

## Test Content Outline

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Implementation Date: March 2014

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| A. Procurement                 | 5%  |
| B. Project Management          | 5%  |
| C. Operations                  | 10% |
| D. Communications              | 10% |
| E. Training and Education      | 5%  |
| F. Image Management            | 20% |
| G. Information Technology      | 15% |
| H. Systems Management          | 10% |
| I. Clinical Engineering        | 10% |
| J. Medical Imaging Informatics | 10% |

The Test Content Outline lists the areas to be covered and the weightings reflecting their relative importance. Content specifications are developed by determining what imaging informatics staff at entry level is required to do on the job, and then defining the knowledge and skills necessary to perform those tasks.

(A detailed *Test Content Outline* continues on following pages)

## **A. Procurement (7)**

1. Needs Assessment
  - a. Organization strategic plan and policies
  - b. Procurement goals
  - c. Methods of needs analysis
  - d. Replacement or enhancement
2. Vendor Selection
  - a. Collection tools
    1. Request for Information (RFI)
    2. Request for Application (RFA)
    3. Request for Proposal (RFP)
  - b. Vendor response analysis tools
  - c. Vendor demonstrations and evaluation
3. Vendor Contracts
  - a. Contract development
  - b. Standard components of contracts
    1. licensing and user fee models (e.g., charge per click/folder; capital)
    2. performance metrics/payment milestones
    3. uptime guarantees
    4. liability
    5. obsolescence clauses
    6. service level agreements
  - c. Evaluation of a contract

## **B. Project Management (6)**

1. Goals, Scope, and Risks
  - a. Identifying common risks
    1. internal and external dependencies
  - b. quantifying and controlling risks
2. Project Feasibility
  - a. Needs assessment design
  - b. Needs assessment implementation and review
  - c. Financial viability [financial feasibility analysis (FEA)]

3. Project Management Assessment Tools
  - a. Documentation of readiness, planning, initiating, executing, monitoring and closing processes (e.g., PERT charts, Gantt charts, milestones, time-and-task schedules)
  - b. Budget, cost schedule, resource, quality and procurement plan
4. Project Completion Assessment
  - a. Validation and performance
    1. documentation
    2. user acceptance testing

## **C. Operations (13)**

1. Quality Improvement (QI) Procedures
  - a. Philosophical basis of QI
  - b. Process improvement strategies (PDSA, Six Sigma, LEAN)
  - c. Tools for problem identification and analysis (e.g., runchart, fishbone)
  - d. Target areas for improvement
2. Policies and Procedures
  - a. System management (e.g., downtime, incidents, back-up and recovery, privacy and security)
  - b. User management (e.g., access, roles)
3. Compliance with Federal Regulations
  - a. HIPAA
  - b. MQSA for digital mammography
  - c. HITECH Act (e.g., meaningful use, PQRI)

## **D. Communications (13)**

1. Roles and Relationships in Healthcare Settings
  - a. Organizational chart
  - b. Medical specialties (e.g., radiology, pediatrics, orthopaedics, neurology)
  - c. Organizational theory
  - d. Customer service methods

2. Medical Terminology
  - a. Anatomy, physiology, and pathology
  - b. Common imaging positions
  - c. Imaging planes
  - d. ICD, CPT codes
  - e. Modality-specific terminology
3. System Availability Issues or Changes, Notifications to Business Units
  - a. Downtime
  - b. Upgrades
  - c. Changes in workflow
  - d. Methods (who, what, when, why, how)
  - e. Plans and techniques based on user roles
4. Management Reporting and Strategic Planning
  - a. Strategic plan
  - b. Technology and procedure change effect on strategic plan
5. Feedback Mechanisms
  - a. Reporting tools
  - b. Surveying methods

## **E. Training and Education (6)**

1. Needs Assessment
  - a. Types of learners
    1. learning styles
    2. characteristics of adult learners
  - b. Measurement methods (e.g., surveys, task analysis)
  - c. Instructional objectives
2. Training Programs
  - a. Instructional methods
  - b. Instructional tools
  - c. Educational resources
  - d. Assessment of training

## **F. Image Management (26)**

1. Environmental Design for Viewing and Interpreting Images
  - a. Ergonomics

- b. Environmental factors
  - c. Room layout physical considerations
2. The Human Computer Interface
  - a. EMR/RIS/PACS/dictation integration
  - b. Usability
  - c. Key image selection and image annotation
  - d. Input devices
  - e. Display devices
3. Work Flow Processes that Ensure Data Integrity
  - a. Post- processing workflow
  - b. Compression
  - c. Image workflow (e.g., hanging protocols, read-ready)
  - d. Teaching files
  - e. Clinical trials
  - f. Acquisition and display terminology
  - g. Reporting and results communication
  - h. Data integrity QC checks (store-commit)
  - i. Optimization of workflow
4. Import and Export Images
  - a. Policies and procedures
  - b. Workflow procedures (e.g., IHE PDI)
  - c. Data integrity
  - d. Recording and digitizing technology
  - e. Standards of file exchange

## **G. Information Technology (20)**

1. Storage and Archiving Technologies and Architecture
  - a. Architectures (NAS, SAN, DAS)
  - b. Storage network protocols (SCSI, fibre channel, ATA/SATA)
  - c. Archive strategies

- d. Methods for storage management (virtualization, replication, mirroring, security, compression, process automation, storage provisioning)
  - e. Storage metrics
  - 2. Network Architecture
    - a. Network protocols (Ethernet: 801, Wireless 802.11, Bluetooth, OSI/ISO mode, TCP/IP)
    - b. Transmission protocols (DICOM, FTP, HTTP, CIFS, SSH, Ports)
    - c. Load balancing and fault tolerance
    - d. Network components and hardware (hubs, switches, routers, gateways, trunks, CAT-5/e, CAT 6, fiber)
    - e. Network configuration (IP address, LAN, WAN, VLAN, DNS, ARP, NAT, firewall, SSL, ports)
    - f. Network metrics/dashboard (e.g., capacity, bandwidth, redundancy, performance, cost)
  - 3. Hardware and Software Components
    - a. Hardware components
      - 1. video card
      - 2. CPU
      - 3. memory
      - 4. hard drive
      - 5. network interface card
      - 6. motherboard (PCI, USB, SCSI, AGP)
      - 7. removable media hardware (CD, DVD, MOD, flash)
    - b. Software components
      - 1. operating systems
      - 2. mobile devices
      - 3. browser
      - 4. DNS
      - 5. group policy
      - 6. remote management (e.g., Citrix, VMView)
    - c. Server architecture
  - 4. Retrieval of Information from Databases for Operations, Quality Assurance, and Planning Purposes
    - a. Structured Query Language (SQL)
    - b. Key performance indicators: utilization, performance, uptime, capacity, exceptions, un-dictated exams, lost studies
    - c. Database design
      - 1. relational versus hierarchical
      - 2. basic principles (e.g. keys, normalization, table joining, performance)
    - d. Dashboard concepts
  - 5. IT Standards
    - a. Methods to identify appropriate standards
  - 6. Obsolescence Planning
    - a. Technology lifecycle
    - b. Moore's Law
- ## H. Systems Management (13)
- 1. Requirements for Optimal, Cost Effective System Capacity and Throughput
    - a. Study size calculations
    - b. Scalability considerations
      - 1. database
      - 2. storage
      - 3. server
      - 4. networking
    - c. Impact of new technology (e.g., 256 slice CT, breast tomosynthesis)
    - d. Licensing models: concurrent versus fixed seat
  - 2. Disaster Recovery Plans and Business Continuity Strategies
    - a. Policies and procedures
      - 1. test
      - 2. downtime
      - 3. failover
      - 4. HIPAA compliance

- b. Data and system recovery
    - 1. offsite archiving
    - 2. hardware and software solutions
    - 3. Applications Service Provider (ASP)
- 3. System Problem Management
  - a. Availability monitoring and problem detection
    - 1. reporting procedures
    - 2. automated monitoring (dashboard)
    - 3. alerts
    - 4. SNMP
  - b. Troubleshooting/problem diagnosis (remote access tools)
  - c. Root cause analysis
    - 1. bottlenecks
    - 2. single points of failure
    - 3. alternate pathways
  - d. Status reports to management
- 4. Data Migration Procedures
  - a. Strategies for migration
  - b. Physical data transfer considerations
  - c. DICOM standardization and data integrity
  - d. Work-product migration (key images, annotations, presentation states)
  - e. Cost and performance models
  - f. User impact
- 5. Data Security and Individual Privacy
  - a. Standards, policies and guidelines
    - 1. HIPAA
    - 2. ACR-SIIM Practice guideline for electronic medical information privacy and security
  - b. Security strategies
    - 1. physical
    - 2. system
    - 3. application

c. Privacy

## I. Clinical Engineering (13)

- 1. Support for Imaging Modalities
  - a. Radiography/Medical Imaging
  - b. Breast Imaging
    - 1. screening and diagnostic
    - 2. tomosynthesis
    - 3. breast ultrasound
    - 4. breast MRI
    - 5. interventional
  - c. Magnetic Resonance Imaging (MRI)
  - d. Computed Tomography (CT)
  - e. Radiation Therapy
  - f. Interventional Radiology
  - g. Ultrasound
  - h. Nuclear Medicine
    - 1. functional imaging
    - 2. SPECT
    - 3. PET/CT
    - 4. PET/MR
    - 5. nuclear cardiology
  - i. Cardiology
    - 1. diagnostic and interventional
    - 2. nuclear cardiology
    - 3. echo cardiology
- 2. Information Management from Outside Medical Imaging
  - a. Pathology
  - b. Ophthalmology
  - c. Dermatology
  - d. Oncology
  - e. Orthopedic templates
  - f. Surgical planning
  - g. Stereotactic imaging
- 3. Modality Integration
  - a. DICOM configuration
    - 1. configuration parameters: (AE title, port, etc.)
    - 2. modality work list
    - 3. performed procedure step
    - 4. storage commitment

- b. DICOM services
- c. DICOM objects
- d. DICOM validation
- e. DICOM transfer syntax
- f. DICOM tools
- g. Other types of integration
- 4. Image Display Quality Control
  - a. DICOM Grayscale Standard Display Function (GSDF) part 14
  - b. AAPM task group 18
- 5. Clinical Awareness
  - a. Electrical hazards
  - b. Ionizing radiation
  - c. Magnetic fields
  - d. Infection/biohazards
  - e. Sterile field procedures (e.g., operating room)

## **J. Medical Imaging Informatics (13)**

- 1. Medical Imaging Workflow Solutions
  - a. Implementation
  - b. Evaluation/process improvement
- 2. Systems Integration
  - a. HIS/EMR
  - b. RIS
  - c. PACS
  - d. dictation systems
- e. post-processing software or systems
- f. radiation dose management
- g. decision support
  - 1. order entry
  - 2. exam protocols
  - 3. interpretation, case comparisons
- h. critical results communication
- i. peer review
- j. clinical analytics
- 3. Medical Imaging Standards
  - a. DICOM
  - b. HL7
  - c. MQSA
  - d. ACR
  - e. AAPM, SIIM
  - f. ICD, CPT, SNOMED
- 4. Apply Appropriate IHE Guidelines
  - a. Integration profiles
  - b. RSNA connectathon results
- 5. Integrate Image Architecture into Organization's Long-Range Plan
  - a. Enterprise archiving
  - b. Master patient index
  - c. RHIOs (regional healthcare information organizations)
  - d. Enterprise imaging specialties (cardiology, pathology)