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.
   - 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.
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 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.
o 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.
o Recognize the roles and uses of ICD and CPT coding in relation to PACS’ workflow and billing.
o 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 a 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 learning 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.

o Define a delivery process for those resources that accommodate the organization’s staffing, schedules, special needs, and available resources.
o Analyze and suggest workflow modifications that are required during training.
D. **Evaluate effectiveness of training.**
- Develop methods for learning 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.

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 standards of file exchange.

Recognize the recording and digitizing technology used for image integration.

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.
   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.
   o Differentiate among the different database designs and understand the implementation basics.
   o Execute simple database queries.
   o Understand basic database management and performance measurement tools.

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

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

G. PACS architecture.
   o Identify key components of PACS architecture, including servers, diagnostic workstations, and software application architectures.
   o Explain how components are connected, including any relevant interfaces and approaches to integrated HIS/RIS/PACS/VR.
   o Differentiate among common PACS architectures, such as web-based viewing, integrated webservers, multiple tier archives, the role of specialty workstations, and modalities.
   o 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.
   o Develop a model for calculating archive capacity requirements.
   o Describe various methods that vendors use for licensing software.
   o 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 policies.
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
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 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.