



The Quality Management Examination

The purpose of The American Registry of Radiologic Technologists® (ARRT®) Quality Management Examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the technologists who perform quality management. Using a nationwide survey, the ARRT periodically conducts a practice analysis to develop a task inventory which delineates or lists the job responsibilities typically required of QM technologists.¹ An advisory committee then determines the knowledge and cognitive skills needed to perform the tasks on the task inventory and these are organized into the content categories within this document. The document is used to develop the examination. The results of the most recent practice analysis have been applied to this document. Every content category can be linked to one or more activities on the task inventory. The complete [task inventory](#) is available at [arrt.org](#).

The following table presents the major content categories covered on the examination, and indicates the number of test questions in each category. The remaining pages list the specific topics addressed within each category, with the approximate number of test questions allocated to each topic appearing in parentheses.

This document is not intended to serve as a curriculum guide. Although certification and registration programs and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address the subject matter that is included in these content specifications, but do not limit themselves to only this content.

Content Category	Number of Scored Questions ²
A. Equipment Quality Control	64
B. Quality Improvement Management and Administration	61
C. Laws, Regulations, Standards and Guidelines	40
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. Each exam includes an additional 25 unscored (pilot) questions.



A. Equipment Quality Control (64)

I. Physical Principles (20)

- A. Radiation Production
 - 1. waveform characteristics
 - a. single phase
 - b. three phase
 - c. high frequency
 - 2. target design
 - a. target angle
 - b. target material
- B. X-ray Beam Characteristics
 - 1. beam quality
 - 2. radiation output
 - 3. beam modification
 - a. filtration
 - b. collimation
- C. Analog Radiography
 - 1. image receptors
 - a. speed
 - b. resolution
 - c. film-screen contact
 - d. spectral matching
 - 2. conventional film processing
 - a. chemical factors
 - b. development time
 - c. developer temperature
 - 3. sensitometric factors
 - a. base-plus-fog
 - b. d_{max}
 - c. density difference
 - d. mid-density
 - 4. environmental factors
 - a. darkroom cleanliness
 - b. darkroom fog
 - c. temperature and humidity
 - d. silver recovery
 - e. film inventory and storage control

- D. Digital Radiography
 - 1. computed radiography (CR)
 - 2. digital radiography (DR)
 - 3. speed
 - 4. resolution
 - 5. exposure indicator value (e.g.,* S, EI, mean log, target exposure indicator (EI_T), deviation index (DI))
 - 6. image processing
 - 7. picture archiving communication systems (PACS)
 - 8. image display devices
 - 9. environmental factors

2. Collection and Analysis of Quality Control (QC) Data (32)

- A. Equipment Performance Evaluation
 - 1. timer accuracy and reproducibility
 - 2. kVp accuracy and reproducibility
 - 3. exposure output as a function of tube potential (kVp)
 - 4. mA or mAs linearity
 - 5. x-ray output (mR/mAs)
 - 6. entrance skin exposure (ESE)/ entrance skin air KERMA (ESAK)
 - 7. AEC response
 - 8. exposure reproducibility
 - 9. beam quality (half-value layer)
 - 10. beam restriction system
 - a. light field-radiation field congruence
 - b. image receptor-radiation field alignment
 - c. positive beam limitation (PBL)
 - d. light localizer illuminance
 - 11. spatial resolution
 - 12. compression (mammography)
 - 13. grid performance
 - a. artifact analysis
 - b. alignment
 - 14. source-to-image distance (SID) indicator accuracy

*e.g., This is used here and in the remainder of this document to indicate examples of the topics covered, but not a complete list.

(Section A continues on the following page.)



A. Equipment Quality Control (continued)

- B. Ancillary Equipment Evaluation
 - 1. viewboxes
 - a. luminance
 - b. uniformity
 - c. ambient light (illuminance)
 - 2. monitors
 - a. luminance
 - b. ambient light (illuminance)
 - c. spatial resolution
 - d. contrast resolution/dynamic range
 - e. digital display test pattern (SMPTE, AAPM TG-18)
 - 3. hard copy printers
 - 4. hard copy digitizers
 - 5. radiation protection devices
 - a. protective apparel
 - b. shielding devices
- C. Fluoroscopic Systems
 - 1. automatic brightness control (ABC)
 - 2. beam quality (half-value layer)
 - 3. beam limitation/collimation
 - 4. low and high contrast resolution
 - 5. entrance exposure rate (EER)/entrance skin air KERMA rate (ESAKR)
 - 6. five-minute timer
 - 7. evaluate source to skin distance (SSD) (e.g., C-arm spacers)
 - 8. patient dose tracking
 - 9. AAPM TG-125 data collection methodology for fluoroscopic ABC/ADRC in cardiovascular and angiography systems
- D. Analog Imaging (including mammography)
 - 1. image receptors
 - a. phantom analysis
 - b. background density
 - c. contrast
 - d. recorded detail and resolution
 - e. artifact analysis
 - f. exposure artifacts
 - g. processing artifacts
 - h. film-screen contact
 - 2. processor performance
 - a. film processor temperatures
 - b. replenishment rates
 - c. daily sensitometry
 - 1. base-plus-fog
 - 2. mid-density
 - 3. density difference
 - 3. darkroom cleanliness and environmental integrity
- E. Digital Imaging (including mammography)
 - 1. image receptor
 - 2. phantom tests to evaluate for spatial resolution, noise and contrast
 - 3. system malfunctions (e.g., ghost image, banding, erasure, dead pixels, printer distortion)
 - 4. image artifacts
 - 5. PACS troubleshooting
 - 6. CR reader function
- F. Bone Densitometry (BD)
 - 1. calibration
 - 2. phantom analysis
- G. Computed Tomography (CT)
 - 1. image quality
 - 2. spatial resolution (high contrast)
 - 3. low contrast resolution
 - 4. image uniformity
 - 5. noise
 - 6. artifact evaluation
 - 7. alignment light accuracy
 - 8. reconstructed slice thickness
 - 9. CT number accuracy
 - 10. protocol review
 - 11. dose monitoring
 - 12. beam width
 - 13. displayed CTDI_{vol} accuracy

(Section A continues on the following page.)



A. Equipment Quality Control (continued)

3. Test Instrumentation (12)

- A. kVp Evaluation
 - 1. kVp meter
- B. Exposure Measurement Devices
 - 1. ion chamber
 - 2. solid state detector
- C. Exposure Duration
 - 1. digital timer meter
 - 2. mAs meter
- D. Testing Devices
 - 1. anthropomorphic phantoms
 - 2. system performance test tools and phantoms
 - 3. resolution patterns
 - 4. screen-film contact mesh
 - 5. collimation test tool
 - 6. radiochromic film
 - 7. absorber materials (e.g., aluminum, lead, copper)
- E. Sensitometer
 - 1. design characteristics
 - 2. function
- F. Densitometer
 - 1. design characteristics
 - 2. function
- G. Photometer (light meter)
 - 1. design characteristics
 - 2. function
 - a. luminance
 - b. illuminance (ambient light)

B. Quality Improvement Management and Administration (61)

I. Concepts and Principles of Quality Improvement (20)

- A. Foundations of QI
 - 1. customer focus
 - 2. planned, systematic evaluation
 - 3. process orientation
 - 4. data driven
- B. Problem Solving Strategies
 - 1. define basic process components
 - a. supplier
 - b. input
 - c. action (activity)
 - d. output (outcome)
 - e. customer
 - 2. identify process variables
 - a. supplier
 - b. input
 - c. action (activity)
 - 3. identify quality characteristics
 - a. output (outcome)
 - b. customer
- C. Process Improvement Models
 - 1. find, organize, clarify, understand, select (FOCUS)
 - 2. plan, do, check, act (PDCA)
 - 3. focus, analyze, develop, execute (FADE)
 - 4. strengths, weaknesses, opportunities, threats (SWOT)
 - 5. failure mode and effects analysis (FMEA)
 - 6. Six Sigma
 - 7. Lean Process Improvement
- D. Tools for Problem Identification and Analysis
 - 1. group dynamics (e.g., focus groups, brainstorming)
 - 2. problem solving tools (e.g., flow charts, decision matrices, affinity charts, nine block grids)
 - 3. information analysis (e.g., histograms, Pareto charts, control charts, Shewhart charts)
 - 4. root cause analysis (e.g., fishbone diagrams)

(Section B continues on the following page.)



B. Quality Improvement Management and Administration (continued)

2. Applications of Quality Improvement (24)

- A. Development of Indicators
 - 1. dimensions of clinical performance
 - a. appropriateness of care
 - b. continuity of care
 - c. effectiveness of care
 - d. efficacy of care
 - e. efficiency of care
 - f. respect and caring
 - g. safety in the care environment
 - h. timeliness of care
 - i. cost of care
 - j. availability of care
 - 2. target areas for improvement
 - a. high volume (e.g., chest x-ray)
 - b. high risk (e.g., angiography)
 - c. problem prone (e.g., IV contrast use, dose creep)
 - d. sentinel events
- B. Data Collection Methods
 - 1. surveys and questionnaires
 - 2. facility database (e.g., staff credential verification and sentinel events)
 - 3. focus groups
 - 4. log entries
 - 5. record audits and reviews
 - 6. peer review
 - 7. reject/repeat analysis
 - 8. national and regional registries (e.g., dose reporting)
- C. Data Analysis
 - 1. measures of frequency (e.g., counts, percents, rates and ratios)
 - 2. measures of central tendency (e.g., mean, median, mode)
 - 3. measures of variation (e.g., range, standard deviation, variance, reproducibility, validity, reliability, precision, accuracy)

- D. Assessment of Outcomes
 - 1. identification of reference standards
 - a. internal benchmarks (e.g., baseline performance, local customer expectations)
 - b. external (e.g., government regulations, national norms, practice standards)
 - 2. comparison of outcomes to reference standards
- E. Evidence Based Improvement Implementation
 - 1. action plans
 - 2. update policies and procedures
 - 3. incident response
 - 4. equipment evaluation/purchase recommendations
 - 5. staffing recommendations
 - 6. update technique charts and/or CT scan protocols

3. Operational Management (17)

- A. Staffing Education
- B. Maintenance and Preventative Maintenance
- C. Committee Membership and Activities
- D. Recommendation for Staffing Assignments
- E. Maintain QC/QI Documentation
- F. Utilization and Appropriateness Management
- G. Maintain Policies and Procedures



C. Laws, Regulations, Standards and Guidelines (40)

I. Laws and Regulations (20)

- A. Food and Drug Administration (FDA)
 - 1. Code of Federal Regulations (CFR)
TITLE 21, PART 1020
 - 2. Mammography Quality Standards Act (MQSA) CFR TITLE 21, PART 900
 - a. QC tests
 - b. frequency of QC tests
 - c. performance criteria for QC tests
 - d. documentation requirements
(e.g., credentials, continuing experience and education, surveys, policies and procedures)
 - e. medical outcomes audit
 - 3. Safe Medical Devices Act (SMDA)
CFR TITLE 21, PART 807.92
 - a. general provisions
 - b. reporting procedures
 - 4. Occupational Safety and Health Administration (OSHA) CFR TITLE 29, PART 1910
 - a. bloodborne pathogens/
CDC Standard Precautions
 - b. material safety data sheet
 - c. reporting procedures
 - 5. Health Insurance Portability and Accounting Act (HIPAA) CFR TITLE 45, PART 160
 - a. general provisions
 - b. reporting procedures
 - 6. Medicare Improvements for Patients and Providers Act (MIPPA) CFR TITLE 42, PART 414 and designated accreditation agency programs
 - a. American College of Radiology (ACR)
 - b. Intersocietal Accreditation Commission (IAC)
 - c. The Joint Commission (TJC)

2. Standards and Guidelines (20)

- A. National Council on Radiation Protection (NCRP) Recommendations
 - 1. Report No. 99, Sections 1, 6 and 7
 - 2. Report No. 105, Sections 1, 2, 6, 7 and 8.4
 - 3. Report No. 114
 - 4. Report No. 147, Sections 1, 2 and 3
 - 5. Report No. 160, Sections 3, 4.1-4.3 and 7
 - 6. Report No. 168, Sections 3, 4, 5 and 6
 - 7. Report No. 172, exclude dental and nuclear medicine sections
- B. American College of Radiology (ACR) Technical Standards
- C. American Association of Physicists in Medicine (AAPM)
 - 1. Task Group 18
 - 2. Report No. 60
 - 3. Report No. 74
 - 4. Report No. 93
 - 5. Report No. 94
 - 6. Report No. 96
 - 7. Report No. 111
 - 8. Report No. 116
 - 9. Report No. 160
- D. American Society of Radiologic Technologists (ASRT) Practice Standards
- E. Conference of Radiation Control Program Directors (CRCPD) publications
- F. American Registry of Radiologic Technologists (ARRT) Standards of Ethics