Pathology Informatics Essentials for Residents

Pathology Informatics Essentials for Residents
Getting Started With PIER

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Release 4

Association of Pathology Chairs

COLLEGE of AMERICAN PATHOLOGISTS

api PATHOLOGY INFORMATICS

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1 INTRODUCTION

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.

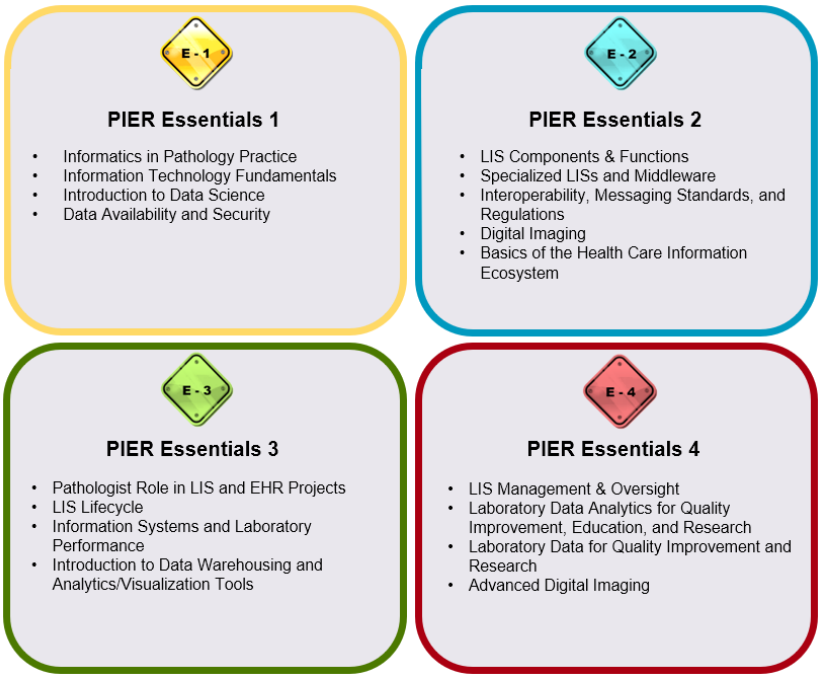
Elements of PIER provide an organizer and process for residency programs to begin to develop their own self-study modules, lecture series, and blended learning units. It is beyond the scope of PIER to provide fully developed and ready-to-use downloadable self-study or didactic teaching materials.

2 PIER SCOPE AND SEQUENCE

2.1 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. **Exhibit 1** presents the four PIER Essentials and illustrates how a resident can apply the Essentials sequence and build their pathology informatics competence over time.

Exhibit 1: PIER Scope and Sequence



2.2 PIER Essentials and the ACGME Informatics Milestones

While PIER enables residents to meet the ACGME Milestone Levels 1-4 (version 2.0), 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.

Exhibit 2: PIER Essentials and the ACGME Informatics Milestones

Systems-Based Practice 4: Informatics (AP/CP)				
Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Demonstrates familiarity with basic technical concepts of hardware, operating systems, databases, and software for general purpose applications.	Understands laboratory specific software, key technical concepts and interfaces, workflow, barcode application, automation systems (enterprise systems architecture)	Discusses the role of the pathologist in laboratory initiatives based on integrative pathology informatics and bioinformatics (e.g., laboratory information system implementation and configuration, QI initiatives)	Applies knowledge of informatics skills as needed in laboratory initiatives (e.g., data management and security, computational statistics, information governance)	Participates in operational and strategy meetings, troubleshooting with information technology staff members; able to utilize medical informatics in the direction and operation of the laboratory
Comments:				

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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**" (ACGME Pathology Milestone 2019). PIER focuses on preparing residents to achieve Levels 1-4 during residency, and is not intended for residents participating in advanced training or fellowships.

3 RESIDENT ASSESSMENT TOOL

3.1 Introduction

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 Resident Assessment tool 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.

3.2 PIER Resident Assessment Tool

The PIER Resident Assessment tool provides three functions. First, it is a high-level map containing the topics, subtopics, outcome statements, and rationale for each Essentials in one document. Secondly, it acts as a self-reporting assessment tool allowing you and your residents to monitor their progress towards the attainment of the PIER Essentials Outcomes. Third, the document can be used as a permanent record of the resident's completion of PIER.

An example of this tool is shown on the following page.

PIER Map and Resident Assessment Tool

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.

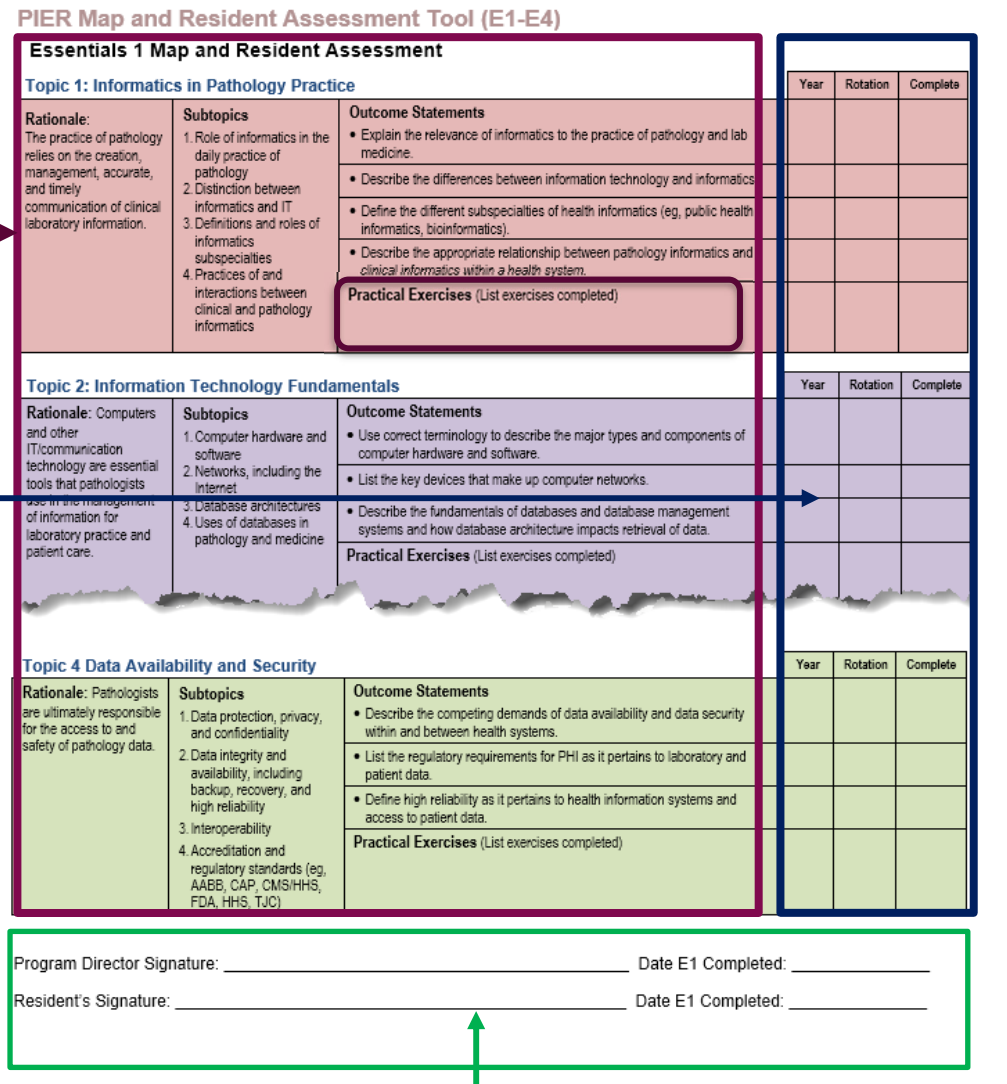
The **assessment** portion provides a method for tracking the progress of the resident. This section is completed by inserting the following information:

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.


PIER Map and Resident Assessment Tool (E1-E4)

Essentials 1 Map and Resident Assessment

Topic 1: Informatics in Pathology Practice

Rationale:	Subtopics	Outcome Statements	Year	Rotation	Complete
The practice of pathology relies on the creation, management, accurate, and timely communication of clinical laboratory information.	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	• 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)			

Topic 2: Information Technology Fundamentals

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)	Year	Rotation	Complete

Topic 4 Data Availability and Security

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)	Year	Rotation	Complete

Program Director Signature: _____ Date E1 Completed: _____

Resident's Signature: _____ Date E1 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. Once all assigned Essentials are completed, the document can then be used as a permanent record indicating the resident's participation in PIER.

4 PIER RESOURCE TOOLKIT

The Resource Toolkit provides the recommended resources and practical exercises for each of the associated topics within an Essentials. These resources are used to achieve the designated outcome statements listed for their associated topic. Each of the Essentials toolkits (eg, E1 through E4) can be downloaded as separate files or all at once from the APC website.

PIER Resource Options

Each topic is presented on a page that provides an overview of the topic rationale, PIER outcome statements, topic content, resources, and practical exercises. New in Release 4 is the association between the outcome statement and the recommended resource and practical exercise. In addition, the practical exercises now provide enhanced setup instructions and how achievement can be measured.

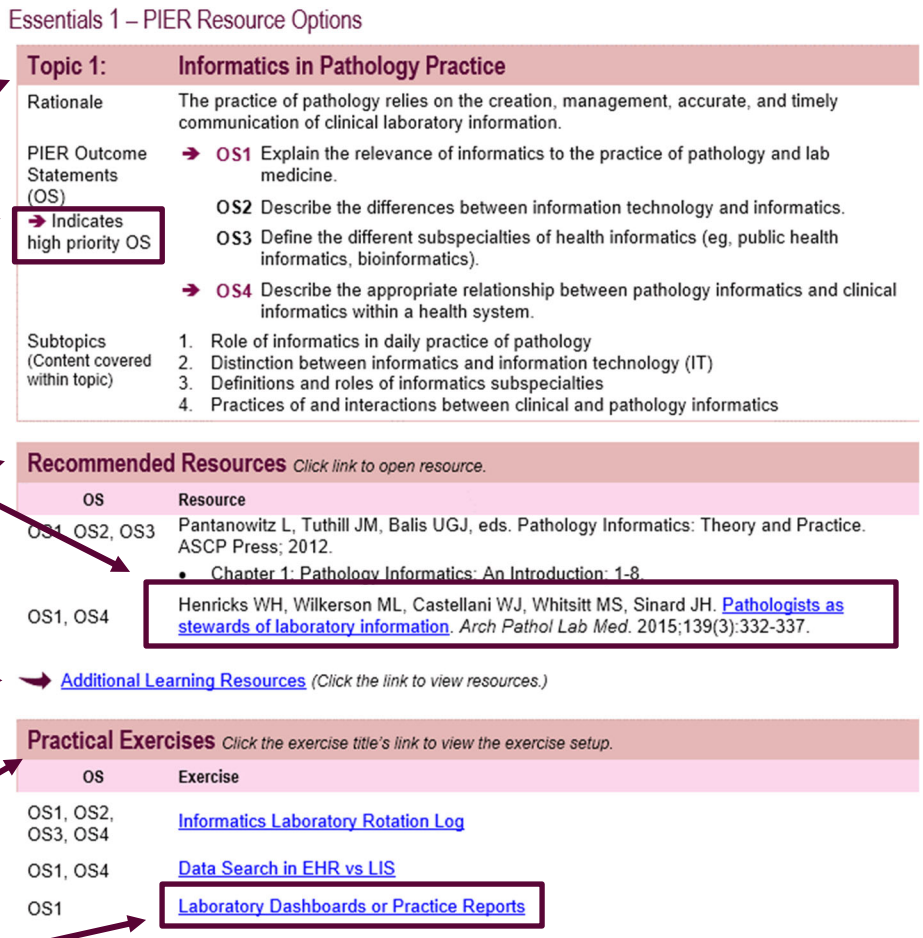
Topic: This section provides a quick overview of the Rationale, Outcome Statements (OS), and Subtopics for the topic. Note that the ➔ indicates these are high priority statements and have a practical exercise associated with the statement.

Recommended Resources: This section lists the recommended resources to achieve the outcome statements. There is at least one resource per outcome statement. Free resources include a quick assess link to the content.

Advanced Learning Resources: This section lists optional, nonrequired resources for those resident's wanting more in-depth learning materials.

Practical Exercises: This section provides practical applications for the critical outcome statements. Instructions for each exercise can be found by clicking on the exercise's title to view the following information:

- Type of exercise (ie, Case study, Hands on application, Thought provoking question, or Research topic)
- Exercise setup
- Informatics tools
- Resources
- Approximate activity time length
- Proof of completion



Essentials 1 – PIER Resource Options

Topic 1:	Informatics in Pathology Practice
Rationale	The practice of pathology relies on the creation, management, accurate, and timely communication of clinical laboratory information.
PIER Outcome Statements (OS)	➔ OS1 Explain the relevance of informatics to the practice of pathology and lab medicine.
➔ Indicates high priority OS	OS2 Describe the differences between information technology and informatics.
	OS3 Define the different subspecialties of health informatics (eg, public health informatics, bioinformatics).
	➔ OS4 Describe the appropriate relationship between pathology informatics and clinical informatics within a health system.
Subtopics (Content covered within topic)	1. Role of informatics in daily practice of pathology 2. Distinction between informatics and information technology (IT) 3. Definitions and roles of informatics subspecialties 4. Practices of and interactions between clinical and pathology informatics

Recommended Resources *Click link to open resource.*

OS	Resource
OS1, OS2, OS3	Pantanowitz L, Tuthill JM, Balis UGJ, eds. Pathology Informatics: Theory and Practice. ASCP Press; 2012. • Chapter 1: Pathology Informatics: An Introduction: 1-8.
OS1, OS4	Henricks WH, Wilkerson ML, Castellani WJ, Whitsitt MS, Sinard JH. Pathologists as stewards of laboratory information. *Arch Pathol Lab Med.* 2015;139(3):332-337.

➔ Additional Learning Resources *(Click the link to view resources.)*

Practical Exercises *Click the exercise title's link to view the exercise setup.*

OS	Exercise
OS1, OS2, OS3, OS4	Informatics Laboratory Rotation Log
OS1, OS4	Data Search in EHR vs LIS
OS1	Laboratory Dashboards or Practice Reports

NOTES:

Some resources may have to be purchased or require a special login to obtain the content. This information is noted in the PIER Resource Library in the front of each Essentials.

Occasionally, you will find a resource repeated in an Essentials section. The duplication of resources is intentional and allows for reinforcement of more complex topics.

5 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.

5.1 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 Toolkits 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.

5.2 Obtain Resources

Content

Access to PIER Resource Options is now easier and more convenient for both program directors and residents. PIER Release 4 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 upfront in each of the PIER Essentials Resource Toolkits provides a list of these resources.

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 Toolkits 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 aid 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 annual conferences to get more in-depth exposure to this topic.

5.3 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 PIER Map and Resident Assessment 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.

5.4 Assessing Your Resident's Knowledge

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.

6 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** toolkit 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 can be found on CAP's **Clinical Informatics Resource** webpage. Two other valuable resources are the CAP resource guides for **Clinical Informatics** and **Digital Pathology** https://www.cap.org/member-resources/pathology-resource-guides.

How much depth should I go into for each topic?

Use the PIER Outcomes and Content sections found in both the **Residency Assessment Tool** and in the **PIER Resource Options** 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 a 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.

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 4 contains several new and revised practical exercises which now include how achievement can be measured. 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

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 different types of learning 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.

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. It is suggested for this method 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.