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

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B. Apply appropriate IHE guidelines.

C. Integrate image architecture into organization's long-range plan.
The SIIM Imaging Informatics Professional (IIP) Education Advisory Network 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 or Imaging Based component (Archive/Viewer/Workflow Manager).
   - Identify key stakeholders within and outside the organization and their expectations.
   - Discuss the objectives and elements of a formal PACS Strategic Plan.
   - Identify the functional requirements associated with PACS for factors affecting the organizations’ business practices.
   - Appraise the relevance of existing equipment and systems inventory in PACS purchasing decisions.
   - 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.
   - Identify the impact of PACS implementation on future workflow processes in Radiology and other clinical departments.

B. Establish and implement a process for vendor selection.
   - Discuss the elements of a formal Request for Proposal (RFP) document.
   - Describe the objectives of the RFP process.
   - 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, a Request for Solutions, and a Request for Information.

C. Negotiate contracts with vendors.
   - List the standard components of a contract, such as pricing, implementation support, training, service, functionality, acceptance criteria, financing options, penalties, etc.
   - Describe negotiation strategies as they relate to the contract components.
   - Recognize the need to comply with federal regulations.
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 basis of QI (i.e., 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.
• Develop, implement, monitor, and regulate policies and procedures, and establish accountability.

C. Ensure compliance with Federal regulations.
• Define criterion for compliance with federal regulations.
• Evaluate the impact of the Health Information Technology for Economic and Clinical Health (HITECH) Act and The Affordable Care Act on imaging processes.
• 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.
• Contrast PACS as a Radiology versus an Enterprise implementation, including its role, workflow, organizational structure, management, departments, affiliates 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 Imaging Informatics organizational structure.
• Determine the needs for an Imaging Informatics 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.
- Define the audience affected by downtimes, upgrades, and changes in workflow.
- Define the processes for suitable communication strategies to reach medical, allied health, and technical professionals.
- Create documentation describing the communication of downtime procedures.

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

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

V. Training and Education

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

B. Evaluate and select training programs according to user needs.
- Incorporate the characteristics of adult learners and adult training methods into teaching strategies.
- 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.
   - Assess appropriate usage of tablets and smart phones for image display.
   - 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 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.
● Determine viewing privileges and storage rules for importing studies into the PACS.
● Establish workflow processes and protocols for exporting studies from the PACS.
● Understand the policy and implementation, as described by the IHE, specifically PDI and IR.
● Understand the methods of image exchange as well as the advantages or limitations of each. (CD, Cloud)
● Recognize the recording and digitizing technologies used for image exchange.

VII. Information Technology

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

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

C. Implement and maintain appropriate server hardware and software.
  ● Examine hardware and software requirements for imaging servers.
  ● 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.
- Describe the metrics used to measure system performance, such as online response time.
- Evaluate alternative strategies for enterprise-wide performance improvement and cost-effectiveness.
- Evaluate impact of new technologies on PACS infrastructure.

B. Plan disaster recovery (DR) and business continuity (BC) strategies.
- Differentiate between BC planning and DR planning.
- Create policies and procedures for DR.
- Describe the HIPAA requirements for systems management with respect to DR.
- Test DR and BC plans.
- Evaluate DR and BC plans and modifications periodically, as required.

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

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

E. Maintain data security and individual privacy.
● Create, monitor, and enforce data security and privacy policies.
● Describe the HIPAA requirements for systems management with respect to privacy.
● Describe strategies for providing data security.
● Identify tools and techniques for providing data security.

IX. Clinical Engineering

A. Assess imaging modality capabilities.
● 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.
● Manage and coordinate integration activities.
● Comprehend applicable technical documentation, such as network diagrams, conformance statements, and integration profiles.
● 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.
● Explain what is meant by compliance with the Grayscale Standard Display Function (GSDF).
● Discuss the impact of GSDF on display and hard copy consistency.
● Describe the use of recommended tools, procedures, and test patterns for image display consistency.
● 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.
● Recognize the occupational safety hazards associated with each modality, such as infection and biohazards.
● 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 statements 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.