
CONTENT SPECIFICATIONS FOR THE EXAMINATION IN QUALITY MANAGEMENT



Publication Date: March 2008
Implementation Date: July 2008

The purpose of the ARRT Examination in Quality Management is to assess the knowledge and cognitive skills underlying the performance of the tasks typically required of staff technologists practicing in this specialized area. In order to identify the knowledge and skills covered by the examination, the ARRT conducted a practice analysis study involving a nationwide sample of QM technologists. The results of the practice analysis are reflected in this document.

The table below presents the three major content categories covered on the examination, along with the number of test questions in each major category. The remaining pages of this document list the specific topics addressed within each major content category. The approximate number of test questions allocated to each content category appears in parentheses.

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

Content Category	Number of Questions*
A. Radiographic and Mammographic Quality Control	93
B. Quality Improvement	44
C. Program Standards and Guidelines	<u>28</u>
	165

*Each exam includes an additional 20 unscored (pilot) questions, so the actual number of questions in a category may vary slightly from the numbers stated here.

A. Radiographic and Mammographic Quality Control (93)

1. Physical Principles (25)

- a. Radiation Production (3)
 - 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 (4)
 - 1. beam quality
 - 2. radiation output
 - 3. beam modification
 - a. filtration
 - b. collimation
- c. Screen-Film Characteristics (3)
 - 1. speed
 - 2. resolution
 - 3. contact
 - 4. spectral matching
- d. Digital Imaging Systems (12)
 - 1. radiography
 - a. computed radiography (CR)
 - b. digital radiography (DR)
 - c. exposure indicator value (e.g., S, EI, mean log)
 - 2. fluoroscopy
 - 3. bone densitometry (BD)
 - 4. computed tomography (CT)
 - 5. digital mammography
 - 6. picture archiving communication systems (PACS)
 - 7. image display devices

- e. Conventional Film Processing (3)
 - 1. chemical factors
 - a. development time
 - b. developer temperature
 - 2. sensitometric factors
 - a. base-plus-fog
 - b. d_{\max}
 - c. density difference
 - d. mid-density
 - 3. environmental factors
 - a. darkroom cleanliness
 - b. darkroom fog
 - c. temperature and humidity
 - d. silver recovery
 - e. film inventory and storage control

2. Collection and Analysis of QC Data (49)

- a. Generator Performance (6)
 - 1. timer accuracy and reproducibility
 - 2. kVp accuracy and reproducibility
 - 3. mA or mAs linearity
 - 4. AEC response and density control
 - 5. exposure reproducibility
 - 6. x-ray tube heat sensors
 - 7. mobile x-ray generators
- b. Beam Characteristics (6)
 - 1. half-value layer
 - 2. mR / mAs
 - 3. light field-radiation field congruence
 - 4. image receptor - radiation field alignment
 - 5. focal spot size

- c. Ancillary Equipment Evaluation (5)
 - 1. grid performance
 - a. artifact analysis
 - b. alignment
 - 2. viewboxes
 - a. luminance
 - b. uniformity
 - c. illuminance
 - d. ambient light
 - 3. monitors
 - a. luminance
 - b. ambient light
 - c. spatial resolution
 - d. contrast resolution/dynamic range
 - e. DICOM gray scale function
 - 4. radiation protection devices
 - 5. conventional tomographic units
 - a. section level accuracy
 - b. section level thickness
 - c. exposure angle
- d. Fluoroscopic Systems (4)
 - 1. automatic brightness control (ABC)
 - 2. beam quality
 - 3. collimation limits
 - 4. low and high contrast resolution
 - 5. tabletop exposure rate
- e. Processor Performance (4)
 - 1. direct measurements
 - a. development time
 - b. developer temperature
 - c. replenishment rates
 - d. fixer retention
 - 2. processing control charts
 - a. base-plus-fog
 - b. mid-density
 - c. density difference
- f. Imaging System Performance (8)
 - 1. phantom analysis
 - a. background density
 - b. contrast
 - c. recorded detail and resolution
 - 2. artifact analysis
 - a. exposure artifacts
 - b. processing artifacts
 - c. CR and DR artifacts
 - 3. reject/repeat analysis
- g. Evaluation of Digital Systems (16)
 - 1. computed radiography (CR)
 - a. imaging plate
 - b. phantom tests
 - c. system malfunctions (e.g., ghost image, banding, erasure, dead pixels, printer distortion, etc.)
 - 2. digital radiography (DR)
 - a. phantom tests
 - b. system malfunctions (e.g., ghost image, banding, dead pixels, printer distortion, etc.)
 - 3. fluoroscopy
 - 4. bone densitometry (BD)
 - 5. computed tomography (CT)
 - 6. digital mammography
 - 7. picture archiving communication systems (PACS)
 - 8. hard copy imagers

3. Test Instrumentation (19)

- a. kVp Evaluation (1)
 - 1. kVp meter
 - 2. test cassettes
- b. Radiation Detector (2)
 - 1. exposure meter
 - 2. film
- c. Exposure Duration (2)
 - 1. digital meter
 - 2. mAs meter
- d. Testing Devices (6)
 - 1. anthropomorphic phantoms
 - 2. system performance test tools
 - 3. resolution patterns
 - 4. screen-film contact mesh
- e. Sensitometer (3)
 - 1. design characteristics
 - 2. function
- f. Densitometer (2)
 - 1. design characteristics
 - 2. function
- g. Light Meter (1)
 - 1. design characteristics
 - 2. function
- h. Test Pattern Generator (2)
 - 1. design characteristics
 - 2. function

B. Quality Improvement (44)

1. Concepts and Principles of Quality Improvement (19)

- a. Philosophical Basis of QI (3)
 - 1. customer focus
 - 2. planned, systematic evaluation
 - 3. process orientation
 - 4. data driven
- b. QI Problem Solving Strategies (3)
 - 1. define basic process components
 - a. supplier
 - b. input
 - c. action (process, activity)
 - d. output (outcome)
 - e. customer
 - 2. identify process variables
 - a. supplier
 - b. input
 - c. action (process, activity)
 - 3. identify quality characteristics
 - a. output (outcome)
 - b. customer
- c. Process Improvement Models (3)
 - 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)
- d. Tools for Problem Identification and Analysis (10)
 - 1. group dynamics (e.g., focus groups, brainstorming)
 - 2. problem solving tools (e.g., flow charts, fishbone diagrams, decision matrices, affinity charts, nine block grids)
 - 3. information analysis (histograms, Pareto charts, control charts, Shewhart charts)

2. Collection & Analysis of QI Data (25)

- a. Development of Indicators (8)
 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)
 - d. sentinel events
- b. Data Collection Methods (6)
 1. surveys and questionnaires
 2. facility database
 3. focus groups
 4. log entries

- c. Data Analysis (6)
 1. measures of frequency (counts, percents, rates, and ratios)
 2. measures of central tendency (mean, median, mode)
 3. measures of variation (range, standard deviation, variance)
- d. Assessment of Outcomes (5)
 1. identification of reference standards
 - a. internal (e.g., baseline performance, local customer expectations)
 - b. external (e.g., government regulations, national norms, practice standards)
 2. comparison of outcomes to reference standards
 3. utilization of findings
 - a. update QC/QI manual
 - b. prepare incident reports
 - c. equipment evaluation/purchase recommendations
 - d. staffing recommendations
 - e. update technique charts

C. Program Standards and Guidelines (28)

1. **National Council on Radiation Protection (NCRP) Recommendations (6)**
 - a. Report #99, Sections 1, 6, 7 (2)
 - b. Report #105, Sections 1, 2, 6, 7, 8.4 (4)
2. **Mammography Quality Standards Act (MQSA) (7)**
 - a. QC Tests (2)
 - b. Frequency of QC Tests (2)
 - c. Performance Criteria for QC Tests (2)
 - d. Documentation Requirements (1)

3. **Occupational Safety and Health Administration (OSHA) Requirements (5)**
 - a. Blood Borne Pathogens / Standard Precautions (2)
 - b. Material Safety Data Sheet (2)
 - c. Reporting Procedures (1)
4. **Safe Medical Devices Act (SMDA) (4)**
 - a. General Provisions (2)
 - b. Reporting Procedures (2)
5. **Health Insurance Portability and Accounting Act (HIPAA) (6)**
 - a. General Provisions (3)
 - b. Reporting Procedures (3)