Imaging Informatics Professional
Educational Learning Objectives

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Revising Body | IIPI Subcommittee
Luke Bideaux, BSRT, RT (R), CIIP
Don Dennison, FSIIM
Nikki Fennell, CIIP

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Revising Body | Education Task Force
Meredith Alaynick, BSRT, CIIP
T. Jay Crawford, MHA, CIIP
Abe Nader, MS, CIIP, RT(CT)(R)

Created January 2008
Establishing Body | SIIM Education Committee
George H. Bowers, MBA,
Chair Leonard S. Avecilla, MS
David E. Brown, BSCS, CNMT, CIIP
Nicole M. Hardin, MS, RT(R)(M)
David A. Koff, MD
David A. Lahman, MA, RT(R)
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Ann L. Scherzinger, PhD
Alan L. Schweitzer, MEE
Mark A. Struthers, BSRT, CIIP
MaryAnn Tateosian, RT(R), CIIP
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Introduction
This set of learning objectives has been developed to serve as an outline for IIP educational development at SIIM. A competent imaging informatics professional should have sufficient capabilities in the 10 knowledgebases identified below. Content developers for foundational IIP educational material should work to align with the below learning objectives in order to create material that is consistent with SIIM’s objectives for educating the imaging informatics professional community.

Procurement

Perform financial analysis for procurement procedures.
- Develop a business case for a procurement project
- Prepare a Total Cost of Ownership (TCO) proposal
- Demonstrate a Return on Investment (ROI) presentation

Determine organizational need and readiness for system changes.
- Synthesize the financial aspects of purchasing a PACS or Imaging Based component (Archive/Viewer/Workflow Manager).
- Determine needs through assessment procedures
- Determine process for requesting and utilizing capital expenditure and operational expenditure funds
- Identify key stakeholders within and outside the organization and document their expectations.
- Align procurement decisions with the organizational strategic plan.
- Identify the functional requirements associated with the system being procured for factors affecting the organizations’ business practices.
- Appraise the relevance of existing equipment and systems inventory in system purchasing decisions.
- Identify the members needed for a imaging informatics steering committee.
- List key elements that must be considered (planned for) in site preparation that are not included in the vendor’s system purchase price.
- Identify the impact of system implementation on future workflow processes in Radiology and other clinical departments.

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 system selection, including site visits, reference checks, etc.
Differentiate between a Request for Proposal, a Request for Solutions, and a Request for Information.

Contribute to the contracting process.

- Comprehend the standard components of a contract, such as pricing, implementation support, training, service, functionality, acceptance criteria, financing options, penalties, etc.
- Recognize the need to comply with appropriate regulations and laws.
- Advise the contracting team on the technical and operational considerations of the contract.
Project Management

Identify the goals, scope, risks, and key members of the project team.
- Identify the appropriate documentation templates to use for the project (e.g., Gantt chart, RACI diagram, SWOT analysis, etc.)
- 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.

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.

Utilize 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.
Operations

Identify, 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 (e.g., SBAR form).
- Determine target areas for improvement based upon analysis.
- Evaluate issues through a 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.

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 new policies and procedures.
- Administer policies and procedures.
- Develop and manage contingency plans.
- Communicate policies and procedures within and outside of the imaging department.

Ensure compliance with regulations and laws.

- Define criterion for compliance with regulations and laws.
- Evaluate the impact of the Health Information Technology for Economic and Clinical Health (HITECH) Act and The Affordable Care Act on imaging processes (or similar for the jurisdiction).
- Assemble tools for compliance processes.
- Design compliance procedures and processes.
- Educate staff on compliance procedures.
- Regulate compliance.

Perform operational budgeting

- Determine existing organizational budgets
- Determine how operational expenses are submitted and approved
- Identify and implement operational cost savings initiatives
- Identify and implement operational revenue generation initiatives
Identify and report compliance issues
  ● Assess existing operation for compliance concerns
  ● Align operation with existing compliance program
  ● Implement reporting process for ethical issues

Support operations of ancillary services
  ● Assess operations of ancillary departments within your organization
  ● Determine strategies for integrating ancillary services into enterprise operational strategy
  ● Document differences in operational workflows and processes
  ● Contribute to a multi-departmental governance strategy for operational change management
Communications

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.
- Advocate for the need for Imaging Informatics within the IT department
- Educate personnel on the proper support channels for both internal and vendor-related support needs

Communicate with healthcare professionals using appropriate imaging informatics terminology and standards.

- Explain appropriate medical terminology (i.e., anatomy, physiology, and pathology) as it relates to medical images.
- Utilize appropriate imaging informatics system terminology (i.e. display protocols, series descriptions, routing rules, etc.).
- Relate the terminology to its use in the standards, such as DICOM and HL7, as well as in technical frameworks like IHE, and the impact on display parameters, such as determining the relevance among a set of exams and the application of desired hanging/display 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.

Communicate the value of the Imaging Informatics Team.

- Present the cost savings initiatives performed by the Imaging Informatics Team
- Present the revenue generating initiatives performed by the Imaging Informatics Team
- Communicate the technical and operational value that the Imaging Informatics Team brings
- Prepare and communicate a roadmap for imaging informatics changes

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.

Develop user feedback mechanisms.

- Evaluate existing assessment and feedback tools and techniques, both operational and technical.
- Develop response strategies.
Apply change management best practices

- Provide an assessment of change enhancement that is consistent with organizational objectives.
- Adhere to system change control procedures (e.g. as defined in ITIL).
- Identify stakeholders that should be informed of the change.
- Identify the mediums available for communication pathways.
Training and Education

Perform a needs assessment to determine training strategies.
- 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.

Evaluate and select training programs according to roles and responsibilities.
- 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.

Implement training or educational programs.
- Identify and prepare the systems and data to be used for training.
- 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.

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.
Image Management

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

- Review and apply appropriate recommendations of the Human Factors and Ergonomics Society to workstations.
- Identify key considerations for designing the 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.

Evaluate the human-computer interface.

- Evaluate the overall workflow and optimize the user experience for each role
- Evaluate the requirements for the integration of EMR/RIS/PACS/other health informatics systems and identify which IHE integration profiles should be supported to optimize the user experience.
- Utilize the tools within the image viewer to interact with the images
- Implement display devices according to regulatory requirements, industry guidelines and best practices
- Optimize the use of input devices according to user and workflow requirements
- Assess appropriate usage of tablets and smart phones for image and result display, where necessary.

Establish workflow and 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.
- Establish a process for identifying records that need to be corrected
- Assess and implement appropriate tools and methods for correcting records
- Classify and document all actions related to workflow integrity.
- 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.
- Identify image storage, acquisition protocols, and standards implementation for teaching files and research, where applicable.
- Determine what form of image compression should be used according to various workflow and clinical requirements.
- Evaluate the IHE Technical Framework in relation to image display and workflow.
Manage outside studies

- Implement and prioritize imaging information management policies and procedures for clinical, research, nighthawk, and teleradiology services, where appropriate.
- 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.
- Evaluate if your organization should adopt processes outlined in the PDI and/or IRWF IHE Technical Frameworks.
- Identify the advantages and limitations of different kinds of image exchange methods.

Develop an Enterprise Imaging strategy

- Develop an enterprise imaging governance team and corresponding governance processes
- Document existing imaging workflows and inventory image generating device types and clinical areas across the enterprise
- Determine system consolidation and/or integration strategy for all imaging within the enterprise
Information Technology

Manage servers and client workstations
- Determine appropriate server architecture
- Implement appropriate client workstations
- Determine virtualization needs and implement appropriate VM instances

Manage image and clinical data storage
- Examine storage and archive needs associated with medical imaging, projected over time.
- Review current storage (e.g. for cache, archive, database) architectures and solutions, such as DAS, SAN, and NAS.
- Identify the types of storage protocols, such as file based and block based.
- Distinguish among the different storage media technologies (e.g. SSD, spinning disk) and identify when and how they are used.
- Establish storage management and retention policies.
- Implement appropriate data backup and restore procedures
- Calculate performance and capacity needs.

Design and specify network architecture.
- Examine networking needs generated by imaging.
- Review network architecture and solutions, including LAN and WAN.
- Implement fault tolerance and load balancing practices to secure your environment and improve system availability.
- Utilize network and transmission protocols for data communication.
- Comprehend the OSI reference model.
- Distinguish network hardware and software components.
- Configure organizational networks according to local needs and best practices.
- Distinguish network metrics such as bps, service level, collisions, etc.

Document and maintain appropriate hardware and software.
- Document all existing hardware and software being utilized for medical imaging
- Develop a patch management strategy
- Examine hardware and software requirements for imaging servers.
- Differentiate among different server architectures.

Retrieve information from databases for operations, quality assurance, and planning purposes.
- Determine level of database access
- Differentiate among the different database designs and understand the implementation basics.
- Execute simple database queries.
- Utilize basic database management and performance measurement tools.

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

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

Architect imaging informatics systems
- Identify key components of Imaging Informatics systems, including servers, diagnostic workstations, and software application architectures.
- Explain how components are connected, including any relevant interfaces and approaches to the integrated HIS/RIS/PACS/VR.
- Differentiate among common Imaging Informatics system architectures, such as web-based viewing, integrated web servers, multi-tier archives, the role of specialty workstations, and modalities.
Systems Management

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.

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.

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.

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, and work product (KON, annotations, PS) migration.
- Determine costs of data migration strategies.
- Develop a cutover strategy that minimizes impact on the users.

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.
Clinical Engineering

Assess imaging modality capabilities.
- Describe and differentiate among all imaging modalities, including basic operating principles, typical clinical applications, image formats and appearances, data volumes and file sizes, interpretive considerations, and typical exam protocols.

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, and tools.

Establish a program for image display quality control.
- Utilize Grayscale Standard Display Function (GSDF) to comply with diagnostic monitor calibration guidelines.
- 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.

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.

Manage non-image data used in medical imaging
- Assess all relevant non-image data used in medical imaging departments (HL7 data, documents, biometric data, etc.)
- Incorporate non-image data into the organization’s enterprise imaging strategy
Medical Imaging Informatics

Engineer medical imaging workflows
- Evaluate existing workflow processes for medical imaging informatics systems
- Measure the efficiency of medical imaging workflows
- Optimize processes to improve workflow efficiencies

Identify and implement medical imaging standards.
- Utilize the communication protocols and data formats of imaging informatics standards, such as DICOM and HL7.
- Utilize coding and nomenclature standards, such as ICD, CPT, and SNOMED.

Apply guidelines from appropriate IHE integration profiles.
- Evaluate the utility implementing each IHE integration profile based on organizational need.
- Develop a strategy to align an organization to IHE integration profiles

Implement system integrations (EMR, RIS, VR, Dose Management, etc.)
- Document integration specifications for new and existing integrations
- Implement integrations that allow multiple systems to work together effectively
- Utilize industry standards and best practices to achieve integrations
- Develop a program to monitor all integrations and correct any errors that occur
- Implement a change management program for system integrations

Align imaging architecture with the organization's vision.
- Implement an enterprise imaging archive to manage imaging studies across multiple disciplines within your organization.
- Appreciate the challenges of patient identity management and determine how solutions such as Master Patient Indexes (MPIs) can help solve problems.
- Implement image sharing best practices for both internal and external needs.
- Appreciate the unique workflows and requirements associated with all imaging specialties.