

Test Content Outline

Approved Date: April 2016
Implementation Date: March 2017

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 outlines are developed by determining what imaging informatics staff at entry level are 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.

Note: The abbreviation "e.g." is used in this document to indicate examples of the topics covered, but the examples are not a complete list.

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
 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 (e.g., financial feasibility analysis)

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 (e.g., 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)
4. Handling/Reporting Ethical Issues

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. Change management communications (e.g., 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 (e.g., storage commitment, reconciliation, modality worklist)
 - 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
 - f. Cross enterprise image exchange
5. Enterprise Imaging

G. Information Technology (20)

1. Storage and Archiving Technologies and Architecture
 - a. Architectures (e.g., NAS, SAN, DAS)
 - b. Storage network protocols (e.g., SCSI, fibre channel, ATA/SATA)
 - c. Archive strategies
 - d. Methods for storage management (e.g., virtualization, replication, mirroring)
 - e. Storage metrics
2. Network Architecture
 - a. Network protocols (e.g., Ethernet: Wireless, Bluetooth, OSI/ISO mode, TCP/IP)
 - b. Transmission protocols (e.g., DICOM, FTP, HTTP, CIFS, NFS, SSH)
 - c. Load balancing, fault tolerance, and redundancy
 - d. Network components and hardware (e.g., hubs, switches, routers, gateways, trunks, CAT-5/e, CAT 6, fiber)
 - e. Network configuration (e.g., IP address, LAN, WAN, VLAN, DNS, ARP, NAT, firewall, SSL, ports)
 - f. Network metrics/dashboard (e.g., capacity, bandwidth, performance, cost)
3. Hardware and Software Components
 - a. Hardware components
 1. video card
 2. CPU, GPU
 3. memory
 4. hard drive
 5. network interface card
 6. motherboard connectivity (e.g., PCI, USB, SCSI, AGP)
 7. removable media hardware (e.g., 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
- d. Virtual architecture
4. Retrieval of Information from Databases for Operations, Quality Assurance, and Planning Purposes
 - a. Structured Query Language (SQL)
 - b. Key performance indicators (e.g., utilization, performance, uptime, capacity, exceptions, un-dictated exams, lost studies)
 - c. Database design, management, and maintenance
 1. relational versus hierarchical
 2. basic principles (e.g., keys, normalization, table joining, performance)
 - d. Data analytics
5. Appropriate IT 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 (e.g., concurrent, per/named user)
- 2. Disaster Recovery Plans and Business Continuity Strategies
 - a. Policies and procedures
 - 1. testing
 - 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 (e.g., dashboard)
 - 3. alerts
 - 4. SNMP
 - b. Troubleshooting/problem diagnosis (e.g., 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 (e.g., 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
 - 3. NIST
 - b. Security strategies
 - 1. physical
 - 2. system
 - 3. application
 - 4. encryption
 - c. Privacy

I. Clinical Engineering (13)

- 1. Support for Imaging Modalities and Techniques
 - a. Radiography/Fluoroscopy/Tomography
 - b. Breast Imaging
 - c. Magnetic Resonance Imaging (MRI)
 - d. Computed Tomography (CT)
 - e. Ultrasound
 - f. Nuclear Medicine
 - g. Visible Light
 - 1. pathology
 - 2. ophthalmology
 - 3. dermatology
 - 4. endoscopy
- 2. Image Guided Intervention and Surgical Planning
 - a. Oncology/Radiation Therapy
 - b. Orthopedic templates
 - c. Surgical planning
 - d. Stereotactic imaging
 - e. Interventional radiology
 - f. Intraoperative imaging
 - g. Point of care imaging

3. Modality Integration
 - a. DICOM configuration
 1. configuration parameters (e.g., AE title, port)
 2. modality worklist
 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
 - b. RIS
 - c. EMR
 - d. PACS
- e. Dictation systems
- f. Post-processing software or systems
- g. Radiation dose management
- h. Decision support
 1. order entry
 2. exam protocols
 3. interpretation, case comparisons
- i. Critical results communication
- j. Peer review
- k. Clinical analytics
- l. Integration methods (e.g., API, web services)
3. Medical Imaging Standards
 - a. DICOM
 - b. HL7
 - c. MQSA
 - d. ACR
 - e. AAPM, SIIM
 - f. ICD, CPT, SNOMED
4. Apply Appropriate IHE Guidelines (e.g., integration profiles, connectathon results)
5. Integrate Image Architecture into Organization's Long-Range Plan
 - a. Enterprise archiving
 - b. Master patient index
 - c. Regional Healthcare Information Organizations (RHIOs)
 - d. Enterprise imaging specialties (e.g., cardiology, pathology)
6. Analytical methods and statistics