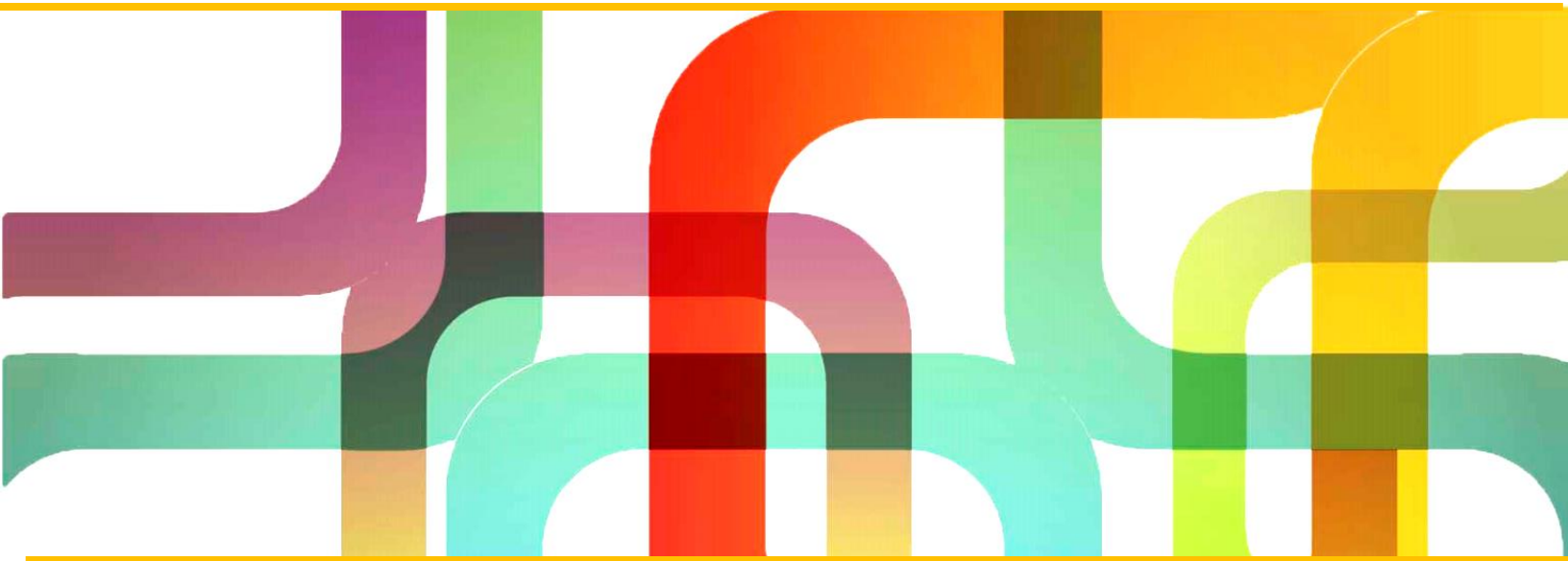


Pathology
Informatics
Essentials
for
Residents



Pathology Informatics Essentials for Residents Instructional Resource Guide

October 2018
Release 3.1



Access PIER releases at the Association of Pathology Chairs website
<http://www.apcprods.org/pier>

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS	3
1 INTRODUCTION.....	4
2 RELEASE HISTORY AND UPDATES	4
3 WHY PIER	4
4 BARRIERS.....	4
5 BENEFITS.....	5
6 PIER SCOPE AND SEQUENCE	5
7 PIER RESOURCE TOOLKIT OVERVIEW	8
8 GETTING STARTED WITH PIER	10
9 IMPLEMENTATION: HELPFUL HINTS AND TIPS.....	14
APPENDIX A – PIER OUTCOMES FOR ACHIEVEMENT	18
APPENDIX B – INFORMATICS ASSOCIATIONS, SOCIETIES, AND OTHER RESOURCES.....	21
APPENDIX C – ONE WEEK DIDACTIC COURSE (SAMPLE OUTLINE).....	22

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1 INTRODUCTION

“Pathologists currently in practice and those in training need to acquire additional skills in informatics to be prepared to maintain a central role in patient care.”

J.H. Sinard, MD, PhD
S.Z. Powell, MD
D.S. Karcher, MD
Pathology training in informatics. *Arch Pathol Lab Med.* 2014;138:505-11.

Pathology Informatics Essentials for Residents (PIER) is a research-based instructional resource developed by the APC, API, and CAP that presents training topics, implementation strategies, and resource options for program directors and faculty to effectively provide informatics training to their residents and meet ACGME informatics milestone requirements. PIER is also an effective resource for aspiring specialists to develop prerequisite pathology informatics knowledge and skills prior to advanced training or fellowships.

Successful implementation of PIER is intended to help residency programs provide a sufficient pipeline of residents trained in pathology informatics knowledge and skills required now and in the future.

Elements of PIER provide an organizer and process for residency programs to begin to develop their own self-study modules, lecture series, and blended learning units. It is beyond the scope of PIER to provide fully developed and ready-to-use downloadable self-study or didactic teaching materials.

2 RELEASE HISTORY AND UPDATES

The prototype, *Pathology Informatics Essentials for Residents – Instructional Resource Guide – Release 0* was introduced at the July 2014 APC Annual Meeting. Release 1 was the first fully developed iteration of PIER. It was alpha tested by 12 residency programs from late fall of 2014 through October 2015. Release 2 was launched in July 2016 and contained revisions recommended by the programs that provided input during the alpha test period. Release 3 launched in July 2018 and contains updated resources for all the Essentials plus some enhancements to the Practical Exercises. Future PIER updates and improvements will be distributed as they become available and can be found on the APC website.

3 WHY PIER

Modern health care is dependent on pathologists being competent in pathology informatics to leverage the advances in technology tools for diagnostic management of patient care.

Informatics training is critical in pathology given the implementation of the electronic health record (EHR), wider adoption of digital pathology, and the expanding role of laboratory information systems (LIS) in the day-to-day activities of laboratory pathology.

ACGME Milestones for informatics continue to help ensure that residency programs address this competency and provide training to pathology residents.

4 BARRIERS

Consistently over time, we have heard pathology residency programs mention four key barriers that may affect the successful implementation of informatics training. They are: (1) limited access to pathology informatics expertise and resources; (2) already crowded rotation schedules; (3) residency rotations scheduled in locations other than the primary residency setting; and (4) low interest on the part of some residents regarding the importance of informatics in pathology.

“With the introduction of regulations and accreditation requirements ... laboratories have begun to pay more attention to compliance and their use of the laboratory information system (LIS) and personal health information (PHI) that belongs to patients.”

L. Pantanowitz, MD
Introduction to Informatics. In: Pantanowitz L, Parwani AV, eds. *Practical Informatics for Cytopathology*. New York, NY: Springer Science + Business Media; 2014.

5 BENEFITS

5.1 Resident

The benefits for residents in receiving pathology informatics training in their residency program include:

- Acquiring the knowledge, skills, and tools that will enable them to collect, manage, use, and share information to support the delivery of accurate, high quality health care and promote optimal patient outcomes.
- Ensuring that patient health care information is accessible to colleagues across the health care environments and at every step of patient care.

5.2 Program

PIER offers program directors and faculty:

- An up-to-date and validated set of essential pathology informatics performance outcomes.
- Flexible implementation approaches that can be adapted by program size, needs, and level of faculty expertise.
- Comprehensive topic organizers, implementation strategy options, resource options, practical exercises, outcomes, and tracking and scheduling aids.

6 PIER SCOPE AND SEQUENCE

6.1 Background

A team of pathology informatics experts developed a set of statements identifying the knowledge and skills that a resident should have upon completion of their residency program to practice pathology (see [Acknowledgements, p. 3](#)). The knowledge and skill statement set, titled “PIER Outcomes for Achievement,” (hereafter referred to as “PIER Outcomes” or “outcomes”) is provided in [Appendix A, p. 18](#). PIER Outcomes provide the subject matter for the foundation of PIER.

The PIER Outcomes are organized into training topics based on a recommended sequence for residents to successfully build their pathology informatics knowledge and skills over time. The resulting scope and sequence is named “PIER Essentials.”

6.2 Pier Essentials

PIER Essentials present up-to-date pathology informatics training topics organized into four groupings. PIER exposes residents to information technology in pathology as they participate in their anatomic and/or clinical pathology rotations and residency activities related to management, quality assurance and control, regulatory and accreditation issues, as well as daily flow of information into and out of the laboratory and the proper utilization of that information. See Exhibit 1 on the following page.

Exhibit 1: PIER Scope and Sequence



Exhibit 1 presents the four PIER Essentials and how the topics and proficiency build over time. The ACGME Milestone Level is identified for each of the Essentials. The four Essentials illustrate how a resident can apply the Essentials sequence and build their pathology informatics competence over time.

Residency programs can control timing by year to suit the scheduling availability of PGY1-4 residents; however, it is important that the recommended sequence is followed. For example, E1 and E2 can be combined for PGY3, and E3 and E4 combined for PGY4. However, a resident cannot start with E3 or E4 if they do not have the prerequisite E1 and E2 knowledge and skills.

An estimated number of instructional hours are forecasted for each of the Essentials; however, this estimate is subject to change based on the final number and type of resource options and instructional strategies selected by the program director.

6.3 PIER Essentials and the ACGME Informatics Milestones

As indicated in Exhibit 1, the four PIER Essentials map to the four ACGME Milestone Levels. Exhibit 2 below further illustrates the relationship of PIER Essentials to the high-level milestone statements for the MOC Systems-Based Practice 7 (SBP7) competency: “Explains, discusses, classifies, and applies clinical informatics (AP/CP).”

Exhibit 2: PIER Essentials and the ACGME Informatics Milestones

SBP7: Informatics – Explains, discusses, classifies, and applies clinical informatics (AP/CP)					
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:					

*Reprinted as granted by the ACGME and ABP. [The Pathology Milestone Project](#). Copyright 2013 ACGME and ABP.



Access the paper, [The Pathology Milestone Project](#), developed by the ACGME and ABP and learn more about the milestone requirements for pathology.

While PIER enables residents to meet the ACGME Milestone Levels 1-4, the PIER Outcome Statements specify a complete set of pathology informatics knowledge and skills that a resident needs to have upon completion of their residency program to practice pathology. Therefore, PIER is scoped and sequenced to achieve the outcomes, which is different than the high-level, general nature of the ACGME milestone statements (see [Appendix A, p. 18](#)).

ACGME Milestone Level 5 is beyond PIER’s purpose and scope. The ACGME defines Level 5 as, “The resident has **advanced beyond performance targets set for residency** and is demonstrating “aspirational” goals which might **describe the performance of someone who has been in practice for several years. It is expected that only a few exceptional residents will reach this level**” (The Pathology Milestone Project. July 2015.). PIER focuses on preparing residents to achieve Levels 1-4 during residency, and is not intended for residents participating in advanced training or fellowships.

7 PIER RESOURCE TOOLKIT OVERVIEW

7.1 Introduction

PIER’s Scope and Sequence identifies the “what” to be taught. The PIER Resource Toolkit provides the “how” of planning, implementing, and managing delivery of the four PIER Essentials.

Residency programs can utilize PIER while maintaining their own philosophies, rotations, approaches, customs, and preferences for how to educate and prepare residents for practice. The PIER Resource Toolkit is available to help program directors and residents make good pathology informatics residency training decisions, scaling PIER’s topics and implementation to their own needs and circumstances.

7.2 PIER Resource Toolkit

This section introduces the PIER Resource Toolkit and explains how programs can adapt it to meet their needs. The Resource Toolkit is a standalone, interactive deliverable that is editable by users. Users can add, customize, and maintain their own tools and content in their Resource Toolkit file.

The Resource Toolkit is organized into four sections that correspond to the PIER Essentials (ie, E1 through E4). Each section contains three key interactive tools in PDF format for program directors and residents:

- Essentials Map
- PIER Resource Options
- Outcomes Achievement Checklist

Each tool is introduced below.

Essentials Map

Planning, scheduling, and implementation of each Essentials begins with the Essentials Map tool. The map identifies the topics, topic rationale, key outcomes, topic content, rotation options, and implementation preferences (ie, lecture, resource options, outside resources, and mentor/preceptor).

The program director and resident consider which approach is best, make implementation selections, and customize the map based on the resident’s needs and program director’s preferences. The map also provides the option to schedule dates for progress checks and a wrap-up check for the Essentials topics.

Essential	Information in Pathology Practice	Information Systems Fundamentals	Information Applications	Information Data Analytics	Data Analytics & Events
Rationale	The focus of pathology practice is the creation and management of information.	Computer systems are used for pathology practice and for managing patient care and research.	Computer systems are used to analyze and manage large amounts of pathology information.	Information systems are used to analyze and manage large amounts of pathology information.	Information systems are used to analyze and manage large amounts of pathology information.
Outcome for Residents	Understand the relevance of information technology in pathology practice and its impact on patient care and research. Explain the differences and similarities between pathology informatics and pathology informatics. Explain the differences and similarities between pathology informatics and pathology informatics.	Understand the relevance of information technology in pathology practice and its impact on patient care and research. Explain the differences and similarities between pathology informatics and pathology informatics.	Understand the relevance of information technology in pathology practice and its impact on patient care and research. Explain the differences and similarities between pathology informatics and pathology informatics.	Understand the relevance of information technology in pathology practice and its impact on patient care and research. Explain the differences and similarities between pathology informatics and pathology informatics.	Understand the relevance of information technology in pathology practice and its impact on patient care and research. Explain the differences and similarities between pathology informatics and pathology informatics.
Content	1. Definition of pathology 2. Role of pathology in patient care 3. Different types of pathology 4. The evolution of pathology practice	1. Hardware 2. Software 3. Networks 4. Operating systems 5. Internet	1. Database terminology 2. Data structure: relational, non-relational 3. Types of databases 4. Data modeling	1. Statistical analysis 2. Descriptive statistics 3. Inferential statistics 4. Data visualization	1. Data visualization & reports 2. Dashboard & KPIs 3. KPIs
Rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation
Implementation Preferences	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation
Comments	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation
Check Progress for E1 through E4	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation	Click here to view rotation

Essentials Map

Topic 1: Informatics in Pathology Practice

Rationale: The practice of pathology relies on the creation, management, and accurate and timely communication of critical information.

Outcomes for Achievement:

- Understand the relevance of informatics in pathology practice.
- Describe the differences between IT and informatics and recognize how pathology contributes to informatics in practice.
- Engage the differences and similarities among pathology informatics, bioinformatics, public health informatics, health care information technology, and health knowledge informatics.

Content:

- Definition of Informatics
- Relevance of informatics in pathology
- Differences of informatics
- The practice of informatics in pathology

Recommended PIER Resource Options (check options to be completed)

Corrie HE, Houghton RM, Harwood VM, Moore DR, Sapp JH. Pathology Informatics: An Introduction. In: Parfitt-Rouelle L, Tuffin JM, Bell USJ. Pathology Informatics: Theory and Practice. Chicago, IL: ASCP Press; 2012.

Harrison J. Management of Pathology Information Systems. In: (Page EA, Harwood RE, Siegel GP, Laboratory Administration for Pathologists. Norwalk, IL: CAP; 2011).

Practical Exercise(s) (check options to be completed)

Informatics is embedded throughout pathology practice and laboratory activities. However, most residents do not realize just how much informatics they are learning as part of their routine pathology training because this training is not specifically identified as informatics. During rotations teach the resident directly and recognize the path to "moment" when informatics comes into play. Discuss informatics with more senior residents, staff pathologists, or informatics faculty to understand better the implications for patient care and laboratory operations.

During rotations have the resident keep a log of informatics-related activities and questions that occur (e.g. do this for one week or each rotation).

During a resident group meeting, provide an opportunity for residents to share their varied experiences, observations, and questions from their informatics log.

Comments:
Click here to enter text. **Completion Date:** Click here to enter text.

Optional Resources

Strand JH, Morrow JS. Informatics and anatomy: meeting challenges and charting the future. Hum Pathol. 2007;38(2):143-148.

Strand JH, Prowell GJ, Kevichor DS. Pathology training in informatics: evolution of a growing need. Arch Pathol Lab Med. 2014 Apr;138(4):506-11.

Strand JH. The Scope of Pathology Informatics. In: Strand JH. Practical Pathology Informatics. New York, NY: Springer Science + Business Media, Inc; 2006.

PIER Resource Options

Confirm highlighted page numbers referring to Toolkit June 1 as content is still in development.

PIER Resource Options

PIER Resource Options is the second tool found in the Resource Toolkit. This is one of the PIER implementation preferences listed on the Essentials Map.

For each Essential, the Resource Options tool provides four helpful features:

1. Recap of the rationale, PIER Outcomes, and topic outline
2. Short list of expert recommended content resources and optional resources for further study
3. Practical exercises to enhance learning
4. Area to capture topic notes, resident progress, and follow-up items

In addition, the Resource Toolkit includes a list of resources that require purchase or login (referred to as the PIER Resource Library). Please use this list during the Planning and Set Up phases of PIER to ensure the necessary resources are available when needed. The library is found on page 11 of the Resource Toolkit.

The Essentials Map and PIER Resource Options tools have an iterative relationship and work together hand-in-hand. The program director can use the map to preview the Essentials in their entirety, plan out specific learning activities by topic using the PIER Resource Options pages, and customize their approach by adding their preferred teaching resources, activities, and materials to the map.

The Essentials Map and PIER Resource Options tools provide an organizer and process for residency programs to begin to develop their own self-study modules, lecture series, and blended learning units. As stated earlier, it is beyond the scope of PIER to provide fully developed and ready-to-use downloadable self-study or didactic teaching materials.

Outcomes Achievement Checklist

The last tool in the Resource Toolkit is the Outcomes Achievement Checklist. The purpose of this tool is to document the accomplishment of each outcome statement. Successful completion of Essentials suggests achievement of the corresponding ACGME Milestone Level, making this tool useful as supporting documentation of the ACGME Milestone requirement.

The evaluator may be the program director, faculty, or other designated staff. The Outcomes Achievement Checklist should be completed during face-to-face meetings with the resident during which the evaluator and resident can use it as the basis for discussion regarding the resident's progress, as well as implementation adjustments needed to ensure the outcomes will be achieved. To facilitate a productive conversation, the resident can be asked to use a copy of the checklist to perform a self-assessment prior to meeting. Identifying and resolving points of disagreement concerning resident achievement of the outcomes can promote learning. When the resident achieves all outcomes, the final sign-off documentation can become part of the resident's program file.

PIER Essentials 1 – Outcomes Achievement Checklist

Resident Name: Click here to enter text.

Outcome Statement	Results
Informatics in Pathology Understand the relevance of informatics in pathology practice.	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved
Describe the differences between IT and informatics and recognize how pathology contributes to informatics in practice.	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved
Engage the differences and similarities among pathology informatics, bioinformatics, public health informatics, health care information technology, and health knowledge informatics.	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved
Fundamentals of Information Systems Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved
Importance of Database Convert from the fundamentals of databases, including data types, files, records, database structure, and mechanisms for querying data, understanding how data storage affects data retrieval, sorting.	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved
Introduction to Data Representation and Communicating Standards Understand the basics of the standards development process (includes DICOM participation HL7) and how other processes support standards development (IEEE and CPOE).	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved
Data Availability & Security Understand the elements of data availability as a key part of security.	<input type="checkbox"/> Not Achieved <input checked="" type="checkbox"/> Achieved

Has successfully achieved PIER Essentials 1 Outcome / Milestone Level 1? Yes No

Date: Click here to enter a date. **Evaluator's Signature:** Click here to enter text. **Resident's Signature:** Click here to enter text.

Outcomes Achievement Checklist

7.3 Approach Considerations

PIER provides the outcomes, topic outlines, resource options, and practical exercises for pathology informatics training for residents. Program directors can add their own preferred materials, resources, and teaching strategies to the Essentials Map and make it their own program.

It is the decision of the program director as to when and how to incorporate Essentials work into the rotations. In addition, the program director may want to

ask faculty, fellows, or senior residents with specific expertise and experiences to lead and coach residents on certain pathology informatics topics or activities. If the program director or faculty feels it would be a more efficient use of time to bring a group together for lectures and discussion, the Resource Options can be used as references to create didactic materials.

It is also the decision of the program director and residents as to how they would like to schedule and pace the Essentials. Depending on the number of residents taking Essentials 1-4 and how each of the Essentials will be implemented (ie, self-study or blended learning), the program director may want to have residents at times work individually, in pairs, or in small study teams.

Residents can serve as peer coaches to one another, and discuss topics and their practical applications. They can troubleshoot challenging subject matter, activities, and practical applications together with the program director serving as a guide and mentor.

It is important that the resident have routine individual check-in time with their program director, and that the Outcomes Achievement Checklist be used to monitor progress on each Essential.

8 GETTING STARTED WITH PIER

Developing and incorporating additional training content into an already full residency program may not be easy. This section provides ideas for how to get started with PIER. The following are suggestions from a few program directors that were successful in tailoring PIER to meet their residency training needs.

8.1 Planning/Set Up

Prior to implementing PIER, it is important to have the framework of the curriculum in place. The framework includes considering the structure of the topics which would include the post graduate year (PGY) year that PIER is introduced, the frequency of presentation, the amount of time allowed for each topic, etc.

Planning and setup time will depend to some degree on the number of resources available to your program. Programs with more resources will require less setup time. A medium-sized program with some information technology infrastructure should be able to set up PIER in a few months. Smaller programs or those with limited resources might need more time. What is most important is to determine how you plan to structure training (PGY in which content is delivered, frequency, time allowed for topics) in addition to whether you integrate PIER into existing scheduled rotations or create a specific informatics rotation, deliver via didactic lecture, self-study, on-the-job practice or a mixture of delivery methods, etc). This step can take time, but is a very important step. The following are some tips to consider as part of your planning and setup process:

- Review the PIER Resource Toolkit and determine which portions of the PIER curriculum you want to use/implement in your program that supports meeting the ACGME Milestones for informatics.
- Meet with faculty and technical staff with expertise and interest in informatics to review the curriculum.
- Meet with chief residents and/or residents as a group to get feedback on PIER implementation.
- Take stock of what you currently have in place for informatics training.
- Make note of existing informatics related activities and resources that can be continued as part of your PIER implementation (eg, resident participation in conferences, academic writing, accessing the EHR, online informatics resources).

Be sure to allow enough time to properly plan and set up your unique curriculum. Once the planning and setup steps are complete, the curriculum can be reused for each new group of incoming residents with only minor adjustments. Thus, the planning and setup time commitment will decrease over time.

8.2 Obtain Resources

Content

Access to PIER Resource Options is now easier and more convenient for both program directors and residents. PIER Release 3 provides electronic links to the majority of resources such as journal articles, online courses/presentations, web pages, and other online tools. These electronic links are available for both the Recommended and Resources for Advanced Learning (Optional) sections.

However, a few resources may require purchase or use of a membership login to obtain. You should obtain these resources during your curriculum planning and setup phase. The PIER Resource Library, located in the PIER Resource Toolkit (p. 11), provides a list of these resources. The resources are organized by Essentials to make it easier for planning and setup purposes.

The following are additional tips for obtaining resources:

- Review what informatics content you may already have in place that could be modified and reused to map to the PIER curriculum.
- Identify the feasibility of setting up an informatics resource center or have residents share materials (eg, textbooks).
- Check out the PIER Resource Toolkit for more information on recommended and optional resources that are available for the PIER curriculum.

Faculty

Faculty resources can be a challenge especially for smaller programs and those with limited resources. The following are some suggestions provided by program directors in similar situations who found ways to successfully implement PIER.

- Identify content experts or resources prior to beginning implementation.
 - Meet with any pathology faculty and technical staff with information technology or basic informatics knowledge to find out how they might be able to provide assistance with didactic content, practical exercises, mentoring, or resources.
 - Identify non-pathology system information technology resources – both staff and faculty that could assist in didactic lectures or could support practical exercises.
 - Staff or faculty in institutional IT departments may be looking for ways to increase scholarly activity and may be interested in the opportunity to teach residents.
- Explore the possibility of partnering with other (non-pathology) residency programs at your institution. You may be surprised at how interested other programs are in introducing “informatics” into their curriculum. Support from multiple programs helps drive informatics curriculum at the graduate medical education level.
- Explore partnering with other pathology residency programs at different institutions.
 - For example, partner with a larger program to broadcast select informatics sessions to your residents.
- Establish elective options for residents to fill gaps.
- Support resident attendance at pathology informatics meetings to get more in-depth exposure (eg, CAP, API, and ASCP).

8.3 Map Out Your Course Content, Practical Exercises, and Scheduling Plans

The easiest method for mapping your course content, practical exercises, and scheduling plans is to begin with the Resource Toolkit. The Toolkit provides the curriculum that was built around the ACGME Milestones. Use the Essentials Map tool as a guide to structure your course materials and resident’s schedules. Determine which Essentials topics will be delivered by lecture, self-study, peer conferences, and which may be delivered by other departmental staff, or external resources (eg, online training, guest lectures, conferences).

Next, you will want to determine the delivery schedule for each of the Essentials (eg, PGY1, PGY2, PGY3, and PGY4) and the practical exercises you plan to use to support the various topics.

8.4 Assessing Your Resident’s Knowledge Using the PIER Outcomes Checklist

The following are suggestions for how you can effectively assess whether your resident achieves the PIER Outcome statements and ACGME associated Milestones.

1. **Direct Observation** – Use the practical exercises as both a learning tool and means by which faculty can observe the residents knowledge/skill in an applied situation.

2. **Faculty Feedback** – Depending on how a program is implementing PIER, there could be one or more faculty who has interacted with the resident. If multiple faculty members are involved, they should work together to reach a consensus on the resident's achievement. Also, if the program director is the point of contact for the checklist, he/she should talk to the faculty directly involved in teaching PIER (ie, not just rely on the resident self-assessment).
3. **Assessment** – Programs can certainly develop their own in-house tests. Consider who beyond your department (or institution) might be a good resource to involve in this effort in order to ensure any tests are aligned with the training provided (ie, similar to the teaching of PIER, it does not only have to be pathology faculty who are involved).
4. **Peer/Other Feedback** – Do any of the practical exercises require residents to work with each other or with non-pathology faculty (eg, informatics staff)? If so, requesting feedback from these people would be an appropriate step to take as well prior to meeting with the resident.
5. **PIER Resident Progress Report** – This report, found in Appendix A of the PIER Resource Toolkit, contains the full list of PIER Outcome statements. The PIER Resident Progress Report is an optional tool that you can provide to your resident at the time you begin the implementation of PIER. This self reporting progress tool allows your residents to monitor their own progress towards the attainment of the PIER Outcomes. In addition, the residents can identify if they have previous knowledge related to a PIER Outcome prior to entering their residency.

9 IMPLEMENTATION: HELPFUL HINTS AND TIPS

The following are some helpful hints and tips provided by program directors who have successfully implemented PIER into their curriculum.

Content Design and Practical Exercises

My facility does not have any preexisting informatics teaching content. Do you have any suggestions for creating content from scratch? Is there a form that can be used to ensure the main points for each topic are covered?

PIER provides a significant number of resources with most of them free or at a low cost. If you don't have any existing teaching material, the **PIER Resource Options** tool is the best source for content that you can use to either develop lecture material or to assign self-study material for the resident. Other resources that may be of assistance in developing informatics content are the [Pathology Resource Guides](#) on the CAP website, titled **Clinical Informatics Resource Guide** and **Digital Pathology Resource Guide**. The downloadable versions of these guides are free to all CAP members.

How much depth should I go into for each topic?

Use the PIER Outcomes and Content sections found in both the **Essentials Maps** and in the **PIER Resource Options** tools to help determine how deeply you should cover a topic. The only caveat would be to allow your faculty/informatics experts to add content as they feel necessary. Make sure they have the PIER Outcome statements and resource options for each Essentials well before they deliver training. This gives them the option to develop and provide additional materials.

Each of the four Essentials includes an Essentials Map and PIER Resource Options tool that includes the PIER Outcomes and identifies the Content to cover within each topic. You can use the Outcomes together with the Content list as a guide when determining the level of detail to cover. Remember this is a basic curriculum. The intention of PIER is to provide the resident with the basic knowledge to meet the first four levels of the ACGME Milestone requirements.

How can I map my existing informatics content and practical exercises to the PIER curriculum?

Use the upper portion of the Essentials Map or the PIER Resource Options tools to align your existing content to PIER by comparing your course objectives and topic content to the PIER Outcomes and Content sections.

Once you have identified the PIER topic that most closely aligns with your existing content, use the **Other Implementation Preferences** field on the lower portion of the Essentials Map to record this information.

Do you have any suggestions for mapping the practical exercises to the topic area? The practical exercises for Essentials 3 and 4 are the most difficult for my institution to achieve.

This is already done for you. The **PIER Resource Options** tool assigns specific practical exercises to each topic. PIER Release 3 contains several new and revised practical exercises specific for Essentials 2.

During the Planning and Setup phases, it is important to determine which practical exercises are applicable to your systems and your institution and identify the necessary resources to implement them. Most of the exercises are described broadly enough that this is easy to do.

Faculty

How do I get buy in from residents, faculty, and program chairs to implement PIER at my institution?

You may find that buy in is not as much of a problem as you think. Most residents know they need informatics to be successful, especially today where so much of laboratory processes and outputs are technology driven. In many cases, the residents are essentially demanding sufficient informatics education as part of their training.

Most faculty also understands the importance of informatics, even if they don't fully understand informatics themselves to any degree of detail. However, it is important to have the support of your chair in terms of moving forward with an informatics curriculum particularly from a financial perspective. The financial impact to implement PIER is minimal so this should not be a barrier to implementation. Also, the support of the chair will help obtain cooperation from the faculty.

What do I do if I do not have informatics experts on staff to assist with PIER training or topic content development?

Explore non-pathology resources such as your information technology or information system staff. You may find some form of information technology support at the institutional level. PIER has significant resources that include online courses, prerecorded presentations, and other self-study options that allow the resident to be more in control of what, when, and how they learn.

There will almost certainly be staff at your institution with experience in information technology. The challenge for non-laboratory staff will be to modify their knowledge and expertise to fit the PIER curriculum. Another option is to partner with other pathology programs in your local area that may have established informatics programs or technical expertise. You may also want to determine if any of your residents have informatics expertise or a special interest in the topic. Utilize these residents to assist with lecture content development or to make informal presentations to residents.

Scheduling PIER with Resident Rotations

Resident schedules are already tightly packed with other curriculum content, how do I add the PIER curriculum to the schedule?

Incorporate the PIER curriculum into current rotations or set up a standalone informatics rotation. Some topics do lend themselves to integration with certain rotations. For example, molecular pathology is very “bioinformatics” heavy, so you could include informatics in such a rotation. Scheduling specific time during the four year curriculum seems to allow for better continuity in learning the PIER topics and has made scheduling much easier. However, creating a dedicated rotation is not something that every program would be able or want to do.

Make a conscious decision to give PIER significant importance in your curriculum. Consider carving out a block of time (eg, four weeks) to devote to informatics education. For example, replace a four week elective with the PIER curriculum. The PIER curriculum may not demand the full four weeks but there are lots of creative ways to make good use of the time. For example, you can look at incorporating other topics in this same time period (eg, genomics or bioinformatics). Another benefit of a four week rotation is the ability to participate in a large informatics project (part of the final assessment) that can be a benefit both to the residents and the department. The practical exercises may provide you with possible ideas for projects.

How might I map the PIER topics to residency rotations to better facilitate completing all the PIER topics?

Associating PIER topics to a specific residency rotation is probably going to be unique for each residency program. During the initial set up of your PIER curriculum, discuss the topic and practical exercise alignment with your faculty and information technology experts. They can help you to identify the best opportunities for associating PIER topics and practical exercises to a designated rotation. The following are two examples of different methods demonstrating the implementation of PIER within rotations.

Example 1: Traditional Classroom

Establish a one week course during the first six months of your resident’s PGY-2 year to provide the basics on informatics. Reinforce the basics through practical exercises that align to predetermined rotations during the remainder of PGY-2 through PGY-4. See [Appendix C \(p. 22\)](#) for an example of how one program structured a one week course.

Example 2: Active Learning

Limit the number of didactic lectures to the very basic concepts. Start with a lecture and then follow it up with a project or assignment of applicable practical exercises for the Essentials topic. Increase the number of team based interactive learning activities (eg, residents lead topic discussions, experience sharing, sharing of an informatics project, and group discussions). One or more hours are required for this type of session, so be prepared to include this time within the rotation schedule. Using this method, it is suggested that you begin with the PGY-1 year.

More Hints and Tips

Do you have hints or tips related to PIER implementation that you would like to share? Send your suggestions or tips to Sue Plath, PIER Project Lead at splath@cap.org.

APPENDIX A – PIER OUTCOMES FOR ACHIEVEMENT

This section presents the master list of 38 statements identifying the knowledge and skills that a resident should have upon completion of their residency program to practice pathology.

These outcomes are organized into seven topic areas; they are **not** organized in the sequence in which a resident would learn them. This list is useful to see a master list of the outcomes by topics, independent of the sequence in which they are taught.

For training purposes, the outcomes are organized into the four PIER Essentials, displaying the recommended sequence for residents to successfully build their pathology informatics knowledge and skills over time (see [Exhibit 1, p. 6](#)).

Technology Fundamentals

1. Explain the relevance of informatics in pathology practice.
2. Explain the salient differences and similarities among pathology informatics, bioinformatics, public health informatics, health care information technology, and health knowledge informatics.
3. Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.
4. Conversant in the fundamentals of databases (including data types, fields, records, database structure, and mechanisms for querying data); understands how data storage affects data retrieval options.
5. Recognize the advantages of standardized terminology for creating interchangeable data that can be retrieved and summarized.
6. Define the key features of communication standards used in pathology, such as HL7.
7. Describe the characteristics and appropriate applications of standard terminologies (eg, CPT, ICD, SNOMED CT, and LOINC) used to represent pathology data in the LIS and EHR.
8. Define the types and roles of standards used in pathology, at a basic level.
9. Understand the basics of the standards development process.
10. Describe patient and asset identification standards and tracking systems, and how they are used to improve patient safety and laboratory workflow.
11. Recognize applications of ancillary information systems to optimize clinical, operational, and financial performance of the laboratory (eg, middleware, financial systems, and business intelligence).
12. Describe the difference between IT and informatics.

Laboratory Information Management in Health Systems

13. Describe LISs and the role they play in efficient lab operations and health care delivery.
14. Identify opportunities to modify the LIS to improve operations.
15. Understand capabilities and limitations of electronic interfaces between an LIS and instrumentation, middleware, and other information systems.
16. Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test results.
17. Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test orders.
18. List other major systems to which the LIS is connected within the network of health care information systems (ie, the local health care information ecosystem).
19. Describe middleware, how it relates to the LIS, and roles for middleware in laboratory operations.
20. Understand the special difficulties of information flow to and from the local information ecosystem (eg, for outreach programs) and strategies for overcoming the obstacles.
21. Understand the elements of system and data availability as a key part of security.

Data Analysis and Management Tools

22. Recognize limitations and information gaps resulting from the limitations of the data analysis capability of LISs.
23. Contribute to the definition and creation of integrated health care data sets from multiple disparate sources to support useful, accurate, and reliable data analysis.
24. Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.

Digital Pathology

25. Utilize digital imaging systems such as WSI, dynamic telemicroscopy, and image analysis (as appropriate to practice setting).
26. Articulate potential roles, uses, and limitations of whole slide imaging in the laboratory environment.
27. Determine the appropriate digital image resolution for a particular use.
28. Determine the appropriate telemicroscopy technology to use for a particular application.

Ongoing Laboratory System Management

29. Work with information systems personnel to ensure that reports are properly formatted (eg, synoptic format and other standardized formats as appropriate).
30. Supervise the LIS team in the creation and updating of the LIS procedure manual.
31. Understand the process and requirements for test definition and other information maintenance in the LIS.

Accreditation and Regulatory Compliance

32. Maintain compliance with electronic information management requirements of regulatory and/or accreditation agencies.
33. Interpret regulations to determine how they affect laboratory information management needs and the role of the lab within the health care system.
34. Adhere to HIPAA and other security and privacy requirements for the communication and storage of patient data.
35. Recognize situations under which information technology may be subject to FDA regulation (eg, blood banking and WSI).
36. Comply with positive patient identification processes/protocols.

Selection and Installation of Lab Systems

37. Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the laboratory.
38. Provide input to the LIS selection team to ensure that an optimal fit between a purchased system and departmental needs is attained.

APPENDIX B – INFORMATICS ASSOCIATIONS, SOCIETIES, AND OTHER RESOURCES

The following is a list of informatics organizations and associations that have additional resources, online courses, and journals containing specific information on informatics. All resources are current as of July 1, 2018.

1. American Health Information Management Association (AHIMA). <http://www.ahima.org>.
2. American Medical Informatics Association (AMIA). <http://www.amia.org>.
3. American Telemedicine Association (ATA). <http://www.americantelemed.org/>.
4. Association for Pathology Informatics (API). <http://www.pathologyinformatics.org>.
5. Association of Medical Directors of Information Systems (AMDIS). <http://amdis.org>.
6. Digital Pathology Association. <https://digitalpathologyassociation.org/>.
7. Healthcare Information and Management Systems Society (HIMSS). <http://www.himss.org>.
8. International Medical Informatics Association (IMIA). <http://imia-medinfo.org/wp/>.
9. Society for Imaging Informatics in Medicine (SIIM). <http://siim.org/>.

The following is a list of additional informatics resources, wikis, and blogs that provide further content.

- Digital Pathology Blog. <http://tissuepathology.com/category/digital-pathology-news/informatics/#axzz41faLUCXr>.
- Informatics Professor. <http://informaticsprofessor.blogspot.com/>.
- Journal of Pathology Informatics. www.jpathinformatics.org/browse.asp?sabs=n.
- LAB Soft News. <http://labsoftnews.typepad.com/>.

APPENDIX C – ONE WEEK DIDACTIC COURSE (SAMPLE OUTLINE)

The image below is an example of a one week informatics course provided by one of the alpha test programs. Please note that this course was in place before PIER was implemented so the topics and how they are organized are different than what you see in the PIER Essentials.

Like PIER Essentials 1 and 2, this particular course was designed to provide the resident with an introduction to informatics early on in their residency. Also like PIER, the course is followed by practice exercises that occur throughout PGY1 to PGY2 depending on the resident's rotation schedule.

The take away from this example is to provide you with an illustration of how one program approached planning and scheduling informatics education at a very specific level in terms of days, times, and topics.

DAY 1– Monday

- 9-10:00am Course Introduction
- 10-11:00am ABCs of Pathology Informatics
- 11-12noon ABCs of Digital Imaging
- **LUNCH**
- 1:00 -2:00pm Basic Computing
- 2-3:00pm Networking & Interfaces
- 3:00-3:30pm Overview of the AP-LIS
- 3:30-4:00pm Q&A Feedback Session

DAY 2– Tuesday

- 9-10:00am Overview of the LIS & Middleware
- 10-11:00am Mobile Technology in Pathology Informatics
- 11-12noon How to Present and Publish Data
- **LUNCH**
- 1-3:00pm Basic Research Tools & Prism Demo
- Clinical Lab Automation & Robotics
- 3-4:00pm Overview of Barcoding

DAY 3 – Wednesday

- 8-9:00am Importance of Informatics Training
- 9-10:00am The Value of Informatics
- 10-11:00am Molecular Informatics
- 11-11:30am Overview of Specialty Labs (HLA etc.)

- 11:30-12noon Introduction and Updating Wiki

• **LUNCH**

- 1-2:00 pm The EMR
- 2-4:00pm Need of Informatics solution to Manage Big Data

DAY 4 – Thursday

- 8-9:00am High Level Overview of Informatics
- 9-10:00am Advanced Imaging Tools
- 10-11:00am How to Scan/Navigate Cytology
- 11am-12noon Practical WSI Imaging: Demo in Cytology
- **LUNCH**
- 1-2:00pm Overview of WSI
- 2-3:00pm Telepathology
- 3-4:00pm Introduction to Image Analysis

DAY 5 – Friday

- 8-9:00am Introduction to Bioinformatics
- 9-10:00am Databases & Data Mining
- 10-11:00am Tissue Banking Informatics
- 11-12noon Tissue & Data-Related Issues
- **LUNCH**
- 1:30-2:00pm Overview of CP-LIS
- 2:00-3:00pm Codes (e.g. SNOMED)
- 3:00pm Conclusion