The PIER Map and Resident Assessment Tool is a high-level map containing the topics, subtopics, outcome statements, and rationale for each Essentials in one document and acts as a self-reporting assessment tool allowing you and your residents to monitor and track their progress towards the attainment of the PIER Essentials Outcomes.

The **map** portion provides a high-level overview of each of the four Essentials which includes the goal of the topic (ie, Rationale), subtopics, and outcome statements to be achieved by the resident. It also includes space to enter the name of the **Practical Exercise(s)** completed.

After each Essentials there is a space for the program director and resident to enter their signatures indicating the successful completion of the assigned topics and practical exercises assigned for the Essentials. Once all assigned Essentials are completed, the document can then be used as a permanent record indicating the resident’s participation in PIER.

The **assessment** portion provides a method for tracking the progress of the resident. This section is completed by inserting the following information.

**Year** – Enter the residency year (eg, PGY-1)

**Rotation** – Enter the location where the topic/outcome statements and/or practical exercise occurred.

**Complete** – Enter the date the topic/outcome statements and/or practical exercise was completed.

Note: These fields can be completed by either the resident or program director.

# Essentials 1 Map and Resident Assessment

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| **Topic 1: Informatics in Pathology Practice** | **Year** | **Rotation** | **Complete** |
| **Rationale**: The practice of pathology relies on the creation, management, accurate, and timely communication of clinical laboratory information. | **Subtopics**1. Role of informatics in the daily practice of pathology
2. Distinction between informatics and IT
3. Definitions and roles of informatics subspecialties
4. Practices of and interactions between clinical and pathology informatics
 | **Outcome Statements*** Explain the relevance of informatics to the practice of pathology and lab medicine.
 |  |  |  |
| * Describe the differences between information technology and informatics.
 |  |  |  |
| * Define the different subspecialties of health informatics (eg, public health informatics, bioinformatics).
 |  |  |  |
| * Describe the appropriate relationship between pathology informatics and clinical informatics within a health system.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 2: Information Technology Fundamentals** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Computers and other IT/communication technology are essential tools that pathologists use in the management of information for laboratory practice and patient care. | **Subtopics**1. Computer hardware and software
2. Networks, including the Internet
3. Database architectures
4. Uses of databases in pathology and medicine
 | **Outcome Statements*** Use correct terminology to describe the major types and components of computer hardware and software.
 |  |  |  |
| * List the key devices that make up computer networks.
 |  |  |  |
| * Describe the fundamentals of databases and database management systems and how database architecture impacts retrieval of data.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 3: Introduction to Data Science** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Data science enables the extraction of knowledge and insights from structured and unstructured pathology data and underlies computational pathology. | **Subtopics**1. Structured versus unstructured data
2. Fundamentals of statistical approaches
3. The “V’s” (volume, velocity, variety, veracity, value) of Big Data
4. Data and messaging protocols common in pathology and healthcare
5. Artificial intelligence and machine learning
 | **Outcome Statements*** Define data science, structured and unstructured data, and list where each is found in pathology.
 |  |  |  |
| * Understand fundamentals of statistical approaches to data analysis.
 |  |  |  |
| * Describe the major features of big data.
 |  |  |  |
| * List the types and roles of data and communication standards used in pathology.
 |  |  |  |
| * Define artificial intelligence and machine learning.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 4: Data Availability and Security** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Pathologists are ultimately responsible for the access to and safety of pathology data. | **Subtopics**1. Data protection, privacy, and confidentiality
2. Data integrity and availability, including backup, recovery, and high reliability
3. Interoperability
4. Accreditation and regulatory standards (eg, AABB, CAP, CMS/HHS, FDA, HHS, TJC)
 | **Outcome Statements*** Describe the competing demands of data availability and data security within and between health systems.
 |  |  |  |
| * List the regulatory requirements for PHI as it pertains to laboratory and patient data.
 |  |  |  |
| * Define high reliability as it pertains to health information systems and access to patient data.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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# Essentials 2 Map and Resident Assessment

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| **Topic 1: LIS Components & Functions** | **Year** | **Rotation** | **Complete** |
| **Rationale**: The LIS is mission-critical to the management of the day-to-day practice of pathology and functioning of laboratories. | **Subtopics**1. Definition and major features of the LIS
2. Role of the LIS
3. AP and CP LIS similarities and differences
4. Asset tracking systems
5. Positive patient identification
 | **Outcome Statements*** Describe the LIS and the role that it plays in the efficient operation of the lab and delivery of patient care.
 |  |  |  |
| * Define the core LIS elements: dictionaries, worksheets, and interfaces.
 |  |  |  |
| * List the other major information systems within a health system to which the LIS is connected or interfaced.
 |  |  |  |
| * Describe patient and asset identification standards and tracking and how they are used in lab workflows to improve patient safety.
 |  |  |  |
| * Explain the need for and the key aspects of a positive patient identification process/protocol.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 2: Specialized LISs and Middleware** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Specialized areas and devices in the laboratory require specialized information system capabilities. | **Subtopics**1. Specialized LIS (ie, reasons, distinctions and uses)
2. Specific specialized LISs (transfusion medicine, molecular pathology)
3. Middleware definitions, types, and roles in the lab
4. Interface engines and lab data transmission
 | **Outcome Statements*** List and characterize the specialty LISs (eg, blood bank, molecular) utilized in the laboratory.
 |  |  |  |
| * Describe middleware, how it relates to the LIS, and roles for middleware in laboratory operations.
 |  |  |  |
| * Understand capabilities and limitations of electronic interfaces between the LIS and instrumentation, middleware, and other information systems.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

| **Topic 3: Interoperability, Messaging Standards, and Regulations** | **Year** | **Rotation** | **Complete** |
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| **Rationale:** Standards enable sharing of data among health care information systems (ie, interoperability) which is necessary for patient care. | **Subtopics**1. Features of communication and terminology standards
2. Standards development process (eg, HL7, ISO, IHE, ONC)
3. Application of standards (eg, CPT, ICD, SNOMED CT, DICOM, and LOINC)
 | **Outcome Statements*** List the key features of communication standards used in pathology (eg, HL7).
 |  |  |  |
| * Describe the characteristics and appropriate applications of standard terminologies (eg, CPT, ICD, SNOMED CT, DICOM, and LOINC) used to represent pathology data in the LIS and EHR.
 |  |  |  |
| * Recognize the advantages of standardized terminology for creating data interoperability.
 |  |  |  |
| * Understand the basics of the standards development process.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 4: Digital Imaging** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Digital imaging is a fundamental tool of pathology practice. | **Subtopics**1. Imaging process and image management (eg, capture, storage, retrieval, viewing)
2. Types of digital images (eg, static, dynamic, WSI)
3. Digital pathology applications (eg, telepathology)
4. Image analysis
 | **Outcome Statements*** Describe the impact of image format and resolution on the value of and uses for pathology images.
 |  |  |  |
| * Articulate the uses and limitations of whole slide image (WSI) in the practice of pathology.
 |  |  |  |
| * Determine the appropriate telepathology technology to use in a particular situation.
 |  |  |  |
| * Explain the potential role of image analysis for patient care and pathologist productivity.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 5: Basics of the Health Care Information Ecosystem** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Integrating pathology data into the health care enterprise is necessary for high quality patient care. | **Subtopics**1. Elements of the health care information ecosystem
2. How and why pathology shares data within the health care information ecosystem
3. Enterprise LIS versus a “Best of Breed” LIS
 | **Outcome Statements*** List the elements of the health care information ecosystem.
 |  |  |  |
| * Explain the value of integrating pathology with other health data.
 |  |  |  |
| * List the impact on data integration of the LIS that is an integral part of the EHR versus one that is free standing.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

Program Director Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date E2 Completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# Essentials 3 Map and Resident Assessment

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| **Topic 1: Pathologist Role in LIS and EHR Projects** | **Year** | **Rotation** | **Complete** |
| **Rationale**: The LIS is mission-critical to the management of the day-to-day practice of pathology and functioning of laboratories. | **Subtopics**1. Pathologist involvement in LIS and EHR projects, including decision support and troubleshooting order and result display issues
2. Basic project management of informatics projects (eg, life cycle of an informatics project)
3. Managing people, processes, and technology
4. Leadership versus management
 | **Outcome Statements*** Explain the role and responsibilities of pathologists in LIS projects.
 |  |  |  |
| * Explain the role and responsibilities of pathologists in managing test ordering and lab result display in the EHR.
 |  |  |  |
| * Explain the role and responsibilities of pathologists in the design of decision support for lab test orders.
 |  |  |  |
| * Discuss project management principles as it relates to informatics and lab projects.
 |  |  |  |
| * Describe the laboratory team involved with LIS/EHR projects and the leadership role of the pathologist on those teams.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 2: LIS Lifecycle** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Pathologists need to understand the requirements of managing the LIS through its entire life cycle.  | **Subtopics**1. LIS selection and implementation
2. LIS testing and training
3. LIS system configuration (eg, test creation and maintenance, dictionaries maintenance)
4. LIS upgrades and software patches
5. LIS retirement
 | **Outcome Statements*** List the key steps in the evaluation, selection, and implementation of a new LIS or module.
 |  |  |  |
| * Describe the testing and training procedures required for an implementation or upgrade of the LIS.
 |  |  |  |
| * Understand the process and requirements for test definition and other information maintenance in the LIS.
 |  |  |  |
| * Distinguish between system upgrades and software patches and explain the need to have current software versions.
 |  |  |  |
| * Discuss the retirement of the LIS, including the data transfer needs from the retired system to its replacement.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 3: Information Systems and Laboratory Performance** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Pathologists rely on information to monitor and improve the overall performance of the laboratory. | **Subtopics**1. Test utilization in the laboratory
2. Operational rules (eg, autoverification)
3. Workflow management (eg, tracking)
4. Error tracking and reduction
5. Quality metrics and monitoring (eg, TAT)
 | **Outcome Statements*** Describe the role of the LIS in facilitating appropriate ordering of tests by clinicians.
 |  |  |  |
| * List and define commonly used automated operational rules in the lab. (eg, autoverification, calculations, reflex testing).
 |  |  |  |
| * Describe how pathology utilizes interim, cumulative, amended, and addendum reports to control the flow of information.
 |  |  |  |
| * Explain the role of the LIS in monitoring the quality of lab performance and error tracking/reduction.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 4: Introduction to Data Warehousing and Analytics/Visualization Tools** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Pathologists require more than the LIS to provide data and a platform for analytics to support patient care and system operations. | **Subtopics**1. Data analytics capabilities and shortcomings of the LIS
2. Data warehousing (eg, data lakes, data marts, and unified data architecture (UDA))
3. Data analytics and visualization tools in health care and the lab
4. Essentials of dashboarding
 | **Outcome Statements*** Recognize limitations and information gaps resulting from the limitations of the data analysis capability of the LIS.
 |  |  |  |
| * Define a data warehouse, data lake, and data mart.
 |  |  |  |
| * List features of commonly used data analytics and visualization tools.
 |  |  |  |
| * Describe how pathology data is analyzed and visualized on dashboards to support efficient laboratory operations and the department or institution’s financial performance.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

Program Director Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date E3 Completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# Essentials 4 Map and Resident Assessment

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| **Topic 1: LIS Management and Oversight** | **Year** | **Rotation** | **Complete** |
| **Rationale**: Pathologists share in the responsibility of data and functionality management within the LIS. | **Subtopics**1. Laboratory procedures and hospital policies
2. LIS support model (eg, departmental versus institutional)
3. Vendor relationships
4. Change management (eg, everything from break fixes to upgrades)
5. End user support and communication practices
 | **Outcome Statements*** Maintain LIS policy and procedure manuals.
 |  |  |  |
| * Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of all systems used by the laboratory.
 |  |  |  |
| * Identify opportunities to modify the LIS to improve operations.
 |  |  |  |
| * Participate in a meeting, committee, etc. involving an aspect of LIS governance (eg, adding new lab test).
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 2: Laboratory Data Analytics for Quality Improvement, Education, and Research** | **Year** | **Rotation** | **Complete** |
| **Rationale:** The analysis of pathology data is critical to the safe, effective, and efficient operation of the lab, as well as medical education and research. | **Subtopics**1. CDS tool and test utilization metrics
2. Business intelligence tools
3. Research data infrastructures
4. Regulations regarding secondary use of clinical data
 | **Outcome Statements*** Describe the importance of ancillary data (eg, from middleware, financial systems, business intelligence) to optimize the clinical, operational, and financial performance of the laboratory.
 |  |  |  |
| * Present how your department manages protected health information (PHI) (de-identification and re-identification risk) for educational and research use.
 |  |  |  |
| * Analyze test utilization data to identify a single lab test that might benefit from the creation of a clinical decision support (CDS) tool and propose how the CDS tool might work.
 |  |  |  |
| * Utilize the analysis of pathology data in either a research study or an educational presentation.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 3: Laboratory Data for Quality Improvement and Research** | **Year** | **Rotation** | **Complete** |
| **Rationale:** Laboratory data is utilized for analytics at the enterprise level and requires pathologist input for maximal effectiveness. | **Subtopics**1. Data integration, including extract, transformation, and load principles
2. Data warehousing, including health information exchange considerations
3. Contributions to population health and Accountable Care Organizations (ACO)
4. Machine learning techniques (eg, "artificial intelligence")
5. Data blocking legislation
 | **Outcome Statements*** Explain how data from disparate sources are brought together in support of interoperability both within a healthcare organization and between health systems.
 |  |  |  |
| * Report on what pathology/laboratory data is and is not being stored in your hospital’s data warehouse.
 |  |  |  |
| * Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care effectiveness or quality.
 |  |  |  |
| * Explore data analysis horizons, including machine learning and data blocking legislation.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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| **Topic 4: Advanced Digital Imaging** | **Year** | **Rotation** | **Complete** |
| **Rationale**: The acquisition, storage, viewing and analysis of pathology and other clinical images is rapidly becoming a component of pathology practice. | **Subtopics**1. WSI consensus guidelines
2. FDA Regulation of WSI and WSI data
3. Vendor neutral archive and enterprise imaging strategies
4. Machine learning principles applied to image analysis
5. Annotation and analysis of WSI
 | * Understand the history of FDA regulation of whole slide imaging systems.
 |  |  |  |
| * Investigate the development of image analysis and machine learning applied to pathology and other clinical images with a focus on the need for large, high-quality data sets.
 |  |  |  |
| * Use a whole-slide image viewer to annotate a whole slide image (WSI).
 |  |  |  |
| * Explain the importance of and key aspects of an enterprise imaging strategy, including a vendor neutral archive.
 |  |  |  |
| **Practical Exercises** (List exercises completed) |  |  |  |

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