The Society for Imaging Informatics in Medicine
Imaging Informatics Professional
Education Advisory Network
Learning Objectives

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Learning Objectives

A competent imaging informatics professional should be able to:

I. Procurement

A. Determine organization readiness for the electronic environment.

   - Synthesize the financial aspects of purchasing a PACS.
   - Identify key stakeholders within and outside the organization and their expectations.
   - Discuss the objectives and elements of a formal PACS Strategic Plan document.
   - Identify the functional requirements associated with PACS for factors affecting the organizations’ business practices.
   - Appraise the relevance of existing equipment and systems inventory in purchasing a PACS.
   - Differentiate among the common needs analysis strategies.
   - Understand the need for life cycle analysis.
   - Identify the members needed for a PACS Steering Committee.
   - List key elements that must be considered (planned for) in site preparation that are not included in the vendor’s PACS purchase price.
   - Learn how to develop a PACS Migration Strategy.
   - Identify the impact of PACS implementation on current and future workflow.

B. Establish and implement a process for vendor selection.

   - Discuss the objectives and elements of a formal RFP document.
   - Compare and contrast vendor response analysis tools.
   - Interpret, evaluate, and compare vendor proposals.
   - Develop information collection tools designed to assist with PACS selection, including site visits, reference checks, etc.
   - Relate the difference between a Request for Proposal (RFP), a Request for Solutions, and a Request for Information.
   - Discuss the common standards compliance issues.
C. Negotiate contracts with vendors.

- List the standard components of a contract, such as pricing, implementation support, training, service, functionality, acceptance criteria, financing options (ASP, capital, leasing), penalties, etc.
- Describe negotiation strategies as they relate to the contract components.
- Recognize the need to comply with federal regulations.
- Understand how to research federal standards for protected healthcare information.
- Describe different data migration strategies and highlight possible pitfalls.

II. Project Management

A. Identify the goals, scope, risks, and key members of project team.

- Use project clarification techniques such as scatter diagrams and fish diagrams.
- Define the roles of the Project Manager, Project Sponsor, and other key individuals on a project.
- Create a Project Charter.
- Identify and manage the most common project risks.

B. Evaluate the feasibility of a project.

- Perform workflow analysis to gauge time and resource allocation for new and existing systems.
- Describe how to use qualitative assessment methods (i.e., focus groups) and quantitative analysis (i.e., comparison studies) to zero in on system issues.
- Assess current operating costs of the existing system.
- Assess total investment of a new system to include all pertinent factors such as hardware, software, training, etc.
- Evaluate different return on investment (ROI) models.
- Determine the ROI by assessing reduction in operating cost that offsets investment in new system.
- Identify significant barriers and obstacles that may halt project implementation such as funding limitations, political considerations, management concerns, and organizational resistance to change.
C. Utilize the common project management tools.

- Build a Project Work Plan, including schedules, resource allocations, and budgets.
- Create activity networks (i.e., PERT, Gantt, and CPM) and other tools for communicating project scope and activities.
- Create criteria for monitoring and reporting progress, including milestone charts, project activity, and cost reports.
- Use common financial calculation tools for project measurement.
- Explain how a project is documented.
- Manage external PACS/RIS vendors and consultants effectively.
- Determine and anticipate changes that occur during project execution.

III. Operations

A. Design and implement quality improvement (QI) procedures.

- Explain the philosophical basis of QI (i.e., popular methods and background).
- Identify and use tools for problem identification and analysis.
- Determine target areas for improvement based upon analysis.
- Evaluate issues through gap analysis model.
- Recommend a proposed course of action.
- Create process mapping of redesigned QI procedures.
- Document, formalize, administer, execute, evaluate, and monitor QI procedures and establish QI accountability.
- Establish competency-based applications training for all end user groups.
- Develop protocols for granting user privileges and user training.

B. Develop and implement policies and procedures.

- Reference and verify existing policies and procedures.
- Evaluate existing processes.
- Identify workflow points of failure.
- Recommend process improvements.
- Construct policies and procedures.
- Administer policies and procedures.
- Develop and implement contingency plans.
- Communicate policies and procedures within and outside of the imaging department.
C. **Ensure compliance with Federal regulations.**

- Define criterion for compliance with federal regulations such as FDA, JCAHO, HIPAA and MQSA.
- Assemble tools for compliance processes.
- Design compliance procedures and processes.
- Present compliance procedures.
- Regulate compliance.

### IV. Communications

#### A. Recognize roles and relationships in healthcare settings.

- Comprehend organizational theory and how it applies to typical hospital organizational structures, including affiliates, management, departments and staff, and their individual roles.
- Comprehend roles and relationships in the patient care process, especially the role and function of medical specialties.
- Analyze PACS service metrics with respect to basic customer service tenets.
- Integrate communication strategies into service procedures.
- Appraise the role of Information Technology (IT) in relation to the organizational structure.
- Determine the needs for a PACS/RIS team.

#### B. Communicate with healthcare professionals using appropriate medical terminology.

- Explain appropriate medical terminology (i.e., anatomy, physiology, and pathology) as it relates to medical images.
- Use appropriate positioning terminology as it relates to imaging in medical informatics.
- Relate the terminology to its use in the standards, such as DICOM and IHE, and the impact on display parameters, such as determining the hanging protocols.
- Recognize the roles and uses of ICD and CPT coding in relation to PACS’ workflow and billing.
- Recognize procedure names and clinical findings associated with specific modalities.
C. Alert clinical staff about issues regarding system availability or changes.
   
   o Define the audience affected by downtimes, upgrades, and changes in workflow.
   o Define the processes for suitable communication strategies to reach medical, allied health, and technical professionals.
   o Create documentation describing the communication of downtime procedures.

D. Provide decision-makers (business units, CIO, etc.) with information about system changes.
   
   o Provide an assessment of change enhancement that is consistent with organizational objective.
   o Provide an evidence-based assessment of PACS ROI for strategic planning.

E. Develop user feedback mechanisms.
   
   o Evaluate existing assessment and feedback tools and techniques, both operational and technical.
   o Develop response strategies.

V. Training and Education

A. Perform a needs assessment to determine training needs.
   
   o Distinguish the different learning typologies to apply in a healthcare environment.
   o Create needs assessment based on composition of staff and workflow.
   o Determine the staff needed to support and approve of training plans.
   o Create outcomes or evidence-based objectives.

B. Evaluate and select training programs according to user needs.
   
   o Incorporate the characteristics of adult learners and adult training methods into teaching strategies.
   o Develop or select-from-available instructional resources that are consistent with the instructional needs assessment results.
C. Implement training or educational programs.

- Define a delivery process for those resources that accommodate the organization’s staffing, schedules, special needs, and available resources.
- Analyze and suggest workflow modifications that are required during training.

D. Evaluate effectiveness of training.

- Develop methods for learner and training program performance assessment and reporting.
- Create processes for follow-up training if needed.
- Create processes for periodic re-training of staff.

VI. Image Management

A. Manage the design of the environment for viewing and interpreting images.

- Apply the recommendations of the Human Factors and Ergonomics Society to workstations.
- Identify key considerations for designing the soft copy reading environment.
- Assess the room layout design, incorporating both physical and workflow considerations.
- List the ergonomic considerations necessary for an optimal reading environment.
- Develop policies and procedures surrounding imaging information access requests.

B. Evaluate the human-computer interface.

- Evaluate, implement, support, and manage the applications and/or interfaces necessary for interpretations.
- Evaluate the requirements for seamless interfacing of EMR/RIS/PACS/other health informatics systems, and identify what IHE profiles must be available.
- Develop the processes and policies for monitor calibration and recycling of imaging devices.
- Develop the communications protocols for exceptions resolution.
- Establish the relationship between DICOM and media exchange.
- Use the software to demonstrate how the PACS system viewer operates.
- Explain how to use the web browser.
- Explore the functions available with the software.
- Understand the function and standard implementation of Key Images and Annotations.
- Explain what functions PACS administrators might use.
- Describe the functions that the technologists and radiologists would use.

C. **Determine optimal image flow and implement processes that ensure data integrity.**

- Recognize and develop protocols and procedures for data and workflow integrity.
- Classify and document all actions directly related to manual interventions with data integrity.
- Analyze data to identify trends in problem solving issues surrounding equipment, training, and workflow points of failure.
- Classify and document all actions related to workflow integrity.
- Develop protocols and procedures for activating support of imaging information systems.
- Identify technological challenges with image viewing and large data sets in relation to image accessibility across the enterprise.
- Develop workflow contingencies for single points of failure and systems’ failures.
- Explore the purpose of teaching files.
- Identify image storage, acquisition protocols, and standards implementation (DICOM) for teaching files and clinical trials.
- Determine compression requirements appropriate for specific modality images sets.
- Determine compression requirements for appropriate image display for radiologists, technologists, and referring physicians.
- Evaluate IHE in relation to image integrity and teaching files.
- Explain the relationship between softcopy/hardcopy imaging pipeline and a PACS environment.
- Evaluate the issues associated with image compression and PACS.

D. **Import and export outside studies into a PACS.**

- Implement and prioritize imaging information management policies and procedures for clinical, research, nighthawk, and teleradiology services.
- Facilitate and document workflow processes, policies, and procedures associated with image integration.
o Determine viewing privileges and storage rules for importing studies into the PACS.
o Establish workflow processes and protocols for exporting studies from the PACS.
o Understand the policy and implementation, as described by the IHE, specifically PDI and IR.
o Understand the standards of file exchange.
o Recognize the recording and digitizing technology used for image integration.

VII. Information Technology

A. Assess storage and archive needs and determine appropriate architecture.

o Examine storage and archive needs associated with medical imaging.
o Review current archive architectures and solutions, such as DAS, SAN, NAS and grid storage.
o Understand storage protocols, such as file based, block based, and meta file header.
o Distinguish among the different archive media (tape, MOD, spinning disk) and identify when and how they are used.
o Establish storage management and retention policies.
o Calculate performance and capacity needs.

B. Design and specify network architecture.

o Examine networking needs generated by imaging.
o Review network architecture and solutions. Include LAN, WLAN, MAN, and WAN.
o Understand fault tolerance and load balancing implementation.
o Understand network and transmission protocols with corresponding performance parameters.
o Comprehend the OSI reference model.
o Distinguish network hardware and software components.
o Understand basic networking configuration parameters.
o Distinguish interpretation network metrics such as bps, service level, collisions, etc.

C. Implement and maintain appropriate server hardware and software.

o Examine hardware and software requirements for imaging servers.
o Differentiate among different server architectures.
D. Retrieve information from databases for operations, quality assurance, and planning purposes.
   - Differentiate among the different database designs and understand the implementation basics.
   - Execute simple database queries.
   - Understand basic database management and performance measurement tools.

E. Identify and implement IT standards.
   - Identify IT communications standards.
   - Identify IT network management standards.
   - Demonstrate knowledge of IT security aspects.

F. Develop appropriate replacement schedules.
   - Define the lifecycle of each software and hardware component, including Moore’s Law.
   - Explain technology obsolescence and obsolescence planning.
   - Describe the process of data migration.

G. PACS architecture.
   - Identify key components of PACS architecture, including servers, diagnostic workstations, and software application architectures.
   - Explain how components are connected, including any relevant interfaces and approaches to integrated HIS/RIS/PACS/VR.
   - Differentiate among common PACS architectures, such as web-based viewing, integrated webservers, multiple tier archives, the role of specialty workstations, and modalities.
   - Distinguish PACS architecture from other IT architectures (i.e., similarities and differences).

VIII. Systems Management

A. Determine the requirements for optimal, cost-effective system capacity and throughput.
   - Develop a model for calculating archive capacity requirements.
   - Describe various methods that vendors use for licensing software.
   - Use tools to monitor system performance.
o Describe the metrics used to measure system performance, such as online response time.
o Evaluate alternative strategies for enterprise-wide performance improvement and cost-effectiveness.
o Evaluate impact of new technologies on PACS infrastructure.

B. Plan disaster recovery (DR) and business continuity (BC) strategies.

o Differentiate between BC planning and DR planning.
o Create policies and procedures for DR.
o Describe the HIPAA requirements for systems management with respect to DR.
o Test DR and BC plans.
o Evaluate DR and BC plans and modifications periodically, as required.

C. Use problem management and system availability tools and strategies.

o Create policies and procedures for systems performance monitoring and troubleshooting.
o Define problem escalation protocols.
o Analyze problems and solutions for performance improvement.
o Identify and use appropriate monitoring and troubleshooting tools.
o Create short-term downtime strategies.

D. Plan and evaluate data migration procedures.

o Develop and execute a data migration procedure for current, as well as future, migrations.
o Identify issues with data migration strategies and describe the implications:
  ▪ Accuracy
  ▪ Data integrity
  ▪ Efficiency
  ▪ Work product (KON, annotations, PS) migration
o Determine costs of data migration strategies.
o Develop a cutover strategy that minimizes impact on the users.

E. Maintain data security and individual privacy.

o Create, monitor, and enforce data security and privacy polices.
o Describe the HIPAA requirements for systems management with respect to privacy.
o Describe strategies for providing data security.
o Identify tools and techniques for providing data security.

IX. Clinical Engineering

A. Assess imaging modality capabilities.
o Describe and differentiate among all imaging modalities:
   ▪ Basic operating principles
   ▪ Typical clinical applications
   ▪ Image formats and appearances
   ▪ Data volumes and file sizes
   ▪ Interpretive considerations
   ▪ Typical exam protocols

B. Supervise modality integration.
o Manage and coordinate integration activities.
o Comprehend applicable technical documentation, such as network diagrams, conformance statements, and integration profiles.
o Use the technical skills needed for integration such as:
   ▪ Networking
   ▪ Appropriate DICOM Transfer Syntaxes
   ▪ Standards
   ▪ Tools

C. Establish a program for image display quality control.
o Explain what is meant by compliance with the Grayscale Standard Display Function (GSDF).
o Discuss the impact of GSDF on display and hard copy consistency.
o Describe the use of recommended tools, procedures, and test patterns for image display consistency.
o List and describe all influences in the imaging chain that should be evaluated and monitored for optimal image display.

D. Recognize hazards specific to the healthcare environment.
o Recognize the occupational safety hazards associated with each modality, such as infection and biohazards.
o Recognize the patient safety hazards associated with each modality, such as electrical safety, ionizing radiation, and magnetic fields.
X. Medical Informatics

A. Identify and implement medical imaging standards.
   - Understand the communication protocols and data formats of imaging informatics standards, such as DICOM and HL7.
   - Understand the image quality standards, recommendations, and regulations.
   - Understand coding and nomenclature standards which impact image interpretation and workflow.

B. Apply appropriate IHE guidelines.
   - Specify and interpret applicable IHE integration profiles.
   - Interpret an IHE integration statement and connectathon results.

C. Integrate image architecture into organization's long-range plan.
   - Understand how multiple imaging disciplines can use a common enterprise archive.
   - Appreciate the challenges of using multiple patient identifiers (MPI) and how MPI can help.
   - Understand information sharing concepts and the requirements associated with regional and national healthcare delivery systems.
   - Appreciate the unique workflows and requirements associated with all imaging specialties.