INFORMATICS CURRICULUM

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Pathology Informatics Essentials for Residents (PIER) Overview

PIER is a research-based instructional resource developed by the Association of Pathology Chairs (APC), the Association for Pathology Informatics (API) and the College of American Pathologists (CAP) that presents training topics, implementation strategies and resources for pathology residents to learn the fundamentals of informatics in its relation to the practice of Pathology and meet ACGME informatics milestone requirements. PIER was designed and developed by the PIER Collaboration Working Group with members and professional staff from APC, API and CAP.

Reference text


Informatics ACGME Milestones

| SBP7: Informatics: Explains, discusses, classifies, and applies clinical informatics (APCP) |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Has not Achieved Level 1       | Level 1                         | Level 2                         | Level 3                         | Level 4                         | Level 5                         |
| Demonstrates familiarity with basic technical concepts of hardware, operating systems, and software for general purpose applications. | Understands lab specific software, key technical concepts and subsystems on interfaces, workflow, barcode applications, automation systems (enterprise systems architecture). | Applies informatics skills as needed in project management (data management, computational statistics). | Participates in operational and strategy meetings, apprentices troubleshooting with IT staff, applies informatics skills in laboratory management and integrative bioinformatics (able to aggregate multiple data sources and often multiple data analysis services). | Is proficient in medical informatics systems. Able to assess and purchase a laboratory information system for anatomic and/or clinical pathology laboratories. Able to utilize medical informatics in the direction and operation of the laboratory. |

Comments:

E-1  
E-2  
E-3  
E-4

Revised: 8/12/2016
PIERS Curriculum

PIER Essentials 1
- Informatics in Pathology Practice
- Information Systems Fundamentals
- Importance of Databases
- Introduction to Data Standards
- Data Availability & Security

Entry-Level Proficiency
ACGME Milestone Level 1
Instructional Hours: 4-6

PIER Essentials 2
- LIS Components & Functions
- Specialized LISs & Middleware
- Data & Communication Standards
- Digital Imaging
- Basics of the Health Care Information Ecosystem

Basic Proficiency
ACGME Milestone Level 2
Instructional Hours: 8-10

PIER Essentials 3
- Pathologist Role in LIS & EHR Projects
- LIS Installation & Configuration
- Information Systems & Laboratory Performance
- Data Security, Regulatory & Accreditation Requirements

Intermediate Proficiency
ACGME Milestone Level 3
Instructional Hours: 10-12

PIER Essentials 4
- LIS Management & Oversight
- Order and Results Management
- Laboratory Data for Quality Improvement & Research
- Laboratory Data & Enterprise Health Care Analytics

Advanced Proficiency
ACGME Milestone Level 4
Instructional Hours: 10-14

Pathology Informatics Essentials for Residents

Revised: 8/12/2016
This curriculum will be integrated into the Intro to Laboratory and CP Core Rotations (see separate curricula).

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Note: PIER Essentials 1 should be covered during the Intro to Lab Rotation. If the resident has already completed that rotation, he/she must perform duties of PIER Essentials 1 during the first CP Core Rotation.

1. Essentials 1
   a. Informatics in pathology practice
      • Outcomes
        i. Understand the relevance of informatics in pathology practice.
        ii. Describe the difference between information technology and informatics and recognize how pathologists contribute to informatics initiatives.
        iii. Explain the salient differences and similarities among pathology informatics, bioinformatics, public health informatics, health care information technology and health knowledge informatics.
      • Exercises
        i. Keep a log of informatics-related activities and questions that occur for one full week.
        ii. Throughout the rotation, discuss informally with more senior residents, staff pathologists or informatics faculty to understand better the implications for patient care and laboratory operations.
        iii. During a resident conference (CP Call Review, Journal Club or other), share your experiences, observations and questions from your informatics log.
   b. Information systems fundamentals
      • Outcome
        i. Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.
      • Exercises
        i. Use any computer in the pathology laboratory to perform the following actions:
           • Display the total amount of data storage and the percentage of storage capacity that is currently available on the computer.
           • Identify the operating system, its version, and application programs in use on the computer.

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• Identify the web browser (and version) in use on the computer.
• Use a networked server to open and save files.
• Select a desired networked printer and print a document.
• Determine the IP address for this networked computer.

c. Importance of databases
• Outcome
  i  Become conversant in the fundamentals of databases, including data types, fields, records, database structure and mechanisms for querying data, and display an understanding of how data storage affects data retrieval options.
• Exercise
  i  Demonstrate the ability to use a database application (e.g., FileMaker, MS-Excel, MS-Access) to design and build a simple database for a particular purpose (such as a QA project, an address book, etc.).

d. Introduction to data standards
• Outcome
  i  Define the types and roles of standards used in pathology, at a basic level.
• Exercises
  i  Identify codes that are associated with a given case, specimen or report. This data may be available in the laboratory information system (LIS) and/or printed reports. Examples include ICD-9/10, CPT, SNOMED CT, LOINC, etc.
  ii  View an example HL7 message from one of the laboratory’s systems.

e. Data availability and security
• Outcome
  i  Understand the elements of data availability, as a key part of security.
• Exercises
  i  Review the laboratory’s downtime policy/SOP to see how the lab would operate during a downtime.
  ii  Review the hospital’s hurricane preparedness policy.

2. Essentials 2

a. Laboratory information system (LIS) components and functions
• Outcomes
  i  Recognize what LISs are, what they do, and the role they play in efficient lab operations and health care delivery.
  ii  Articulate the role and connections of the LIS within the network of health care information systems (i.e., the local health care information ecosystem).
  iii  Understand how patient and asset identification standards and tracking systems are used to improve patient safety and laboratory workflow.
iv  Comply with positive patient identification processes/protocols.

• Exercises
  i  Follow a specimen from receipt through to final report generation, noting each instance how a person or device (e.g., lab instrument) interacts with the LIS in processing that specimen. For each step, identify the key data elements involved and the user type(s)/role(s) involved.
  ii  Access the most recent CAP Today System Survey (http://www.captodayonline.com/productguides/) regarding either clinical laboratory information systems and identify five to six distinguishing characteristics that clearly differentiate the labs current LIS from the others listed.

b. Specialized laboratory information systems and middleware

• Outcomes
  i  Recognize what LISs are, what they do and the role they play in efficient lab operations and health care delivery.
  ii  Describe middleware, how it relates to the LIS and roles for middleware in laboratory operations.
  iii  Understand capabilities and limitations of electronic interfaces between an LIS and instrumentation, middleware and other information systems.

• Exercises
  i  Identify where middleware is used, the name of the middleware system, and its functions or purposes.
  ii  Visit an area of the laboratory that utilizes a specialized LIS or specialized module of the LIS and identify what features/functions are unique (e.g., blood bank, molecular lab, etc.).
  iii  How does the blood bank differ from other areas of the lab?

c. Data and communication standards

• Outcomes
  i  Define the key features of communication standards used in pathology, such as HL7 and DICOM.
  ii  Describe the characteristics and appropriate applications of standard terminologies (e.g., CPT, ICD, SNOMED CT and LOINC) used to represent pathology data in the LIS and EHR.
  iii  Recognize the advantages of standardized terminology for creating interchangeable data, which can be retrieved and summarized.
  iv  Understand the basics of the standards development process (includes ISO organizations like HL7 and also other processes important in standards development like IHE and ONC).

• Exercises

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i  Have the resident compare a laboratory/pathology report with the corresponding HL7 message and identify the main data elements.

ii  Review the National Center for Biomedical Ontology (NCBO) BioPortal: (http://bioportal.bioontology.org). Perform the following tasks:
   •  Compare and contrast the structure and concept content of SNOMED CT, ICD 9/10, LOINC and CPT, using the BioPortal browser displays for pathology reports.
   •  Code a set of AP and CP pathology reports that contain a range of procedure and clinical concepts, of varying complexity (e.g., at least one synoptic report should be included).

d.  Digital imaging
   •  Outcomes
      i  Determine the appropriate digital image resolution for a particular need/purpose.
      ii  Understand potential role, use, and limitations of whole slide imaging in the laboratory environment.
      iii Determine the appropriate telemicroscopy technology to use for a particular application.
      iv  Utilize digital imaging systems, such as whole slide imaging, dynamic telemicroscopy and image analysis (as appropriate to the practice setting).
   •  Exercises
      i  Edit a digital image (e.g., crop, resample, adjust colors).
      ii  Review the digital imaging equipment available for residents to take digital gross photographs and/or photo-micrographs, as well as the process involved in including such images in a presentation.
      iii Create and use whole slide images (if available) for any application, such as a tumor board presentation or other educational activity.

e.  Basics of the health care information ecosystem
   •  Outcome
      i  Articulate the role and connections of the LIS within the network of health care information systems (i.e., the local health care information ecosystem).
   •  Exercise
      i  Sketch out a relatively high-level diagram of information systems in your environment with which the LIS exchanges data. This should include names of key systems, such as the electronic health record (HER) in use.
      ii  Demonstrate how to submit and respond to a patient safety report.

3.  Essentials 3
   a.  Pathologist role in LIS and EHR projects
• Outcomes
  i  Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the function of the modern pathology laboratory.
  ii Describe the difference between information technology and informatics and recognize how pathologists contribute to informatics initiatives.
  iii Articulate the role and connections of the LIS within the network of health care information systems (i.e., the local health care information ecosystem).

• Exercises
  i  Attend a lab/IT collaboration meeting and record your observations.
  ii Provide one (or more) recommendations for improvement in how the LIS and/or EHR manage pathology/laboratory data and the rationale for the recommendation.

b. LIS installation and configuration
• Outcomes
  i  Provide input to the LIS selection team to ensure that an optimal fit between a purchased system and departmental needs is attained.
  ii Work with information systems personnel to ensure that reports are properly formatted (e.g., synoptic format and other standardized formats as appropriate).
  iii Understand the process and requirements for test definition and other information maintenance in the LIS.
  iv Recognize limitations and information gaps resulting from the limitations of the data analysis capability of the LIS.

• Exercises
  i  Provide one (or more) recommendations for improvement in how the LIS and/or EHR manage pathology/laboratory data and the rationale for the recommendation.
  ii Identify all required elements of a lab report.
  iii Identify test codes in the clinical the laboratory LIS.
  iv Identify the process for creating or updating a test definition in the LIS.
  v Identify the process for creating or updating a specimen type (part type) in the LIS.

c. Information systems and laboratory performance
• Outcomes
  i  Recognize what LISs are, what they do and the role they play in efficient lab operations and health care delivery.
  ii Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.
iii Understand how patient and asset identification standards and tracking systems are used to improve patient safety and laboratory workflow.
iv Identify opportunities to modify the LIS to improve operations.

• Exercises
  i Review autoverification practices and criteria for at least one laboratory test.
  ii Observe process for review and release of test results that have failed autoverification criteria.
  iii Determine whether autoverification rules for a given test reside in the LIS or in middleware.
  iv Review turnaround time (TAT) reports/statistics, learn from where they are derived and identify TAT trouble areas.
  v Attend quality assurance meetings and recognize data requirements and sources for the metrics discussed/followed in the lab’s quality plan.
  vi Review proficiency testing results.
  vii Access the specimen tracking function in the LIS to identify steps in tracking and/or to locate a specimen’s current location.

d. Data security, regulatory and accreditation requirements

• Outcomes
  i Maintain compliance with electronic information management requirements of regulatory and/or accreditation agencies (focus on regulatory perspective, management and inspection perspective of topic).
  ii Recognize situations under which information technology may be subject to FDA regulation (e.g., blood banking and whole slide imaging).
  iii Follow technology developments and identify opportunities for improving the security and quality of patient data.
  iv Adhere to HIPAA and other security and privacy requirements for the communication and storage of patient data (e.g., correct use of password protected accounts, firewalls, digital certificates, encryption, and two-factor authentication).

• Exercises
  i Perform a mock CAP inspection with the laboratory general checklist.
  ii Review laboratory procedures and documentation applicable to meeting requirements for testing/validation of an interface between the LIS and EHR.
  iii Participate in an inspection by a regulatory agency such as CAP, AABB, the Joint Commission or ASHI.

4. Essentials 4

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a. LIS management and oversight
   • Outcomes
      i. Explain the role and responsibility of pathologists with regard to the selection, oversight and use of informatics systems in the function of the modern pathology laboratory.
      ii. Supervise the LIS team in the creation and updating of the LIS procedure manual.
      iii. Identify opportunities to modify the LIS to improve operations.
      iv. Contribute to analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.
   • Exercises
      i. Identify important information to provide to a vendor.
      ii. Identify portions most important for pathologist input.
      iii. Understand who created the request for proposal (RFP).
      iv. Have the resident review a LIS vendor contract if available. Identify key elements, such as the licensing model (e.g., per seat), pricing and vendor support agreement (e.g., 24 x 7, phone, etc.)
      v. Name the vendor(s) of the following systems in use: LIS(s), EHR and any major middleware information handling systems, including point-of-care testing data management. For LIS(s), have residents determine the version name/numbers that the laboratory is using.

b. Order and results management
   • Outcomes
      i. Anticipate (and recommend remediation for) issues, potential problems and challenges in EHR handling of laboratory test orders.
      ii. Anticipate (and recommend remediation for) issues, potential problems and challenges in EHR handling of laboratory test results.
   • Exercises
      i. Observe any clinician order a laboratory test and see how they look up and use laboratory results in the EHR when rounding.
      ii. Review any problem cases that arise in which there is evidence that a laboratory order in computerized physician order entry (CPOE) was incorrect or incomplete.
      iii. Review any problem cases that arise in which there is a problem with interpretation or availability of a laboratory result in the EHR.
      iv. Compare the display of test results/reports in the LIS(s) to the display of the same result in the EHR. The relevance of any differences should be noted. See the Lab General CAP Checklist.

c. Laboratory data for quality improvement and research
   • Outcomes
i Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.

ii Contribute to the definition and creation of integrated health care data sets from multiple disparate sources in order to support useful, accurate, and reliable data analysis.

• Exercises

i Identify how to solve this scenario: There is literature supporting the fact that fine needle aspiration biopsies performed by pathologists save the health system money in the care of its patients. What data would you require to substantiate this claim in your own institution?

ii Identify how to solve this case: Performing biomarker testing on needle core biopsies of breast cancers may minimize the costs to the health care system by providing treatment related information earlier in the process versus waiting for the excised specimen. However, oftentimes repeat testing is performed. Sometimes testing is not performed and should be. How would one establish criteria for appropriate testing based on available data sets?

d. Laboratory data and enterprise health care analytics

• Outcomes

i Recognize applications of ancillary information systems to optimize clinical, operational and financial performance of the laboratory (e.g., middleware, financial systems, business intelligence).

ii Understand the special difficulties of information-flow to and from the local information ecosystem (e.g., for outreach programs) and strategies for overcoming the obstacles.

iii Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.

• Exercises

i Partake in Informatics for Integrating Biology and the Bedside (i2b2) or Business Objects training.

ii Use informatics in a quality assurance or test utilization project.

iii Identify informatics in a quality assurance or test utilization project.

iv Identify which metrics the laboratory is expected to report for institution-level quality activities.