp selection
 - 3. mAs selection
 - 4. Pitch
 - 5. Detector slice thickness
 - 6. Beam width/collimation
- B. Distinguish factors that impact image quality and apply problem solving techniques
 - 1. Image quantitative measurements
 - a. Image noise
 - b. Uniformity
 - c. Linearity
 - d. Spatial resolution
 - e. Contrast resolution

- f. Temporal resolution
- 2. Reconstruction parameters
 - a. Algorithm/kernel
 - b. Windowing
 - c. Matrix
 - d. Reconstruction slice thickness
 - e. Reconstruction interval
- 3. Artifacts
- 4. Field of view
- C. Demonstrate understanding of image display
 - 1. Linear attenuation coefficient
 - 2. CT number/Hounsfield unit
 - 3. Window width/window level
- D. Apply knowledge of quality control tests to evaluating images

IV. Patient Management (8%)

- A. Provide patient education, instructions, and preparation
- B. Perform patient screening and assessment
 - 1. Contraindications
 - 2. Medication and results of laboratory testing
- C. Perform an ongoing assessment and respond appropriately to changes in the patient's condition
- D. Utilize patient positioning and immobilization devices
- E. Identify principles of patient documentation, record keeping, and confidentiality
- F. Verify physician orders
- G. Apply legal and ethical considerations and reporting guidelines
- H. Apply transmission-based and standard precautions for infection control

V. Medications and Contrast Agents (14%)

- A. Understand contrast agents and their properties/usage
 - 1. Contraindications
 - 2. Adverse reactions and events
 - 3. Viscosity/osmolality
 - 4. Volume
 - 5. IV gauge
 - 6. Flow duration/rate
- B. Identify contrast agents and their routes of administration
 - 1. Intravenous contrast
 - 2. Oral contrast
 - 3. Intrathecal contrast
 - 4. Rectal contrast
 - 5. Urography contrast
 - 6. Intra-articular contrast
- C. Identify bolus parameters, timing, and tracking
- D. Recognize common contrast allergy pre-medications
- E. Recognize treatments for contrast reactions

VI. CT Procedures: Anatomy, Elements, Indications, and Pathology (25%)

- A. Demonstrate understanding of the fundamental parameters of head CT
 - 1. Brain (with and/or without contrast)
 - 2. Internal auditory canals
 - 3. Pituitary
 - 4. Orbits
 - 5. Sinuses
 - 6. Maxillofacial
 - 7. Temporomandibular joint
 - 8. Angiography-Circle of Willis
 - 9. Brain perfusion
- B. Demonstrate understanding of the fundamental parameters of neck CT
 - 1. Routine soft tissue neck (with and/or without contrast)
 - 2. Trauma
 - 3. Larynx
 - 4. Parathyroid
 - 5. Angiography-Carotids
- C. Demonstrate understanding of the fundamental parameters of spine CT
 - 1. Cervical spine
 - 2. Thoracic spine
 - 3. Lumbosacral spine
 - 4. Post-Myelography spine
- D. Demonstrate understanding of the fundamental parameters of musculoskeletal CT
 - 1. Shoulder
 - 2. Elbow
 - 3. Wrist
 - 4. Hand
 - 5. Hips
 - 6. Knee
 - 7. Ankle
 - 8. Foot
 - 9. Long bones (upper and lower)
 - 10. Arthrogram
- E. Demonstrate understanding of the fundamental parameters of chest CT
 - 1. Routine chest (with and/or without contrast)
 - 2. Chest Angiography
 - 3. High resolution
 - 4. Low dose screening
 - 5. Respiratory gating
- F. Demonstrate understanding of the fundamental parameters of abdomen CT
 - 1. Routine abdomen/pelvis (with and/or without contrast)
 - 2. Multi-phasic procedures
 - 3. Liver
 - 4. Pancreas
 - 5. Kidneys

- 6. Spleen
- 7. Stone (renal, ureteral)
- 8. Adrenals
- 9. Urogram/Cystogram
- 10. Angiography
- 11. Trauma
- G. Demonstrate understanding of the fundamental parameters of pelvis CT
 - 1. Bladder
 - 2. Trauma
 - 3. Angiography
- H. Demonstrate understanding of the fundamental parameters of cardiac CT
 - 1. Angiography
 - 2. Calcium scoring
 - 3. Cardiac gating
- I. Recognize characteristics of special procedures
 - 1. Biopsy
 - 2. Drainage
 - 3. Nerve blocks
 - 4. Ablation
- J. Recognize characteristics of PET/CT and SPECT/CT
 - 1. Physiology
 - 2. Attenuation correction
- K. Recognize procedural differences for patient populations
 - 1. Age appropriate
 - 2. Body habitus
 - 3. Trauma
 - 4. Medical history

VII. Radiation Safety (15%)

- A. Recognize biological effects of ionizing radiation
- B. Recognize elements of dose reporting and measurements/units
 - 1. CTDI_v (CT dose index-volume), CTDI_w (CT dose index-weighted)
 - 2. DLP (dose length product)
 - 3. Effective dose
 - 4. Multislice Average Dose (MSAD)
- C. Apply dose optimization techniques
 - 1. Hardware factors
 - 2. Scan parameters
 - 3. Reformations
 - 4. Radiation penumbra
- D. Recognize dosing modifications for patient populations
 - 1. Pediatric
 - 2. Body habitus
 - 3. Pregnancy
- E. Identify characteristics of ALARA