



Pathology Informatics Essentials for Residents

PIER Resource Toolkit

October 2018 Release 3.2





COLLEGE of AMERICAN PATHOLOGISTS

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

© 2018 by APC/API/CAP. Except as otherwise noted, this PIER Resource Toolkit is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit <u>https://creativecommons.org/licenses/by-nc-nd/4.0/</u>.





 Table of Contents
 Resource Library
 Essentials 1
 Essentials 2

Essentials 3

Essentials 4

Appendix

 $^{\odot}$ 2018 APC/API/CAP. All rights reserved.

Table of Contents

BEFORE YOU START	5
PIER RESOURCE TOOLS DEFINED	7
PIER ESSENTIALS MAP OVERVIEW – EXHIBIT A PIER ESSENTIALS MAP DETAILS – EXHIBIT B PIER RESOURCE OPTIONS OUTCOMES ACHIEVEMENT CHECKLIST	7 8 9 10
PIER RESOURCE LIBRARY	11
PIER ESSENTIALS 1 TOOLS	13
ESSENTIALS 1 – MAP ESSENTIALS 1 – PIER RESOURCE OPTIONS PIER ESSENTIALS 1 – OUTCOMES ACHIEVEMENT CHECKLIST	15 17 25
PIER ESSENTIALS 2 TOOLS	27
ESSENTIALS 2 – MAP ESSENTIALS 2 – PIER RESOURCE OPTIONS, TOPIC 1 PIER ESSENTIALS 2 – OUTCOMES ACHIEVEMENT CHECKLIST	29 31 41
PIER ESSENTIALS 3 TOOLS	43
ESSENTIALS 3 – MAP ESSENTIALS 3 – PIER RESOURCE OPTIONS, TOPIC 1 PIER ESSENTIALS 3 – OUTCOMES ACHIEVEMENT CHECKLIST	45 47 55
PIER ESSENTIALS 4 TOOLS	57
ESSENTIALS 4 – MAP ESSENTIALS 4 – PIER RESOURCE OPTIONS, TOPIC 1 PIER ESSENTIALS 4 – OUTCOMES ACHIEVEMENT CHECKLIST	59 61 70
APPENDIX A – PIER RESIDENT PROGRESS REPORT	72
APPENDIX B – ACRONYMS USED IN TOOLKIT	84

Essentials 4



Program Director Notes



BEFORE YOU START...

The PIER Resource Toolkit contains the information and documentation necessary to implement PIER. It is a downloadable, interactive PDF that is editable and can be saved as a document file. Program directors have the option to use the interactive features or print a hardcopy of the form.

Users can add, customize, and maintain their own tools and content within this toolkit. 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 for use by program directors, faculty, residents, and other designated roles.

- The <u>Essentials Map</u> is the first tool, and its primary purpose is for scheduling and planning. It
 identifies topics, topic rationales, key outcomes, topic content, rotation options, and
 implementation preference (eg, lecture, resource options, outside resources, and
 mentors/preceptors). This tool is predominantly designed for the program director; however, it
 can be shared with the resident as an overview of the program. A description of the features of
 this tool and how to adapt it to your program is found on pages <u>7-8</u> of this toolkit.
- 2. The <u>PIER Resource Options</u> is the second tool and its primary purpose is to provide informatics content and related activities for the resident. Like the Essentials Map, it is also interactive allowing the program director to select the recommended resources and practical activities intended for the resident. This tool includes a Comments section where additional information can be recorded such as adding additional resources, recording notes related to progress, and/or resident questions (and provides a place to identify an expected completion date). A description of the features of this tool and how to adapt it to your program is found on page <u>9</u> of this toolkit.
- The <u>Outcomes Achievement Checklist</u> is the third tool, and its purpose is to document completion of each PIER Outcome statement and serve as a record of completion for the corresponding ACGME milestone. A description of the features of this tool and how to adapt it to your program is found on page <u>10</u> of this toolkit.

The Appendix contains additional resources for your use.

- The <u>RESIDENT PROGRESS REPORT</u> is an optional tool that can be used by your residents to track their progress in achieving completion of the Essentials PIER Outcomes. This tool allows the resident to identify the year (eg, PGY-1, PGY-2, PGY-3, PGY-4) in which the PIER Outcome was completed and the rotation where the practical exercise occurred. For more information on this tool and how you can implement it within your program refer to <u>Appendix A</u>, <u>p.72</u> of this toolkit.
- The <u>DEFINITIONS FOR ACRONYMS</u> used throughout the PIER Resource Toolkit can be found in <u>Appendix B, p.84</u> of this toolkit.

The document navigation provides easy access to the sections within the toolkit through the use of:

- INTERACTIVE NAVIGATION LINKS have been added to the footer of each page to help you
 easily and quickly jump to main sections of the Toolkit (Table of Contents, the PIER Resource
 Library, Essentials 1 through 4, and the Appendix). In addition, each of the four Essentials title
 pages contains links to the corresponding Essentials Map, PIER Resource Options, and
 Outcomes Achievement Checklist.
- QUICK ACCESS LINKS to free online journal articles, presentations, and webpages have also been added to the Recommended Resources section of the PIER Resource Options Tool in each Essentials. The intent of this feature is to make it easier to access the materials. The Recommended Resource Options provide hyperlinks for quick access to the content. We recommend that you provide an electronic copy of the material rather than a paper copy for ease in accessing the hyperlinked resources

Table of Contents	Resource Library	Essentials 1	Essentials 2	Essentials 3	Essentials 4	<u>Appendix</u>
-------------------	------------------	--------------	--------------	--------------	--------------	-----------------

DISCLAIMER:

6

Links to external presentations, tools, and applicable journal articles were validated before the launch of PIER RELEASE 3.2 and are provided here for your convenience. However, owners of the sites where these items are stored can make changes. If you encounter a link that does not work, please report it to Sue Plath, PIER project lead, at splath@cap.org.

NOTES:

- On rare occasions, some resources may have a minimal fee for access or need a special login to obtain the content. This information is noted in the first column of the Recommended Resource Options table. Resources that require special access or purchase can be found in the <u>Resource Library</u> on page <u>11</u> of this document.
- Occasionally, you will find a resource repeated in an Essentials section as denoted in the first column of the Recommended Resource Options table. The duplication of resources is intentional and allows for reinforcement of more complex topics. During planning and scheduling, program directors may need to review the resources to determine whether the resident should complete all or specific resources.

PIER RESOURCE TOOLS DEFINED

PIER Essentials Map Overview – Exhibit A

The **PIER Essentials Map** tool is organized into two sections. The **upper** portion of the map displays the topic title, the rationale statement, the outcome statements, and the topic content. This portion of the map is static and not editable.

.uu IIIIC. 4 - 0	DINUUIS				
le Informa Patholo	atics in ogy Practice	Information Systems Fundamentals	Importance of Databases	Introduction to Data Standards	Data Availability & Security
e The prac pathology creation, and accu timely cco of clinica informat	ctice of ny relies on the management, urate and ommunication al laboratory tion	Computers are essential tools that pathologists use in the management of information for laboratory practice and patient care	Databases provide core structure and tools that enable pathologists to manage and analyze large amounts of information	Standards enable sharing of data among different health care information systems (ie, interoperability), which is necessary for natient care	Pathologists are ultimately responsible for the access to and safety of pathology information.
toomee Understa relevano informati pathology Desorbe between technolog informati recognizy pathologi to inform initiative Explain ti differenci similaritie pathology bioinform health ca technolo knowled;	and the se of ios in y practice. a the difference information gy (17) and ios and e how jists contribute natics is. the salient ces and es among y informatics, preference, promotion gy, and health ge informatics.	Use correct terminology to desorbe the major types and components of computer hardware, software, and computer networks.	Conversantin the fundamentals of databases (including data types, fields, records, database structure, and mechanisms for querying data); understands how data storage a fields data retrie val options.	Define the types and roles of standards used in pathology, at a basic level.	Understand the elements of data availability as a key part of security.
1. Defini inform 2. Relev. inform pathol 3. Diffen inform 4. The p inform pathol	ition of natics vance of natics in logy renttypes of natics ractice of natics in logy	Hardware Software Software Software Software Communications Internet / Web	Database terminology Structured vs. Unstructured data Types of databases Use of databases	Messaging protocols Data models Interoperability Introduction to coding systems	 Data protection and confidentiality Data availability & integrity Data backup & recovery
te Click here t	to enter a date.	Click here to enter a date.	Click here to enter a date.	Click here to enter a date.	Click here to enter a date.
d select Choose a m	rotation.	Choose a rotation.	Choose a rotation.	Choose a rotation.	Choose a rotation
ita	N CIND ICAL				CITATION DO DID ICAL
ntation hC68 II that DIER R Outside Mentorl	n Lecture Resource Options e Resources IPreceptor	Program Lecture PIER Resource Options Outside Resources Mentor/Preceptor	Program Lecture PIER Resource Options Outside Resources Nenton/Preceptor	Program Lecture PIER Resource Options Outside Resources Mentor/Preceptor	Program Lecture PIER Resource Option Outside Resources Nentor/Preceptor
mments Click here	to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here	e to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.	Click here to enter text.
ting					
rogrees Click here	to enter a date.	Click here to enter a date.	Click here to enter a date.	Click here to enter a date.	Click here to enter a date.
-Up Date		Click here to enter text.			
N T T T N T	cee pur ing cogress Click here Up Date d PIER Essentials 1 ent Checklist comp	cee our ogrees Click here to enter a date. Up Date d PIER Esertials 1 Outcomes enr Checklist completion date)	cee our ogreee Click here to enter a date. Click here to enter a date. Up Date Click here to enter text. dPIER Essentials 1 Outcomes ent Checklist completion date)	cee our ing Click here to enter a date. Click here to enter text. PIER Essentials 1 Outcomes ent Checklist completion date)	cee our ing Click here to enter a date. Click here to enter a date. Click here to enter a date. Click here to enter a date. Up Date Click here to enter text. JP IDE Essentials 1 Outcomes ent Checkkis completion date)

The **lower** portion of the map is designed to help the program director with the planning and scheduling of each Essentials. The map allows the program director to enter start and end dates, identifies specific rotations where topics will be learned, define implementation preferences, set dates to check on progress, and provides comment fields where program directors can document topic delivery methods that are unique to their residency training program. On the following page, Exhibit B presents an enlarged image of the lower portion of this tool with more in-depth descriptions of each item.

PIER Essentials Map Details – Exhibit B

8

Use the **Start Date field** to enter the date when you plan to start training for each topic.

Use the **Rotation list box** to select a rotation where you plan to present each topic. If the desired rotation is not listed, you can use the **Additional Rotations/Comments field** to type in the name of the rotation where the topic will be presented. This field can also be used to insert specific instructions for the rotation training.

The **Implementation Preference checkboxes** identify implementation options for content delivery.

Lecture	Select if the topic will be implemented through live or recorded lectures.
PIER Resource Options	Select recommended and optional resources (eg, books, journal, online courses) and practical exercises that you want to use for training from the list provided in the Essentials PIER Resource Options Tool.
Outside Resources	Identify if there are current learning opportunities available from outside sources that you plan to incorporate into the Essentials.
Mentor/ Preceptor	Identify if someone will be assigned to work directly with the resident during training (ie, program director meets weekly with resident to review topic content; the resident is assigned a mentor within the laboratory; the resident is assigned to a preceptor who provides training on specific equipment and/or topics).
Comments	Use the Comments field to add any additional notes related to the selected items or

resources.

Implementation options may vary for each topic or multiple options may be selected for a specific topic. There is room in the **Implementation Preferences Comments field** to identify specific resources (eg, name of the mentor, lecture date and time, outside resource, institutional existing materials).

The **Other Implementation Preferences field** is a place to identify resource options that are NOT listed in the Essentials Resource Options Tool (ie, your own materials or materials created for your program by faculty or other experts).

The **Check Progress date field** is a date reminder field the evaluator can use to follow up on residents progress related to the assigned activities.

The **E# Wrap-up Date field** is the date you anticipate residents will complete all the topics for the Essentials and be ready to discuss and sign off using the Outcome Achievement Checklist.

Topic Title	Informatics in Pathology Practice	Informatio Fundame
Start Date	Click here to enter a date.	Click here
Rotation (click and select a rotation)	Choose an item. Click here to enter text	Choose ar
Additional Rotations / Comments		Click here
Implementation Preferences	Program Lecture	Progra
(select all that apply)	PIER Resource Options	
	Outside Resources	C Outside
	Mentor/Preceptor	Mentor
Comments:	Click here to enter text.	Click here
Other Implementation Preferences		Click here
(identify your own existing materials)		
Check Progress	Click here to enter a date.	Click here
E1 Wrap-Up Date (expected PIER Essentials 1 Outcomes Achievement Checklist completion date)		

Resource Library

Essentials 1 E

Essentials 2 Essentials 3

PIER Resource Options

The top section of the PIER Resource Options tool provides a recap of the rationale, outcomes for achievement, and intended content for the topic.

The Recommended Resources and Practical

Exercises checkboxes provide learning opportunities specific to the topic's outcome statements. Program directors can elect to assign all or select specific resource options and practical exercises from the list provided. Resources are organized by type (eg, Book, Course, Journal, Other, Webpage) to provide ease in selection and use.

Note: If you are electing to use your own lectures and outside resources to achieve the PIER Outcomes for a topic, use the **Comments and Observation** field to enter the resource option details for the resident.

In addition to the use stated above, the **Comments and Observations** field allows the program director to enter comments about topic specific content, the resident's learning experience, or any required follow up on the topic.

The **Date Topic completed** field is used to enter the date

the resident completed the assigned resource options and practical exercises for the topic.

Essentials 1 – PIE	R Resource Options, Topic 3				
Topic 3:	Importance of Databases				
Rationale	Databases provide core structure and tools that enable pathologists to use and manage large amounts of information.				
PIER Outcomes	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.				
Content	 Database terminology Structured versus unstructured data Types of databases Use of databases How database structure affects data queries & retrieval. 				
Recommended	Resources (Check options for residents to complete)				
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory a</i> Chicago, IL: ASCP; 2012.	and Practice.			
	Pages: 35-65 Derk SL Desugeri AV Destenouritz L Detabases				
Book	Sinard JH, ed. Online resources can be easily accessed by clicki Business Media <u>Dages</u> 121	ing on the ked text.			
CAP login required	Sinard JH, Dash R, Association of Pathology Chairs, College of American Pa Tackling today's technology: a pathologist's guid to health IT. Course origina at: APC/ PRODS Annual Meeting; July 10, 2012; Monterey, CA. Original relea Updated August 14, 2017.	thologists. ally presented ase 2013.			
•					
Practical Exerci	ises (Check options for residents to complete)				
Have the residuent occurring in the	dent perform a "Natural Language Search" (text/keyword search) in the LIS (if av ber of cases with a particular diagnosis. Discuss "false positives" and the reason e match list (for example, matched a word in the note or matched a negated dia	vailable) to ns forthem agnosis).			
Have the resid	dent do a similar search by ICD or SNOMED code and compare the results (see	also Topic 4).			
Have the resid FileMaker, MS QA project, an	dent demonstrate the ability to use a database application (eg, <u>Shiny from R Stu</u> S-Excel, MS-Access) to design and build a simple database for a particular purp n address book).	i <u>dios,</u> ose (such as a			
Commonto and	Observations				
Use this area to enter resident's questions.	r additional information, resources, and record notes related to the topic progress or	Date topic completed:			

Resources for Advanced Learning (Optional)

Book Park S, Balis U, Pantanowitz L. Computer fundamentals. In: Pantanowitz L, Tuthill JM, Balis UGJ, eds. Pathology Informatics: Theory and Practice. Chicago, IL: ASCP; 2012.

The **Resources for Advanced Learning (Optional)** section provides additional, expert selected resources for use if the resident wishes to complete further study of the topic. The program director may also elect to include some or all of these resources in their required training for the topic.

*Note: Links to external presentations, tools, and applicable journal articles were validated before the launch of PIER Release 3 and are provided here for your convenience. However, owners of the sites where these items are stored can make changes. If you encounter a link that does not work, please report it to the PIER project lead, Sue Plath, at splath@cap.org.

Outcomes Achievement Checklist

The checklist is the means by which successful completion of PIER Essentials is documented. Upon completion of the Essentials, the evaluator should use this form to evaluate the resident on the achievement of each PIER Outcome statement. As additional input to the final evaluation, the resident may also use a copy of the checklist to complete a self-assessment of PIER Outcome achievement.

A resident should complete 100% of the assigned Essentials activities (eg, readings, online courses, practical exercises, outside resources) in order to be marked **Achieved**.

Other achievement indicators may include but are not limited to:

- Direct observation of the **resident**.
- Feedback received about the resident from a preceptor or mentor.
- Documented feedback gathered via end-of-rotation or other standard evaluations.

Use the **Comments and Observations field** to

document specific supporting evidence for the Achieved results. If an outcome has not been achieved, explain why and indicate what the resident needs to complete or demonstrate in order to achieve the outcome.

PiER Essentials 1 – Outcomes Achievement Checklist	ACGME N Demonstrates basic technical	filestone 1 familiarity with concepts of		
Residents Resident Name:	hardware, operating systems, and software for general purpose applications			
Informatics in Pathology Practice				
Outcome Statement	Resu	ilts		
Explain the relevance of informatics in pathology practice.		Achieved		
Describe the difference between IT and informatics.		Achieved		
Explain the salient differences and similarities among pathology informatics, bioinformatics, public hear informatics, health care IT, and health knowledge informatics.	alth 🔲	Achieved		
Information Systems Fundamentals				
Outcome Statement	Resu	ilts		
Use correct terminology to describe the major types and components of computer hardware, software and computer networks.	^{e,} 🛛	Achieved		
Importance of Databases				
Outcome Statement	Resu	ilts		
Conversant in the fundamentals of databases (including data types, fields, records, database structur and mechanisms for querying data); understands how data storage affects data retrieval options.	e, 🛛	Achieved		
Introduction to Data Standards				
Outcome Statement	Resu	ilts		
Define the types and roles of standards used in pathology, at a basic level.		Achieved		
Data Availability & Security				
Outcome Statement	Resu	ilts		
Understand the elements of system and data availability as a key part of security.		Achieved		
Comments and Observations Use this text box to add additional comments or observations regarding the resident's accomplishments for the topics in Essentials 1.				
This resident has successfully achieved the PIER Essentials 1 Outcomes/ACGME Informati Evaluator's Signature: <i>Click here to enter text.</i>	ics Mileston	e Level 1.		
Resident's Signature: Click here to enter text. Date: Click here to enter a	a date.			

Once the resident has achieved the outcomes, use the **Evaluator's Signature**, **Resident's Signature**, and **Date fields** to document completion of the Essentials topics.

Essentials 1

Essentials 2 Essentials 3

PIER RESOURCE LIBRARY

This section provides a list of the recommended resources that may require advance purchase or login access. We recommend that you identify and obtain the resources you plan to use prior to implementing PIER.

COLLEGE OF AMERICAN PATHOLOGISTS (CAP) ONLINE ACTIVITIES

The CAP has curated several online informatics activities. The majority of these activities are freely available for all PIER participants. A login is required to access the activities and can be created by clicking on the LOG IN button on the <u>CAP website</u>. There is no charge for creating an account.

NEW IN RELEASE 3.2

The Association for Pathology Informatics (API) has curated specific presentations from their annual Pathology Informatics Summit meetings and mapped them to the four PIER Essentials, covering over 80% of the PIER curriculum. They have created a special webpage on their site for PIER so that faculty and residents can access these video presentations and the presentation files, and use them to teach and learn informatics concepts through the PIER curriculum. Click here for more information about this website. *API membership is required to access the presentations*. API has options for teaching institutional memberships that will give access to all your faculty and residents.

Click <u>here</u> to access the API presentations curated especially for PIER.

Click <u>here</u> for details about API membership.

Recommended Resources Requiring Advanced Purchase/Login Access

Essentials 1

- 1. de Baca ME, Spinosa JC, eds. *Clinical Informatics Resource Guide*. Northfield, IL: College of American Pathologists; 2018.
- 2. Garcia LS, ed. Clinical Laboratory Management. 2nd ed. Sterling, VA: ASM Press; 2013.
- 3. Harrison J. Management of pathology information systems. In: Wagar EA, Horowitz RE, Siegal GP, eds. *Laboratory Administration for Pathologists*. Northfield, IL: CAP; 2011.
- 4. Pantanowitz L, Tuthill JM, Balis UGJ, eds. *Pathology Informatics: Theory and Practice*. Chicago, IL: ASCP Press; 2012.
- 5. Parwani AV, ed. *Pathology Informatics, An Issue of Surgical Clinics*. Volume 8-2, 1st ed. New York, NY: Elsevier Inc.; 2015.
- 6. Parwani AV, Goldblum JR, eds. *Pathology Informatics, Surgical Pathology Clinics.* 8th ed. New York, NY: Elsevier Inc.; 2015.
- 7. Sinard JH. Practical Pathology Informatics. New York, NY: Springer Science + Business Media, Inc.; 2006.
- 8. Sucaet Y, Waelput W. Digital Pathology. New York, NY: Springer; 2014.

Essentials 2

- 1. Dangott B. Specialized laboratory information systems. Clin Lab Med. 2016 Mar;36(1):41-50.
- 2. de Baca ME, Spinosa JC, eds. *Clinical Informatics Resource Guide*. Northfield, IL: College of American Pathologists; 2018.
- 3. Grisson R, Kim JY, Brodsky V, et al. A novel class of laboratory middleware. Promoting information flow and improving computerized provider order entry. *Am J Clin Pathol.* 2010;133(6):860-9.
- 4. Henricks WH. Laboratory information systems. *Clin Lab Med.* 2016 Mar;36(1):1-11.
- 5. Pantanowitz L, Parwani AV, eds. Digital Pathology. Chicago, IL: ASCP; 2017.
- 6. Pantanowitz L, Tuthill JM, Balis UGJ, eds. *Pathology Informatics: Theory and Practice*. Chicago, IL: ASCP Press; 2012.
- 7. Riben M. Laboratory automation and middleware. Surg Pathol Clin. 2015;8(2);175-86.
- 8. Shortliffe EH, Cimino JJ, eds. *Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics) 4th ed.* New York, NY: Springer; 2014.

Table of Contents Resource	e Library Essentials	1 Essentials 2	2 Essentials 3	Essentials 4	Appendix
----------------------------	----------------------	----------------	----------------	--------------	----------

Essentials 3

- 1. Harrison J. Management of pathology information systems. In: Wagar EA, Horowitz RE, Siegal GP, eds. *Laboratory Administration for Pathologists*. Northfield, IL: CAP; 2011.
- 2. Jones JB. A strategic informatics approach to autoverification. Clin Lab Med. March 2013;33(1):161-81.
- 3. Pantanowitz L, Tuthill JM, Balis UGJ, eds. *Pathology Informatics: Theory and Practice*. Chicago, IL: ASCP Press; 2012.
- 4. Sinard JH. Practical Pathology Informatics. New York, NY: Springer Science + Business Media, Inc.; 2006.
- 5. de Baca ME, Spinosa JC, eds. *Clinical Informatics Resource Guide*. Northfield, IL: College of American Pathologists; 2018.

Essentials 4

- 1. Baron JM, Dighe AS. The role of informatics and decision support in utilization management. *Clin Chem Acta*. 2014 Jan 1;427:196-201.
- 2. Benson T. *Principles of Health Interoperability; HL7 and SNOMED 2nd*. London, England: Springer-Verlag: 2012.
- 3. Glaser JP, Salzberg C. *The Strategic Application of Information Technology in Health Care Organizations.* 3rd ed. San Francisco, CA: Jossey-Bass; 2011.
- 4. Pantanowitz L, Tuthill JM, Balis UGJ, eds. *Pathology Informatics: Theory and Practice*. Chicago, IL: ASCP Press; 2012.
- 5. Kaplan JK, Rao LK. Selection and implementation of new information systems. *Surg Pathol Clin.* 2015;8(2):239-53.
- 6. Jackson BR. Laboratory formularies. Clin Chim Acta. 2014 Jan 1;427:151-3.
- 7. de Baca ME, Spinosa JC, eds. *Clinical Informatics Resource Guide*. Northfield, IL: College of American Pathologists; 2018.

PIER ESSENTIALS 1 TOOLS



Essentials 1 Tools include:

- PIER Essentials 1 Map (pp. 15-16)
- PIER Essentials 1 Resource Options (pp. 17-24)
- PIER Essentials 1 Outcomes Achievement Checklist (pp. 25-26)

Essentials 1 Notes

DEFINITIONS FOR ACRONYMS used throughout the PIER Resources Toolkit can be found in <u>Appendix B</u>, <u>p. 84</u> of this toolkit.

QUICK ACCESS LINKS to free online journal articles, presentations, and webpages have also been added to the Recommended Resources section of the PIER Resource Options Tool in each Essentials. The intent of this feature is to make it easier to access the materials. The Recommended Resource Options provide a quick link (eg, Journal, Course, Other, Website) for quick access to the content. Therefore, it is recommended that when assigning residents to these resources, you provide an electronic copy of the material rather than a paper copy.

DISCLAIMER: Links to external presentations, tools, and applicable journal articles were validated before the launch of PIER RELEASE 3.2 and are provided here for your convenience. However, owners of the sites where these items are stored can make changes. If you encounter a link that does not work, please report it to the PIER project lead, Sue Plath, at splath@cap.org.

NOTES:

- On rare occasions, some resources may have a minimal fee for access or need a special login to obtain the content. This information is noted in the first column of the Recommended Resource Options table. Resources that require special access or purchase can be found on page <u>11</u> of this document.
- Occasionally, you will find a resource repeated in an Essentials section as denoted in the first column of the Recommended Resource Options table. The duplication of resources is intentional and allows for reinforcement of more complex topics. During planning and scheduling, program directors may need to review the resources to determine whether the resident should complete all or specific resources.

Essentials 1 – Map

Estimated Time: 4-6 hours

Topic Title	Informatics in Pathology Practice	Information Systems Fundamentals	Importance of Databases	Introduction to Data Standards	Data Availability & Security
Rationale	The practice of pathology relies on the creation, management, and accurate and timely communication of clinical laboratory information.	Computers are essential tools that pathologists use in the management of information for laboratory practice and patient care.	Databases provide core structure and tools that enable pathologists to manage and analyze large amounts of information.	Standards enable sharing of data among different health care information systems (ie, interoperability), which is necessary for patient care.	Pathologists are ultimately responsible for the access to and safety of pathology information.
PIER Outcomes	Explain the relevance of informatics in pathology practice. Describe the difference between IT and informatics. Explain the salient differences and similarities among pathology informatics, bioinformatics, public health informatics, health care information technology, and health knowledge informatics.	Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.	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.	Define the types and roles of standards used in pathology, at a basic level.	Understand the elements of system and data availability as a key part of security.
Content	 Definition of informatics Relevance of informatics in pathology Different types of informatics The practice of informatics in pathology 	 Hardware Software Networks Communications Internet/web 	 Database terminology Structured versus unstructured data Types of databases Use of databases How database structure affects data queries & retrieval 	 Messaging protocols Data models Interoperability Introduction to coding systems 	 Data protection and confidentiality Data availability & integrity Data backup & recovery

Resource Library Es

Essentials 1 Essentials 2

als 2 Essentials 3

Essentials 1 – Map, cont'd

Topic Title	Informatics in Pathology Practice	Information Systems Fundamentals	Importance of Databases	Introduction to Data Standards	Data Availability & Security
Start Date					
Rotation (Click and select a rotation)					
Additional Rotations & Comments					
Implementation Preferences (Select all that apply) Comments:	Program Lecture PIER Resource Options Outside Resources Mentor/ Preceptor				
Other Implementation Preferences (Identify your own existing materials)					
Check Progress					
E1 Wrap-up Date (Expected PIER Esse Achievement Checklis	ntials 1 Outcomes st completion date)				

Essentials 2

Essentials 3

Essentials 4

Essentials 1 – PIER Resource Options

Topic 1:	Informatics in Pathology Practice				
Rationale	The practice of pathology relies on the creation, management, and accurate and timely communication of clinical laboratory information.				
PIER Outcomes	Explain the relevance of informatics in pathology practice. Describe the difference between IT and informatics. Explain the salient 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 Different types of informatics The practice of informatics in pathology 				

Recommended	Resources (Check options for residents to complete)
Book	 Harrison J. Management of pathology information systems. In: Wagar EA, Horowitz RE, Siegal GP, eds. <i>Laboratory Administration for Pathologists</i>. Northfield, IL: CAP; 2011. Page 87. Definition of pathology informatics. Pages 87-88. Early development and growth of laboratory information systems. Pages 88-90. Maturation and adoption.
Book	 Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i>. Chicago, IL: ASCP Press; 2012. Pages 1-8. Carter AB, McKnight RM, Henricks WH, Moore GW, Saltz JH. Pathology informatics: an introduction.
Book	 Parwani AV, Goldblum JR, eds. <i>Pathology Informatics, Surgical Pathology Clinics, 8th ed.</i> New York, NY: Elsevier Inc.; 2015. Pages 239-254. Kaplan KJ, Rao LKF. Selection and implementation of new information systems. Pages 255-268. Sirintrapun J, Artz DR. Health information systems.

Practical Exercises (Check options for residents to complete)

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 have the resident identify and recognize specific "moments" when informatics comes into play. Discuss informally with more senior residents, staff pathologists, or informatics faculty to better understand the implications for patient care and laboratory operations. Examples:

- Ordering special stains in the LIS; looking up prior test results in the LIS or EHR
- Using barcoded labels to identify specimens
- Using online databases to determine what combination of immunostains will best distinguish between two entities
- Performing "Natural Language" (text/keyword search) search for prior cases with a similar diagnosis\
- Setting autoverification ranges for a new laboratory test

Note: Autoverification is the process by which patient results are generated from interfaced instruments and sent to the LIS, where they are compared against laboratory-defined acceptance parameters. If the results fall within these defined parameters, the results are automatically released to patient reporting formats without any additional laboratory staff intervention. Any data that fall outside the defined parameters are reviewed by laboratory staff prior to reporting (Source: CAP Lab General Checklist).

Essentials 1 – PIER Resource Options, Topic 1, cont'd

Practical Exercises, COnt'd (Check options for residents to complete)

- Checking EHR for important information omitted from the requisition (eg, laterality of a biopsy).
- Entering discrete data in a synoptic format.
- Taking a digital photograph of gross specimens and histology slides.
- Preparing a digital presentation.
- Identifying and merging duplicate patients in the LIS.
- Performing a literature search related to a patient test result.

During rotations have the resident keep a log of informatics-related activities and questions that occur (eg, do this for one week on 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 and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.

Date topic completed:

Resources for Advanced Learning (Optional)

Book Cheng L, Bostwick DG. *Essentials of Anatomic Pathology.* 4th ed. New York, NY: Springer; 2016.

- Pages 509-20. Amin W, Chandran U, Parwani AV, Becich MJ. Biomedical informatics for anatomic pathology.
- Journal Sinard JH, Powell SZ, Karcher DS. Pathology training in informatics: evolving to meet a growing need. *Arch Pathol Lab Med.* April 2014;138(4):505-11.

CourseSinard JH, Dash R, Association of Pathology Chairs, College of American Pathologists. Tackling
today's technology: a pathologist's guide to health IT. Course originally presented at: APC/PRODS
Annual Meeting; July 10, 2012; Monterey, CA. Original release 2013. Updated August 14, 2017.

Topic 2:	Information Systems Fundamentals
Rationale	Computers are essential tools that pathologists use in the management of information for laboratory practice and patient care.
PIER Outcomes	Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.
Content	 Hardware Software Networks Communications Internet/web

Essentials 1 – PIER Resource Options, Topic 2

Recommended Resources (Check options for residents to complete)

Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i> . Chicago, IL: ASCP; 2012.
	• Pages 67-84. Sharma G, Routbort MJ, Parwani AV, Pantanowitz L. Networking.
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.
	Pages 19-50. Sinard JH. Desktop computers: hardware.Pages 51-83. Sinard JH. Desktop computers: software.
Course CAP login required	Sinard JH, Dash R, Association of Pathology Chairs, College of American Pathologists. Tackling today's technology: a pathologist's guide to health IT. Course originally presented at: APC/PRODS Annual Meeting; July 10, 2012; Monterey, CA. Original release 2013. Updated August 14, 2017.

Practical Exercises (Check options for residents to complete)

Have the resident use any computer in the pathology laboratory to perform the following actions:

- Display the total amount of data storage and the percentage of storage capacity that is currently available on the computer.
- Identify the operating system, its version, and application programs in use on the computer.
- Identify the web browser (and version) in use on the computer.
- Use a networked server, commonly referred to as a shared drive, to open and save files.
- Select a desired networked printer and print a document.
- Determine the IP address for this networked computer.

Comments and Observations

l r	Use this area to er resident's question	nter additional infor IS.	mation, resource	es, and record not	es related to the t	opic progress or	Date topic completed	:
	Table of Contents	Resource Library	Essentials 1	Essentials 2	Essentials 3	Essentials 4	Appendix	

Essentials 1 – PIER Resource Options, Topic 2, cont'd

Resources for Advanced Learning (Optional)

Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice.</i> Chicago, IL: ASCP; 2012.
	Pages 11-33. Park S, Balis U, Pantanowitz L. Computer fundamentals.
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.
	Pages 83-120. Sinard JH. Networking and the internet.
<u>Journal</u>	Clay MR, Fisher KE. Bioinformatics education in pathology training: current scope and future direction. <i>Cancer Inform.</i> 2017 Apr 10;16:1176935117703389.
<u>Website</u>	Tyson J, Crawford S. How PCs work. How Stuff Works Tech website.
<u>Website</u>	Woodford C. Computer networks. Explain That Stuff website.

Table of Contents Resource Library

Topic 3:	Importance of Databases
Rationale	Databases provide core structure and tools that enable pathologists to use and manage large amounts of information.
PIER Outcomes	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.
Content	 Database terminology Structured versus unstructured data Types of databases Use of databases How database structure affects data queries & retrieval.

Essentials 1 – PIER Resource Options, Topic 3

Recommended	Resources (Check options for residents to complete)
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i> . Chicago, IL: ASCP; 2012.
	Pages 35-65. Park SL, Parwani AV, Pantanowitz L. Databases.
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.
	Pages 121-72. Sinard JH. Databases.
Course CAP login required	Sinard JH, Dash R, Association of Pathology Chairs, College of American Pathologists. Tackling today's technology: a pathologist's guide to health IT. Course originally presented at: APC/PRODS Annual Meeting; July 10, 2012; Monterey, CA. Original release 2013. Updated August 14, 2017.

Practical Exercises (Check options for residents to complete)

Have the resident perform a "Natural Language Search" (text/keyword search) in the LIS (if available) to identify a number of cases with a particular diagnosis. Discuss "false positives" and the reasons for them occurring in the match list (for example, matched a word in the note or matched a negated diagnosis).

Have the resident do a similar search by ICD or SNOMED code and compare the results (see also Topic 4).

Have the resident demonstrate the ability to use a database application (eg, <u>Shiny from R Studios</u>, FileMaker, MS-Excel, MS-Access) to design and build a simple database for a particular purpose (such as a QA project, an address book).

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.

Date topic completed:

Resources for Advanced Learning (Optional)

None identified at this time.

Essentials 2 Essentials 3

Essentials 4

Appendix

© 2018 APC/API/CAP. All rights reserved.

Essentials 1 – PIER Resource Options, Topic 4

Topic 4:	Introduction to Data Standards	
Rationale	Standards enable sharing of data among health care information systems (ie, interoperability), which is necessary for patient care.	
PIER Outcomes	Define the types and roles of standards used in pathology, at a basic level.	
Content	 Messaging protocols Data models Interoperability Introduction to coding systems 	

Recommended Resources (Check options for residents to complete)		
Book	Parwani AV, ed. <i>Pathology Informatics, An Issue of Surgical Clinics.</i> Volume 8-2, 1st ed. New York, NY: Elsevier Inc.; 2015.	
	 Pages 109-22. Amin M, Dhir R. Data representation, coding, and communication standards. 	
	 Pages 145-52. Dangott B. Specialized laboratory information systems. Pages 153-8. Cucoranu IC. Laboratory information systems management and operations. 	
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.	
	• Pages 303-16. Krauthammer M, Sinard JH. Case identification by diagnosis.	
Book	Sucaet Y, Waelput W. Digital Pathology. New York, NY: Springer; 2014.	
	Pages 17-20. How do slide scanners work?Pages 20-2. Virtual slide formats.	
Course CAP login required	Beckwith B, Gumpeni P, Rainer RD. Medical coding basics. College of American Pathologists; Course originally released December 30, 2011. Updated on September 2017.	
<u>Other</u> Login or fees may	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.	
apply	 Pages 65-87. Section 3: Understanding laboratory data structures and information exchange. 	

Practical Exercises (Select options for residents to complete)

On at least one AP and/or CP rotation, have the resident determine at least one ICD, CPT, or LOINC code associated with a given case, specimen, or report. This data may be available in the LIS and/or printed reports.

Show the resident an example HL7 message from one of the laboratory's systems.

Have the resident perform a search of the LIS by a diagnosis code; have the resident review the list for false positives, and explore why these cases were matched (see also Topic 3).

22

Essentials 1 – PIER Resource Options, Topic 4, cont'd

Comments and Observations	
Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	ate topic ompleted:

Resources for Advanced Learning (Optional)		
Journal Login or fees may apply	Amin M, Dhir R. Data representation, coding, and communication standards. <i>Surg Pathol Clin.</i> 2015 Jun;8(2):109-21.	
<u>Website</u>	About HL7. Health Level Seven International website.	
<u>Website</u>	International Organization for Standardization (ISO). How we develop standards? ISO website.	

 Table of Contents
 Resource Library
 Essentials 1
 Essentials 2
 Essentials 3
 Essentials 4

Essentials 1 – PIER Resource Options, Topic 5

Topic 5:	Data Availability & Security	
Rationale	Pathologists are ultimately responsible for the access to and safety of pathology information.	
PIER Outcomes	Understand the elements of system and data availability as a key part of security.	
Content	1. Data protection and confidentiality	
	2. Data availability and integrity	
	3. Data backup and recovery	

Recommended Resources (Check options for residents to complete)

Book	Garcia LS, ed. Clinical Laboratory Management. 2nd ed. Sterling, VA: ASM Press; 2013.
	 Pages 918-32. Henricks WH. Electronic health records and their implications and opportunities for laboratories.
Book	Parwani AV, Goldblum JR, eds. <i>Pathology Informatics, Surgical Pathology Clinics, 8th ed</i> . New York, NY: Elsevier Inc.; 2015
	 Pages 153-8. Cucoranu IC. Laboratory information systems management and operations.
Course CAP login required	Sinard JH, Dash R, Association of Pathology Chairs, College of American Pathologists. Tackling today's technology: a pathologist's guide to health IT. Course originally presented at: APC/PRODS Annual Meeting; July 10, 2012; Monterey, CA. Original release 2013. Updated August 14, 2017.

Practical Exercises (Check options for residents to complete)

Review the laboratory's downtime policy/SOP to see how the resident would do her/his job during a downtime.

Have the resident review the department's policy for data backup. When is it performed? How often is it performed?

Have a group of residents perform an "inspection" of the LIS based on the CAP checklist questions related to the LIS.

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.

Date topic completed:

Resources for Advanced Learning (Optional)

<u>Journal</u>	Cucoranu IC, Parwani AV, West AJ, et al. Privacy and security of patient data in the pathology laboratory. <i>Journal Pathology Informatics</i> . 2013;4:4.
Other Login or fees may apply	College of American Pathologists Accreditation Program. <i>Laboratory General Checklist</i> : <i>GEN.48750 LIS Interface Shutdown/Recovery</i> . Northfield, IL: College of American Pathologists; August 7, 2017.
Other	Local SOP for disaster recovery/business continuity.
Other	Local SOP for LIS downtime.
Other	Local SOP for data backup in LIS.

 Table of Contents
 Resource Library
 Essentials 1
 Essentials 2
 Essentials 3
 Essentials 4
 Appendix

© 2018 APC/API/CAP. All rights reserved.



PIER Essentials 1 – Outcomes Achievement Checklist

Resident Name:

ACGME Milestone 1

Demonstrates familiarity with basic technical concepts of hardware, operating systems, and software for general purpose applications

Informatics in Pathology Practice					
Outcome Statement	Results				
Explain the relevance of informatics in pathology practice.	Achieved				
Describe the difference between IT and informatics.	Achieved				
Explain the salient differences and similarities among pathology informatics, bioinformatics, public health informatics, health care IT, and health knowledge informatics.	Achieved				
Information Systems Fundamentals					
Outcome Statement	Results				
Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.	Achieved				
Importance of Databases					
Outcome Statement	Results				
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.	Achieved				
Introduction to Data Standards					
Outcome Statement	Results				
Define the types and roles of standards used in pathology, at a basic level.	Achieved				
Data Availability & Security					
Outcome Statement	Results				
Understand the elements of system and data availability as a key part of security.	Achieved				

Continue to the next page for comments and signatures.

PIER Essentials 1 – Outcomes Achievement Checklist, cont'd

Comments and Observations: Use this area to add comments or observations regarding the resident's accomplishments for the topics in Essentials 1.

This resident has successfully achieved PIER Essentials 1 Outcomes/ACGME Informatics Milestone Level 1.

Evaluator's Signature:

Resident's Signature:

Date:

PIER ESSENTIALS 2 TOOLS



Essentials 2 Tools include:

Resource Library

Table of Contents

- PIER Essentials 2 Map (pp. 29-30)
- PIER Essentials 2 Resource Options (pp. 31-38)
- PIER Essentials 2 Outcomes Achievement Checklist (pp. 41-42)

Essentials 3

Essentials 4

Appendix

Essentials 1

Essentials 2

Essentials 2 Notes

DEFINITIONS FOR ACRONYMS used throughout the PIER Resources Toolkit can be found in <u>Appendix B</u>, <u>p. 84</u> of this toolkit.

QUICK ACCESS LINKS to free online journal articles, presentations, and webpages have also been added to the Recommended Resources section of the PIER Resource Options Tool in each Essentials. The intent of this feature is to make it easier to access the materials. The Recommended Resource Options provide a quick link (eg, Journal, Course, Other, Periodical) for quick access to the content. Therefore, it is recommended that when assigning residents to these resources, you provide an electronic copy of the material rather than a paper copy.

DISCLAIMER: Links to external presentations, tools, and applicable journal articles were validated before the launch of PIER RELEASE 3.2 and are provided here for your convenience. However, owners of the sites where these items are stored can make changes. If you encounter a link that does not work, please report it to the PIER project lead, Sue Plath, at splath@cap.org.

NOTES:

- On rare occasions, some resources may have a minimal fee for access or need a special login to obtain the content. This information is noted in the first column of the Recommended Resource Options table. Resources that require special access or purchase can be found on page <u>11</u> of this document.
- Occasionally, you will find a resource repeated in an Essentials section as denoted in the first column of the Recommended Resource Options table. The duplication of resources is intentional and allows for reinforcement of more complex topics. During planning and scheduling, program directors may need to review the resources to determine whether the resident should complete all or specific resources.

Essentials 3

Essentials 2 – Map

Estimated Time: 8-10 hours

Topic Title	LIS Components & Functions	Specialized LISs & Middleware	Data & Communication Standards	Digital Imaging	Basics of the Health Care Information Ecosystem
Rationale	The LIS is mission- critical to the management of the day- to-day practice of pathology and functioning of laboratories.	Specialized areas and devices in the laboratory require specialized information system capabilities.	Standards enable sharing of data among health care information systems (ie, interoperability) which is necessary for patient care.Digital imaging is a fundamental tool for modern pathology practice.		Integrating pathology data into the health care enterprise is necessary for high quality patient care.
PIER Outcomes	Describe LISs and the role they play in efficient lab operations and health care delivery. 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). Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow. Comply with positive patient identification processes/protocols.	Describe LISs and the role they play in efficient lab operations and health care delivery. Describe middleware, how it relates to the LIS, and roles for middleware in laboratory operations. Understand capabilities and limitations of electronic interfaces between an LIS and instrumentation, middleware, and other information systems.	Define the key features of communication standards used in pathology, such as HL7. 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. Recognize the advantages of standardized terminology for creating interchangeable data that can be retrieved and summarized. Understand the basics of the standards development process.	Determine the appropriate digital image resolution for a particular use. Articulate potential roles, uses, and limitations of WSI in the laboratory environment. Determine the appropriate telemicroscopy technology to use for a particular application. Utilize digital imaging systems such as WSI, dynamic telemicroscopy, and image analysis (as appropriate to practice setting).	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).
Content	 What is an LIS Role of the LIS AP versus CP LIS Tracking systems 	 Specialized versus general LIS Define middleware Types and roles of middleware Computational pathology (eg, molecular LIS) 	 Features of communication and terminology standards Standards development process (eg, HL7, ISO, IHE, ONC) Application of standards (eg, CPT, ICD, SNOMED CT, DICOM, and LOINC) 	 Imaging process and image management (eg, capture, storage, retrieval, viewing) Types of digital images (eg, static, dynamic, WSI) Digital pathology applications (eg, telepathology) Image analysis 	 Elements of the health care information ecosystem Points of pathology data sharing within the health care information ecosystem (eg, EHR, billing, reference labs, data warehouse, tumor registry)

Resource Library Es

Essentials 1 Essentials 2

als 2 Essentials 3

Essentials 4

Essentials 2 – Map, cont'd

Table of Contents

Resource Library

Essentials 1

Topic Title	LIS Components & Functions	Specialized LISs & Middleware	Data & Digital Imaging Communication Standards		Basics of the Health Care Information Ecosystem	
Start Date						
Rotation (Click and select a rotation)						
Additional Rotations & Comments						
Implementation Preferences	Program Lecture	Program Lecture	Program Lecture	Program Lecture	Program Lecture	
(Select all that apply)	PIER Resource Options	PIER Resource Options	PIER Resource Options	PIER Resource Options	PIER Resource Options	
	Outside Resources	Outside Resources	Outside Resources	Outside Resources	Outside Resources	
Commenter	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor	
Comments:						
Other Implementation Preferences (Identify your own existing materials)						
Check Progress						
E2 Wrap-up Date (Expected PIER Essentials 1 Outcomes Achievement Checklist completion date)						

Essentials 2

Essentials 4

Essentials 3

Essentials 2 – PIER Resource Options, Topic 1

Topic 1:	LIS Components & Functions				
Rationale	The LIS is mission-critical to the management of the day-to-day practice of pathology and functioning of laboratories.				
PIER Outcomes	Describe LISs and the role they play in efficient lab operations and health care delivery. 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).				
	Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow. Comply with positive patient identification processes/protocols.				
Content	 What is an LIS Role of the LIS AP versus CP LIS Tracking systems 				

Recommende	d Resources (Check options for residents to complete)
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory & Practice</i> . Chicago, IL: ASCP; 2012.
	 Pages 85-103. Henricks WH. Laboratory information systems overview structure and function.
	• Pages 283-303. Balis UJ, Pantanowitz L. Specimen tracking and identification systems.
<mark>Journal</mark> Login or fees may apply	Henricks WH. Laboratory information systems. Clin Lab Med. 2016 Mar;36(1):1-11.
<u>Journal</u>	Pantanowitz L, Mackinnon AC, Sinard JH. Tracking in anatomic pathology. Arch Pathol Lab Med. 2013;137:1798-810.
<u>Journal</u>	Park SL, Pantanowitz L, Sharma G, Parwani AV. Anatomic pathology laboratory information systems: a review. <i>Adv Anat Pathol.</i> 2012 Mar;19(2):81-96.
<u>Webpage</u>	Laboratory information system. LIMSwiki.org website. Updated January 26, 2018.

Practical Exercises (Check options for residents to complete)

On at least one AP and/or CP rotation, have the resident follow a specimen from receipt through to final report generation, noting each instance how a person or device (eg, lab instrument) interacts with the LIS in processing that specimen. For each step, identify the key data elements involved and the user type(s)/role(s) involved.

Have the resident access the most recent CAP Today System Survey (<u>http://www.captodayonline.com/productguides/</u>) regarding clinical LISs, anatomic pathology systems, or specialty systems and identify five to six distinguishing characteristics that clearly differentiate the labs current LIS from the others listed.

Essentials 2 - PIER Resource Options, Topic 1, cont'd

	Comments and Observations	
Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Date topic completed:

Resource	s for Advanced Learning (Optional)
Book	Wagar EA, Horowitz RE, Siegal GP, eds. <i>Laboratory Administration for Pathologists</i> . Northfield, IL: CAP Press; 2011.
	Pages 94-5. Harrison JH. Management of pathology information systems.
Course CAP login required	Henricks J, Sinard J. Laboratory information systems (LIS) fundamentals. Released at: College of American Pathologists; February 2018. Northfield, IL.
Journal Login or fees may apply	Hartman DJ. Enhancing and customizing laboratory information systems to improve/enhance pathologist workflow. <i>Clin Lab Med</i> . Mar;36(1):31-9.
<u>Journal</u>	Sepulveda JL, Young DS. The ideal laboratory information system. <i>Arch Pathol Lab Med</i> . August 2014;137(8):1129-40.
<u>Journal</u>	Snyder ML, Carter A, Jenkins K, Fantz CR. Patient misidentifications caused by errors in standard bar code technology. <i>Clin Chem.</i> October 2010;56(10):1554.
Other Login or fees may apply	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.
	 Pages 36-42. Pantanowitz L. What do I need to know when deciding to use 2D barcodes or a radio-frequency identification (REID) system in my laboratory?
	 Pages 43-51. Reichard RR. Everything you always wanted to know about RFID* (*but were afraid to ask).
	• Pages 52-7. Aller R. What exactly is positive patient identification and why is this of concern to me?
<u>Other</u>	Tuthill JM, Splitz A, Balis UJ, Friedmanuse BA. <i>LIS Toolkit</i> . Pittsburgh, PA: Association for Pathology Informatics. September 20, 2013.

Essentials 2

Essentials 2 – PIER Resource Options, Topic 2

Decommonded Desources (checks

Topic 2:	Specialized LISs & Middleware				
Rationale	Specialized areas and devices in the laboratory require specialized information system capabilities.				
PIER Outcomes	Describe LISs and the role they play in efficient lab operations and health care delivery.Describe middleware, how it relates to the LIS, and roles for middleware in laboratory operations.Understand capabilities and limitations of electronic interfaces between an LIS and instrumentation, middleware, and other information systems.				
Content	 Specialized versus general LIS Define middleware Types and roles of middleware Computational pathology (eg, molecular LIS) 				

Kecommender	NESOULCES (Check options for residents to complete)
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. Pathology Informatics

Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory & Practice</i> . Chicago, IL: ASCP; 2012:85-101.				
	 Pages 148-55. Pantanowitz L, Balis UJ, Parwani AV. Laboratory automation. Pages 157-76. Parwani AV, Tuthill JM, Balis UJ, Carter A, Monzon F, Pantanowitz L. Information systems for specialized laboratories. 				
<mark>Journal</mark> Login or fees may apply	Dangott B. Specialized laboratory information systems. <i>Clin Lab Med</i> . 2016 Mar;36(1):41-50.				
<mark>Journal</mark> Login or fees may apply	Grisson R, Kim JY, Brodsky V, et al. A novel class of laboratory middleware. Promoting information flow and improving computerized provider order entry. <i>Am J Clin Pathol</i> . 2010;133(6):860-9.				
<u>Journal</u>	Jones RG, Johnson OA, Batstone G. Informatics and the clinical laboratory. <i>Clin Biochem Rev.</i> 2014;35(3):177-92.				
<mark>Journal</mark> Login or fees may apply	Riben M. Laboratory automation and middleware. Surg Pathol Clin. 2015;8(2):175-86.				
<u>Journal</u>	Wilkerson ML, Henricks WH, Castellani WJ, Whitsitt MS, Sinard JH. Management of laboratory data and information exchange in the electronic health record. <i>Arch Pathol Lab Med.</i> 2015 Mar;139(3):319-27.				
<mark>Other</mark> Login or fees may apply	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.				

Practical Exercises (Check options for residents to complete)

On at least one rotation have residents identify where middleware is used, the name of the middleware system, and for what function(s) or purposes.

Have the resident visit an area of the laboratory that utilizes a specialized LIS or specialized module of the LIS and identify what features/functions are unique (eg, blood bank, molecular lab). Alternatively, have the resident do this on any rotation in a laboratory that utilizes a specialized LIS module.

Have the resident access the most recent CAP Today System Survey

(http://www.captodayonline.com/productguides/) regarding clinical LISs, anatomic pathology systems, or specialty systems, and identify five to six distinguishing characteristics that clearly differentiate the labs current LIS from the others listed.

Table of Contents	Resource Library	Essentials 1	Essentials 2	Essentials 3	Essentials 4	Appendix

Essentials 2 – PIER Resource Options, Topic 2, cont'd

Comments and Observations	
Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Date topic completed:

Resources for Advanced Learning (Optional)		
<u>Journal</u>	Armbruster DA, Overcash DR, Reyes J. Clinical Chemistry Laboratory Automation in the 21st Century-Amat Victoria curam (Victory loves careful preparation). <i>Clin Biochem Rev.</i> 2014 Aug;35(3):143-53.	
Journal Login or fees may apply	Kratz A. Electronic reporting of all reference laboratory results: An important step toward a truly all- encompassing, integrated health record. <i>Health Informatics Journal</i> . 2016 Sep;22(3):496-504.	
<u>Journal</u>	Petrides AK, Tanasijevic MJ, Goonan EM, et al. Top ten challenges when interfacing a laboratory information system to an electronic health record: Experience at a large academic medical center. <i>Int J Med Inf.</i> 2017 Oct;106:9-16.	
<u>Journal</u>	Tan BT, Fralick J, Flores W, et al. Implementation of epic beaker clinical pathology at Stanford University Medical Center. <i>Am J Clin Pathol.</i> 2017 Mar;147(3):261-72.	
<u>Journal</u>	Toouli G, Georgiou A, Westbrook J. Changes, disruption and innovation: an investigation of the introduction of new health information technology in a microbiology laboratory. <i>J Pathol Inform</i> . 2012;3:16.	
<u>Journal</u>	Xiang B, Li P, Hemingway SS, Qumsiyeh M. CytoAccess, a relational laboratory information management system for a clinical cytogenetics laboratory. <i>J Assoc Genet Technol</i> . 2006;32(4):168-70.	

Essentials 3

Essentials 2 – PIER Resource Options, Topic 3

Topic 3:	Data & Communication Standards
Rationale	Standards enable sharing of data among health care information systems (ie, interoperability) which is necessary for patient care.
PIER Outcomes	Define the key features of communication standards used in pathology, such as HL7.
	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.
	Recognize the advantages of standardized terminology for creating interchangeable data that can be retrieved and summarized.
	Understand the basics of the standards development process.
Content	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)

Recommende	d Resources (Check options for residents to complete)
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory & Practice</i> . Chicago, IL: ASCP; 2012.
	 Pages 179-86. Beckwith B. Coding. Pages 135-40. Balis U. Information systems interfaces and interoperability.
<u>Other</u>	American Health Information Management Association Fact Sheet. Standards category: information exchange standards. AHIMA website. 2017.
<u>Other</u>	American Health Information Management Association Standards Fact Sheet. Standards category: data standards. AHIMA website. 2017.
<u>Other</u>	American Health Information Management Association Standards Fact Sheet. Standards and systems interoperability: definitions. AHIMA website. 2017.

Practical Exercises (Check options for residents to complete)

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

This practical application covers browsing, lookup, and automatic coding using standard terminologies in the NCBO BioPortal: <u>http://bioportal.bioontology.org</u>. Have the resident perform the following tasks:

- Compare and contrast the structure and concept content of SNOMED CT, ICD 9/10, LOINC, and CPT
 using the BioPortal browser displays for pathology reports.
- Code a set of AP and CP pathology reports that contain a range of procedure and clinical concepts, of
 varying complexity (eg, at least one synoptic report should be included).

Essentials 2 – PIER Resource Options, Topic 3, cont'd

Comments and Observations	
Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Date topic completed:

Resources f	or Advanced Learning (Optional)
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.
	 Pages 87-101. Sinard JH. Communication on a network. Pages 287-301. Sinard JH. Electronic interfaces and data exchange.
Journal Login or fees may apply	Legg M. Practice brief. Standardisation of test requesting and reporting for the electronic health record. <i>Clin Chim Acta</i> . 2013;(13)00491-00499.
<u>Course</u>	Beckwith B, Gumpeni P, Rainer RD. Medical coding basics. College of American Pathologists; 2011; Northfield, IL.
Essentials 2 – PIER Resource Options, Topic 4

Topic 4:	Digital Imaging			
Rationale	Digital imaging is a fundamental tool for modern pathology practice.			
PIER Outcomes	Determine the appropriate digital image resolution for a particular use. Articulate potential roles, uses, and limitations of WSI in the laboratory environment. Determine the appropriate telemicroscopy technology to use for a particular application. Utilize digital imaging systems such as WSI, dynamic telemicroscopy, and image analysis (as appropriate to practice setting).			
Content	 Imaging process and image management (eg, capture, storage, retrieval, viewing) Types of digital images (eg, static, dynamic, WSI) Digital pathology applications (eg, telepathology) Image analysis 			

Recommended Resources				
Book	 Pantanowitz L, Parwani AV, eds. <i>Digital Pathology</i>. Chicago, IL: ASCP; 2017. Pages 1-8. Pantanowitz L, Sucaet Y, Parwani AV. Introduction. Pages 9-20. Sinard J. Static digital imaging: basics & clinical use. Pages 21-40. Pantanowitz L, Parwani AV, Birdsong G, Kurtycz D. Digital imaging process. Pages 41-58. Farahani N, Pantanowitz L. Telepathology. Pages 59-76. Pantanowitz L. Whole slide imaging. Pages 77- 94. Evans A. Clinical applications of whole slide imaging. Pages 153-72. Conway C, Hewitt S. Image analysis applications. 			
Course CAP login required	Kaplan K, Tan B. Telepathology and whole slide imaging. Released at: College of American Pathologists; December 2017; Northfield, IL.			
<u>Journal</u>	Pantanowitz L, Sinard JH, Henricks WH, et al. Validating whole slide imaging for diagnostic purposes in pathology: Guideline from the College of American Pathologists (CAP) Pathology and Laboratory Quality Center. <i>Arch Pathol Lab Med.</i> 2013;137:1710-22.			

Practical Exercises

Didactic demonstration session (or a "hands-on" workshop session) using basic image editing software (eg, Preview, Photoshop Elements) to edit a digital image (eg, crop, resample, adjust colors).

Review the digital imaging equipment available for residents to take digital gross photographs and/or photomicrographs, and the process involved when residents include such images in their presentations.

Create and use WSIs (if available) for any application, such as a tumor board presentation or other educational activity.

© 2018 APC/API/CAP. All rights reserved.

Essentials 2 - PIER Resource Options, Topic 4, cont'd

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Comments and Observations	
	Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Date topic completed:

Resources for Advanced Learning (Optional)		
Book	 Pantanowitz L, Parwani AV. <i>Digital Pathology</i>. Chicago, IL: ASCP; 2017. Pages 135-52. Gurcan M. Image analysis fundamentals. Pages 173-80. Henricks W, Bauer T. Implementation of whole slide imaging in surgical pathology. Pages 221-40. Guo H, Chen Y. Advanced imaging. 	
<u>Journal</u>	Ghaznavi F, Evans A, Madabhushi A, Feldman M. Digital imaging in pathology: whole-slide imaging and beyond. <i>Annu Rev Pathol</i> . 2013 Jan 24;8:331-59.	
<u>Journal</u>	Mukhopadhyay S, Feldman MD, Abels E, et al. Whole slide imaging versus microscopy for primary diagnosis in surgical pathology: a multicenter blinded randomized noninferiority study of 1992 cases (pivotal study). <i>Am J Surg Pathol.</i> 2018 Jan;42(1):39-52.	
<u>Journal</u>	Sellaro T, Filkins R, Hoffman C, et al. Relationship between magnification and resolution in digital pathology systems. <i>J Pathol Inform.</i> 2013 Aug 22;4:21.	
Journal	Singh R, Chubb L, Pantanowitz L, Parwani A. Standardization in digital pathology: supplement 145 of the DICOM standards. <i>J Pathol Inform.</i> 2011;2:23.	
Other CAP login required; fees may apply	Hipp J, ed. CAP Digital Pathology Resource Guide. Northfield, IL: College of American Pathologists; 2017.	

Essentials 2 – PIER Resource Options, Topic 5

Topic 5:	Basics of the Health Care Information Ecosystem			
Rationale	Integrating pathology data into the health care enterprise is necessary for high quality patient care.			
PIER Outcomes	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).			
Content	1. Elements of the health care information ecosystem			
	2. Points of pathology data sharing within the health care information ecosystem (eg, EHR, billing, reference labs, data warehouse, tumor registry)			

Recommended Resources (Check options for residents to complete)

В	ook	Shortliffe EH, Cimino JJ, eds. <i>Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics)</i> . New York, NY: Springer; 2014.
		• Pages 474-510. Vogel LH. Management of information in healthcare organizations.
<u>J(</u>	<u>ournal</u>	Liyanage H, Liaw ST, de Lusignan S. Accelerating the development of an information ecosystem in health care, by stimulating the growth of safe intermediate processing of health information (IPHI). <i>Inform Prim Care.</i> 2012;20(2):81-6.
<u>0</u>	<u>)ther</u>	Beckwith BA, Aller RD, Brassel JH, Brodsky VB, de Baca ME. Laboratory interoperability best practices: ten mistakes to avoid. Northfield, IL: College of American Pathologists; 2013.
<u>0</u>) <u>ther</u>	The Office of the National Coordinator for Health Information Technology. Connecting health and care for the natation: a ten year vision to achieve interoperable health IT infrastructure. HealthIT.gov website. August 25, 2014.

Practical Exercises (Check options for residents to complete)

Have the resident sketch out a relatively high level diagram of information systems in your environment with which your LIS exchanges data. This should include names of key systems such as the EHR in use.

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.

Date topic completed:

Appendix

Essentials 2 – PIER Resource Options, Topic 5, cont'd

Resources for Advanced Learning (Optional)

Book	Pantanowitz L, Balis UJ, Tuthill JM, eds. <i>Pathology Informatics: Modern Practice & Theory for Clinical Laboratory Computing</i> . Chicago, IL: ASCP; 2012.
	• Pages 217-30. Aller RD, Georgiou A, Pantanowitz L. Electronic health records.
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.
	Pages 173-206. Sinard JH. Pathology LIS: relationship to institutional systems.
<u>Journal</u>	Wilkerson ML, Henricks WH, Castellani WJ, Whitsitt MS, Sinard JH. Management of laboratory data and information exchange in the electronic health record. <i>Arch Pathol Lab Med.</i> 2015 Mar;139(3):319-27.
Journal	Jones RG1, Johnson OA2, Batstone G3. Informatics and the clinical laboratory. <i>Clin Biochem Rev.</i> 2014 Aug;35(3):177-92.



Table of Contents

Resource Library

PIER Essentials 2 – Outcomes Achievement Checklist

Resident Name:

ACGME Milestone 2
Understands lab specific
software, key technical
concepts and subsystems
on interfaces, workflow,
barcode application,
automation systems
(enterprise systems
architecture)

Appendix

LIS Components & Functions		
Outcome Statement	Results	
Describe LISs and the role they play in efficient lab operations and health care delivery.	Achieved	
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).	Achieved	
Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow.	Achieved	
Comply with positive patient identification processes/protocols.	Achieved	
Specialized LISs & Middleware		
Outcome Statement	Results	
Describe LISs and the role they play in the efficient lab operations and health care delivery.	Achieved	
Describe middleware, how it relates to the LIS, and roles for middleware in laboratory operations.	Achieved	
Understand capabilities and limitations of electronic interfaces between an LIS and instrumentation, middle ware, and other information systems.	Achieved	
Data & Communication Standards		
Outcome Statement	Results	
Define the key features of communication standards used in pathology, such as HL7.	Achieved	
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.	Achieved	
Recognize the advantages of standardized terminology for creating interchangeable data that can be retrieved and summarized.	Achieved	
Understand the basics of the standards development process.	Achieved	
Digital Imaging		
Outcome Statement	Results	
Determine the appropriate digital image resolution for a particular use.	Achieved	
Articulate potential roles, uses, and limitations of WSI in the laboratory environment.	Achieved	
Determine the appropriate telemicroscopy technology to use for a particular application.	Achieved	
Utilize digital imaging systems such as WSI, dynamic telemicroscopy, and image analysis (as appropriate to practice setting).	Achieved	
Basics of the Health Care Information Ecosystem		
Outcome Statement	Results	
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).	Achieved	
Continue to the next page for comments and signatures.		

Essentials 1

Essentials 2

Essentials 3

PIER Essentials 2 – Outcomes Achievement Checklist, cont'd

Comments and Observations Use the text box to add additional comments or observations regarding the resident's accomplishments for the topics in Essentials 2.

This resident has successfully achieved PIER Essentials 2 Outcomes/ACGME Informatics Milestone Level 2.

Evaluator's Signature:

Resident's Signature:

Date:

PIER ESSENTIALS 3 TOOLS



Essentials 3 Tools include:

- PIER Essentials 3 Map (pp. 45-46)
- PIER Essentials 3 Resource Options (pp. 47-54)
- PIER Essentials 3 Outcomes Achievement Checklist (pp. 55-56)

Essentials 3 Notes

DEFINITIONS FOR ACRONYMS used throughout the PIER Resources Toolkit can be found in <u>Appendix B</u>, <u>p.84</u> of this toolkit.

QUICK ACCESS LINKS to free online journal articles, presentations, and webpages have also been added to the Recommended Resources section of the PIER Resource Options Tool in each Essentials. The intent of this feature is to make it easier to access the materials. The Recommended Resource Options provide a quick link (eg, Journal, Course, Other, Periodical) for quick access to the content. Therefore, it is recommended that when assigning residents to these resources, you provide an electronic copy of the material rather than a paper copy.

DISCLAIMER: Links to external presentations, tools, and applicable journal articles were validated before the launch of PIER RELEASE 3.2 and are provided here for your convenience. However, owners of the sites where these items are stored can make changes. If you encounter a link that does not work, please report it to the PIER project lead, Sue Plath, at splath@cap.org.

NOTES:

- On rare occasions, some resources may have a minimal fee for access or need a special login to obtain the content. This information is noted in the first column of the Recommended Resource Options table. Resources that require special access or purchase can be found on page <u>11</u> of this document.
- Occasionally, you will find a resource repeated in an Essentials section as denoted in the first column of the Recommended Resource Options table. The duplication of resources is intentional and allows for reinforcement of more complex topics. During planning and scheduling, program directors may need to review the resources to determine whether the resident should complete all or specific resources.

Essentials 3 – Map

Estimated Time: 10-12 hours

Topic Title	Pathologist Role in LIS & EHR Projects	LIS Installation & Configuration	Information Systems & Laboratory Performance	Data Security, Regulatory, & Accreditation Requirements
Rationale	Pathologist expertise and contributions are critical for successful LIS and EHR projects.	Pathologist's best understand what LIS features will support and optimize their practice.	Pathologists rely on information to monitor and improve the overall performance of the laboratory.	Laboratories must be compliant with existing and emerging regulations.
PIER Outcomes	Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the laboratory. Describe the difference between IT and informatics. 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).	Provide input to the LIS selection team to ensure that an optimal fit between a purchased system and departmental needs is attained. Work with information systems personnel to ensure that reports are properly formatted (eg, synoptic format and other standardized formats as appropriate). Recognize limitations and information gaps resulting from the limitations of the data analysis capability of the LIS. Understand the process and requirements for test definition and other information maintenance in the LIS.	Describe LISs and the role they play in efficient lab operations and health care delivery. Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow. Identify opportunities to modify the LIS to improve operations.	Maintain compliance with electronic information management requirements of regulatory and/or accreditation agencies. Recognize situations under which information technology may be subject to FDA regulation (eg, blood banking and WSI). Interpret regulations to determine how they affect laboratory information management needs and the role of the lab within the health care system. Adhere to HIPAA and other security and privacy requirements for the communication and storage of patient data.
Content	 Informatics project life cycle Managing people, processes, and technology Leadership versus supporting roles in informatics projects 	 LIS feature selection LIS testing LIS training System configuration (eg, test creation and maintenance, dictionaries maintenance) 	 Test utilization in the laboratory Operational rules (eg, autoverification) Workflow management (eg, tracking) Error tracking and reduction Quality metrics and monitoring (eg, TAT) 	 Laboratory compliance with informatics regulations Informatics in laboratory inspections (eg, CAP checklists) Meaningful use and HITECH Act Information sources for emerging and evolving regulations Privacy and confidentiality of patient data (eg, HIPAA, HITECH Act) Accreditation and regulatory standards (eg, AABB, CAP, FDA, HHS, TJC)

Table of Contents Re

Resource Library Es

Essentials 1 Es

Essentials 2 Essentials 3

Essentials 4

© 2018 APC/API/CAP. All rights reserved.

Essentials 3 – Map, cont'd

Table of Contents

Resource Library

Essentials 1

Topic Title	Pathologist Role in LIS & EHR Projects	LIS Installation & Configuration	Information Systems & Laboratory Performance	Data Security, Regulatory & Accreditation Requirements
Start Date				
Rotation (Click and select a rotation)				
Additional Rotations &Comments				
Implementation Preferences (Select all that apply)	Program Lecture PIER Resource Options Outside Resources			
Comments:	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor
Other Implementation Preferences (Identify your own existing materials)				
Check Progress by:				
E3 Wrap-up Date (Expected PIER Essentials 3 Outcomes Achievement Checklist completion date.				

Essentials 2

Essentials 3

Essentials 4

Appendix

Essentials 3 – PIER Resource Options, Topic 1

Topic 1:	Pathologist Role in LIS & EHR Projects			
Rationale	Pathologist expertise and contributions are critical for successful LIS and EHR projects.			
PIER Outcomes	Explain the role and responsibility of pathologists with regard to selection, oversight, and use of informatics systems in the laboratory.			
	Describe the difference between IT and informatics.			
	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).			
Content	 Informatics project life cycle Managing people, processes, and technology Leadership versus supporting roles in informatics projects 			

Recommended	Resources (Check options for residents to complete)
Book	Harrison J. Management of pathology information systems. In: Wagar EA, Horowitz RE, Siegal GP, eds. <i>Laboratory Administration for Pathologists</i> . Northfield, IL: College of American Pathologists; 2011.
	 Pages 98-100. System interfaces and HL7. Pages 104-6. Application management. Pages 107-9. System evaluation, selection, and installation.
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory and Practice</i> . Chicago, IL: ASCP; 2012.
	 Pages 1-2, 4-5. Carter AB, McKnight RM, Henricks WH, Moore GW, Saltz JH. Informatics terminology. Page 187-90, 203-6. Perkocha L, Pantanowitz L. Leadership, management & project management skills for the informaticists.
Book	Sinard JH, ed. <i>Practical Pathology Informatics</i> . New York, NY: Springer Science + Business Media, Inc.; 2006.
	Pages 207-31. Sinard JH. Evaluating anatomic pathology information systems.
<u>Journal</u>	Henricks WH, Wilerson ML, Castellani WJ, Sinard JH. Pathologists as stewards of laboratory information. <i>Arch Pathol Med.</i> Mar;139(3):332-7.
<u>Journal</u>	Henricks WH, Wilerson ML, Castellani WJ, Sinard JH. Pathologists' place in the electronic health record landscape. <i>Arch Pathol Med</i> . 2015 Mar;139(3):307-10.

Practical Exercises (Check options for residents to complete)

If there is a pathologist (or clinical laboratory scientist or other laboratory administrative staff person) who has involvement or responsibility for LISs, have the resident schedule a meeting to discuss roles, experience, and expectations of this person in LIS and EHR projects.

If there is a regular meeting of a group responsible for LIS oversight, have the resident attend one or more meetings.

Have the resident carry out a small systems analysis project in which he or she writes a two or three page evaluation that: 1) identifies a current problem in LIS or EHR management of laboratory data, 2) proposes a possible solution and defines its benefits, 3) identifies barriers to implementing the solution, and 4) evaluates the relative value of the solution accounting for the benefits versus barriers.

Have the resident draw a simple (high-level) diagram of the other information systems with which the LIS exchanges data.

47

Comments and Observations	
Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Date topic completed:
Descurses for Advanced Learning (Ontional)	

Resources for Advanced Learning (Optional)

Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory and Practice</i> . Chicago, IL: ASCP; 2012.
	Pages 135-47. Balis UGJ. Information systems interfaces and interoperability.
Book	Wilcox AB, Narus SP, Vawdrey DK. Software engineering for health care and biomedicine. In: Shortliffe EH, Cimino JJ, eds. <i>Biomedical Informatics: Computer Applications in Health Care and Biomedicine</i> . 4th ed. London: Springer-Verlag; 2014.
Other Login or fees may	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.
apply	Pages 6-14. Section 1: Clinical informatics – the basics
<u>Website</u>	Project management. Wikipedia The Free Encyclopedia website.
<u>Website</u>	Systems development lifecycle. Wikipedia The Free Encyclopedia website.

Essentials 3 – PIER Resource Options, Topic 2

LIS Installation & Configuration			
Pathologist's best understand what LIS features will support and optimize their practice.			
Provide input to the LIS selection team to ensure that an optimal fit between a purchased system and departmental needs is attained.			
Work with information systems personnel to ensure that reports are properly formatted (eg, synoptic format and other standardized formats as appropriate).			
Recognize limitations and information gaps resulting from the limitations of the data analysis capability of the LIS.			
Understand the process and requirements for test definition and other information maintenance in the LIS.			
 LIS feature selection LIS testing LIS training System configuration (eq. test creation and maintenance, dictionaries maintenance) 			

Recommended	Resources (Check options for residents to complete)
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i> . Chicago, IL: ASCP Press; 2012.
	Pages 87-91. Henricks WH. Core LIS elements.
	Pages 113-4. Weiner H, Winsten D. Implementation planning (step 11).
	 Pages 122-9. Golightly C, Tuthill JM. LIS Validation. Pages 207-14 Parwani AV Tuthill JM Pantanowitz L. Reporting and transcription
Othor	
Login or fees may	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.
арру	 Pages 109-18. Section 4.1 Selecting and purchasing process.
	Pages 119-29. Sinard J. Laboratory information system (LIS) selection process.
	Pages 130-7. Carter AB. Purchasing contracts.
	Pages 137-47. Dash R. Are you considering a new LIS?
	Pages 150-7. 4.2 Installation process and vendor collaboration.
	Pages 158-88. 4.3 Validation and documentation considerations.
	• Pages 189-97. Routbort M. Why would I want to validate a clinical sequencing assay and how would I do it?
	 Pages 198-9. Section 5 Integration and management of information.
	Pages 199-215. 5.1 Interfaces and middleware.
	Pages 216-8. 5.2 Managing the text compendium.
	Pages 219-21. 5.3 Managing test patients.
	Pages 221-6. 5.4 Clinical decision rules.

Practical Exercises (Check options for residents to complete)

During the course of one or more rotations, have residents:

Review pathology reports and identify all required elements.

Compare pathology reports in the APLIS with those in the EMR and identify differences and/or problematic features.

Essentials 3 – PIER Resource Options, Topic 2, cont'd

Practical Exercises (Check options for residents to complete)

Provide access to selected documentation from the most recent LIS upgrade (eg, testing plans, validation documentation, and training records) for the resident to review. Include project management methodology documentation (eg, Gantt chart) if available. Have the resident estimate the upgrade staffing requirements for the components of the project including FTE and types of staff required (eg, LIS staff, lab technologist, and supervisor). Compare and discuss the resident estimates versus the actual requirements.

Observe the process for creating or updating a test definition in the LIS.

Observe the process for creating or updating a specimen type (part type) in the LIS.

Comments and Observations Use this field to enter additional information, resources, and record notes related to the topic progress or resident's questions. Date topic completed:

Resources for Advanced Learning (Optional)

Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory and Practice</i> . Chicago, IL: ASCP Press; 2012.
	 Pages 157-76. Parwani AV, Tuthill JM, Balis U, Carter A, Monzon F, Pantanowitz L. Information systems for specialized laboratories.
<u>Journal</u>	Goldsmith JD, Siegal GP, Suster S, Wheeler TM, Brown RW. Reporting guidelines for clinical laboratory reports in surgical pathology. <i>Arch Pathol Lab Med</i> . October 2008;132(10):1608-16.
<u>Journal</u>	Kudler NR, Pantanowitz L. Overview of laboratory data tools available in a single electronic medical record. <i>J Pathol Inform</i> . 2010;1:3.
<u>Journal</u>	Sepulveda JL, Young DS. The ideal laboratory information system. <i>Arch Pathol Lab Med</i> . August 2013;137(8):1129-40.
<u>Journal</u>	Valenstein PN. Formatting pathology reports: applying four design principles to improve communication and patient safety. Arch Pathol Lab Med. January 2008;132(1):84-94.
<u>Journal</u>	Sinard JH, Castellani WJ, Wilerson ML, Hendricks WH. Stand-along laboratory information systems versus laboratory modules incorporated in the electronic health record. <i>Arch Pathol Lab Med.</i> 2015 Mar;139(3):311-8.
Other	Local SOP for Change Management in the LIS.
<u>Website</u>	Cancer protocols. College of American Pathologists webpage.

Essentiais 3 – I	PIER Resource Options, Topic 3		
Topic 3:	Information Systems & Laboratory Performance		
Rationale	Pathologists rely on information to monitor and improve the overall performance of the laboratory.		
PIER Outcomes	Describe LISs and the role they play in efficient lab operations and health care delivery. Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow. Identify opportunities to modify the LIS to improve operations.		
Content	 Test utilization in the laboratory Operational rules (eg, autoverification) Workflow management (eg, tracking) Error tracking and reduction 		

ocontialo 2 DIED Decourse Ontione Tonie 2

Quality metrics and monitoring (eg, TAT) 5.

Recomm	ended Resources (Check options for residents to complete)
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics Theory and Practice</i> . Chicago, IL: ASCP Press; 2012.
	 Pages 305-18. D'Angelo R, Zarbo RJ. Error reduction and quality management.
Book	Sinard JH, ed. Practical Pathology Informatics. New York, NY: Springer; 2006.
	 Pages 207-31. Sinard JH. Evaluating anatomic pathology information systems.
<u>Journa</u>	Baird G. The laboratory test utilization management toolbox. <i>Biochem Med (Zagreb).</i> 2014;24(2):223-34.
<u>Journa</u>	Epner PL, Gans JE, Graber ML. When diagnostic testing leads to harm: a new outcomes- based approach for laboratory medicine. <i>BMJ Qual Saf</i> . 2013;22:ii6-ii10.
<mark>Journa</mark> Login or f may appl	Jones JB. A strategic informatics approach to autoverification. <i>Clin Lab Med</i> . 2013 Mar;33(1):161-81.
<u>Journa</u>	Krasowski MD, Chudzik D, Dolezal A, et al. Promoting improved utilization of laboratory testing through changes in an electronic medical record: experience at an academic medical center. BMC Med Inform Decis Mak. 2015 Feb22;15:11.
<u>Other</u>	International Society for Blood Transfustion (ISBT). ISBT 128 standard: technical specification. Version 5.9.0. Published March 2018.
Period	Aller RD. Tightening the reins on positive patient ID. CAP Today. 2012 Jul;26(7):9.

Practical Exercises (Check options for residents to complete)

On one or more applicable rotations, the resident should:

Review autoverification practices and criteria for at least one laboratory test; can include review of testing/validation records for the autoverification rules for the test(s).

Determine whether autoverification rules for a given test reside in the LIS or in middleware.

Review with the laboratory director the process, rationale, and/or philosophy for how autoverification rules and practices are established in the laboratory.

Review TAT reports/statistics, learn from where they are derived, and identify TAT trouble areas.

Attend QM (or analogous) team meetings and recognize data requirements and sources for the metrics discussed/followed in the laboratories QA plan.

Essentials 3 – PIER Resource Options, Topic 3, cont'd

Practical Exercises (Check options for residents to complete)

On one or more applicable rotations, the resident should:

Access the specimen tracking function in the LIS to identify steps in tracking and/or to locate a specimen's current location (AP and CP).

Attend laboratory operational meetings and recognize LIS/information management issues that arise.

Access the histology function in APLIS to determine who prepared the slides for a given case.

Determine duplicate checking rules for a given clinical pathology LIS and/or EHR to which the clinical pathology LIS interfaces.

Review with the laboratory director the process, rationale and/or philosophy for how duplicate checking rules are established for the institution.

Observe process for review and release of test results that have failed autoverification criteria.

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.

Date topic completed:

Resources for Advanced Learning (Optional) Krasowski MD, Davis SR, Drees D, et al. Autoverification in a core clinical chemistry laboratory at Journal an academic medical center. J Pathol Inform. 2014 Mar 28:5:13. Pantanowitz L, Mackinnon AC Jr, Sinard JH. Tracking in anatomic pathology. Arch Pathol Lab Journal Med. 2013 Dec;137(12):1798-810. Journal Prichard JW, Strevig G, Brown AM, Wilkerson ML. Informatics tools for guality in anatomic Login or fees may pathology. Clin Lab Med. 2008 Jun;28(2):207-22. apply Journal Westgard JO. Perspectives on quality control, risk management, and analytical quality Login or fees may management. Clin Lab Med. 2013 Mar;33(1):1-14. apply Other de Baca ME, Spinosa JC, eds. Clinical Informatics Resource Guide. Northfield, IL: College of American Pathologists; 2018. Login or fees may apply Pages 221-6. 5.4.1 What clinical decision rules can the lab develop? Pages 240-2. 6.1.4 What are the regulatory requirements to implement autoverification? Pages 36-42. Pantanowitz L. What do I need to know when deciding to use 2D barcodes or a radio-frequency identification (RFID) system in my laboratory? Pages 43-48. Reichard RR. Everything you always wanted to know about RFID* (*but were afraid to ask). Other Local QM Plan.

Essentials 3 – PIER Resource Options, Topic 4

Topic 4:	Data Security, Regulatory, & Accreditation Requirements		
Rationale	Laboratories must be compliant with existing and emerging regulations.		
PIER Outcomes	Coutcomes Maintain compliance with electronic information management requirements of regulatory and/or accreditation agencies.		
	Recognize situations under which information technology may be subject to FDA regulation (eg, blood banking and WSI).		
	Interpret regulations to determine how they affect laboratory information management needs and the role of the lab within the health care system.		
	Adhere to HIPAA and other security and privacy requirements for the communication and storage of patient data.		
Content	1. Laboratory compliance with informatics regulations		
	2. Informatics in laboratory inspections (eg, CAP checklists)		
	3. Meaningful use and the HITECH Act		
	4. Information sources for emerging and evolving regulations		
	5. Privacy and confidentiality of patient data (HIPAA, HITECH, etc)		
	6 Accreditation and Regulatory standards (AARR CAR EDA TIC HHS etc)		

6. Accreditation and Regulatory standards (AABB, CAP, FDA, TJC, HHS, etc)

Recom	mended	Resources (Check options for residents to complete)
Boo	ok	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i> . Chicago, IL: American Society for Clinical Pathology Press; 2012.
		Pages 117-33. Golightly C, Tuthill JM. Laboratory information system operations.
Boo Logir	ok n or fees	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.
may	apply	Pages 24-6. 2.2 VPNs and authentications.
<u>Jou</u>	<u>irnal</u>	Cucoranu IC, Parwani AV, West AJ, et al. Privacy and security of patient data in the pathology laboratory. <i>J Pathol Inform.</i> 2013 Mar 14;4:4.
Oth	er	Centers for Medicare & Medicaid Services, Department of Health and Human Services. Laboratory Requirements. Clinical Laboratory Improvement Amendments.
		 <u>Standard: test request. 42 CFR §493.1241</u>. <u>Standard: test report 42 CFR §493.1291. 2010</u>.
<u>Oth</u>	<u>er</u>	US Department of Health and Human Services Office for Civil Rights. HIPAA administrative simplification regulation text.
		• Pages 10-7 (§160.101).
		 Pages 20-1 (§160.306-160.310).
		 Pages 23-5 (\$160.402-160.408). Pages 62-73 (Subpart C \$164.302)
		 Pages 110-1 (§164.528).
<u>We</u>	<u>bsite</u>	HIPAA for professionals. HHS.gov Health Information Privacy website.
<u>We</u>	<u>bsite</u>	The Office of the National Coordinator for Health Information Technology. Health IT.gov website.

Appendix

Essentials 3 – PIER Resource Options, Topic 4, cont'd

Practical Exercises (Check options for residents to complete)

Have the resident perform a mock CAP inspection with attention to aspects of the Laboratory General Checklist related to laboratory information management.

Have the resident review laboratory procedures and documentation applicable to meeting requirements for testing/validation of an interface between the LIS and EHR.

The resident can arrange an appointment with an institutional compliance officer and review how the officer complies with requests for lists of disclosures of protected health information that come from patients. The resident should ask for details regarding potentially unauthorized disclosures of laboratory data and how this would be investigated.

The resident chooses a patient and determines how the laboratory would perform an audit of disclosures of that patient's protected health information from specimen receipt to performing the test on laboratory instruments to reporting the results in the LIS. Have the resident assess for any gaps in auditing and report them to the medical director.

Have the resident assess whether genetic data as defined under the Genetic Information Discrimination Act is being housed in the "cloud". The resident can perform a risk assessment of the security of genetic data in that location.

Comments and Observations

Table of

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.

Date topic completed:

Resources	for Advanced Learning (Optional)
Book Login or fees	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.
may apply	Pages 231-5. 6.1 What are the CLIA and LAP Accreditation Requirements?
Book	Sinard JH, ed. Practical Pathology Informatics. New York, NY: Springer; 2006.
	Pages 303-24. Sinard JH. External regulations pertinent to LIS management.
<u>Journal</u>	Bradford W, Hurdle JF, LaSalle B, Facelli JC. Development of a HIPAA-compliant environment for translational research data and analytics. <i>J Am Med Inform Assoc.</i> 2014 Jan;21(1):185-9.
<u>Journal</u>	Henricks WH. "Meaningful use" of electronic health records and its relevance to laboratories and pathologists. <i>J Pathol Inform.</i> 2011;2:7.
Journal Login or fees may apply	Munk C. ISBT guidelines for information security in transfusion medicine. <i>Vox Sanguinis.</i> 2006;91(Suppl 1):S1-23.
Other Login or fees may apply	College of American Pathologists Accreditation Program. <i>Laboratory General Checklist: Hardware and Software</i> . Northfield, IL: College of American Pathologists; August 21, 2017.
Other Login or fees may apply	College of American Pathologists Accreditation Program. <i>Laboratory General Checklist: System Security</i> . Northfield, IL: College of American Pathologists; August 21, 2017.
<u>Other</u>	Office of Civil Rights. HIPAA privacy: Standards for privacy of individually identifiable health information 45 CFR parts 160 and 164. Reviewed November 5, 2015.
<u>Other</u>	Scholl M, Stine K, Has J, et al. An introductory resource guide for implementing the health insurance portability and accountability act (HIPAA) security rule. National Institute of Standards and Technology (NIST), US Department of Commerce. Published October 2008.
<u>Website</u>	Department of Health & Human Services. 45 CFR Parts 160, 162, and 164 Health insurance reform: security standards; final rule. <i>Federal Register</i> . February 20, 2003;68(34):8334-80.

CUITERIS RESOURCE LINEARY ESSENTIALS ESSENTIALS ESSENTIALS	Contents	Resource Library	Essentials 1	Essentials 2	Essentials
--	----------	------------------	--------------	--------------	------------



PIER Essentials 3 – Outcomes Achievement Checklist 55

Pathologist Role in LIS & EHR Projects	
Outcome Statement	Results
Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the function of the modern pathology laboratory.	Achieved
Describe the difference between IT and informatics.	Achieved
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).	Achieved
LIS Installation & Configuration	
Outcome Statement	Results
Provide input to the LIS selection team to ensure that an optimal fit between a purchased system and departmental needs is attained.	Achieved
Work with information systems personnel to ensure that reports are properly formatted (eg, synoptic format and other standardized formats as appropriate).	Achieved
Recognize limitations and information gaps resulting from the limitations of the data analysis capability of the LIS.	Achieved
Understand the process and requirements for test definition and other information maintenance in the LIS.	Achieved
Information Systems & Laboratory Performance	
Outcome Statement	Results
Describe LISs and the role they play in efficient lab operations and health care delivery.	Achieved
Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow.	Achieved
Identify opportunities to modify the LIS to improve operations.	Achieved
Data Security, Regulatory, & Accreditation Requirements	
Outcome Statement	Results
Maintain compliance with electronic information management requirements of regulatory and/or accreditation agencies.	Achieved
Recognize situations under which information technology may be subject to FDA regulation (eg,	Achieved

Interpret regulations to determine how they affect laboratory information management needs and the role of the lab within the health care system.

Adhere to HIPAA and other security and privacy requirements for the communication and storage of patient data. Achieved

Continue to the next page for comments and signatures.

blood banking and WSI).

 Table of Contents
 Resource Library
 Essentials 1
 Essentials 2

PIER Essentials 3 – Outcomes Achievement Checklist, cont'd

Comments and Observations Use this area to add additional comments or observations regarding the resident's accomplishments for the topics in Essentials 3.

This resident has successfully achieved the PIER Essentials 3 Outcomes/ACGME Informatics Milestone Level 3.

Evaluator's Signature:

Date:

Appendix

Resident's Signature:

PIER ESSENTIALS 4 TOOLS



Essentials 4 Tools include:

- PIER Essentials 4 Map (pp. 59-60)
- PIER Essentials 4 Resource Options (pp. 61-69)
- PIER Essentials 4 Outcomes Achievement Checklist (pp. 70-71)

57

Essentials 4 Notes

58

DEFINITIONS FOR ACRONYMS used throughout the PIER Resources Toolkit can be found in <u>Appendix B</u>, <u>p. 84</u> of this toolkit.

QUICK ACCESS LINKS to free online journal articles, presentations, and webpages have also been added to the Recommended Resources section of the PIER Resource Options Tool in each Essentials. The intent of this feature is to make it easier to access the materials. The Recommended Resource Options provide a quick link (eg, Journal, Course, Other, Periodical) for quick access to the content. Therefore, it is recommended that when assigning residents to these resources, you provide an electronic copy of the material rather than a paper copy.

DISCLAIMER: Links to external presentations, tools, and applicable journal articles were validated before the launch of PIER RELEASE 3.2 and are provided here for your convenience. However, owners of the sites where these items are stored can make changes. If you encounter a link that does not work, please report it to the PIER project lead, Sue Plath, at <u>splath@cap.org</u>.

NOTES:

- On rare occasions, some resources may have a minimal fee for access or need a special login to obtain the content. This information is noted in the first column of the Recommended Resource Options table. Resources that require special access or purchase can be found on page <u>11</u> of this document.
- Occasionally, you will find a resource repeated in an Essentials section as denoted in the first column of the Recommended Resource Options table. The duplication of resources is intentional and allows for reinforcement of more complex topics. During planning and scheduling, program directors may need to review the resources to determine whether the resident should complete all or specific resources.

Essentials 4 – Map

Estimated Time: 10-12 hours

Topic Title	LIS Management & Oversight	Order & Results Management	Laboratory Data for Quality Improvement & Research	Laboratory Data & Enterprise Health Care Analytics
Rationale	Pathologists share in the responsibility for information management in the laboratory.	Pathologists need to oversee the identification and resolution of problems related to lab orders and test results.	Pathology information is used for research efforts and enterprise quality improvement.	Integrating pathology data into the health care enterprise is necessary for high quality patient care.
PIER Outcomes	Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the laboratory. Supervise the LIS team in the creation and updating of the LIS procedure manual. Identify opportunities to modify the LIS to improve operations. Contribute to analysis and interpretation of integrated pathology and enterprise data sets for improving care, quality, and increasing the efficiency of care delivery.	Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test orders. Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test results.	Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery. Contribute to the definition and creation of integrated health care data sets from multiple disparate sources in order to support useful, accurate, and reliable data analysis.	Recognize applications of ancillary information systems to optimize clinical, operational, and financial performance of the laboratory (eg, middleware, financial systems, business intelligence). Understand the special difficulties of information flow to and from the local information ecosystem (eg, for outreach programs) and strategies for overcoming the obstacles. Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.
Content	 LIS/IT staffing structure LIS support model (eg, internal – departmental versus institutional) Vendor relationship Change management process (eg, upgrades) Procedures and policies End user support and communication 	 Decision support Order entry process & troubleshooting Laboratory results/reports and troubleshooting (eg, test result display, result integrity) QM & patient safety related to orders/results 	 Regulations for secondary use of clinical data Data warehousing Data integration Advanced analytics (data mining and predictive modeling) Research informatics 	 Business intelligence Population statistics Test utilization by providers Pathology's place in ACOs Clinical and financial value of laboratory testing

Essentials 3

© 2018 APC/API/CAP. All rights reserved.

Essentials 4 - Map, cont'd

Topic Title	LIS Management & Oversight	Order & Results Management	Laboratory Data for Quality Improvement & Research	Laboratory Data & Enterprise Health Care Analytics
Start Date				
Rotation (Click and select a rotation)				
Additional Rotations & Comments				
Implementation		Drogrom Losturo		Drogrom Losturo
Preferences (Select all that apply)	Plier Resource Options	PIER Resource Options	Pler Resource Options	Pler Resource Options
	Outside Resources	Outside Resources	Outside Resources	Outside Resources
	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor	Mentor/ Preceptor
Comments:				
Othor				
Implementation				
(Identify your own				
existing materials)				
Check Progress by:				
E4 Wrap-up Date Outcomes Achievem	(Expected PIER Essentials 4 ent Checklist completion date)			

Essentials 2 Essentials 3

Essentials 4 – PIER Resource Options, Topic 1

Topic 1:	LIS Management & Oversight
Rationale	Pathologists share in the responsibility for information management in the laboratory.
PIER Outcomes	Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the laboratory.
	Supervise the LIS team in the creation and updating of the LIS procedure manual.
	Identify opportunities to modify the LIS to improve operations.
	Contribute to analysis and interpretation of integrated pathology and enterprise data sets for improving care, quality, and increasing the efficiency of care delivery.
Content	 LIS/IT staffing structure LIS support model (eg, internal – departmental versus institutional) Vendor relationship Change management process (eg, upgrades) Procedures and policies End user support and communication

Recommended H	Resources (Check options for residents to complete)
Book	Glaser JP, Salzberg C, eds. The Strategic Application of Information Technology in Health Care Organizations. 3rd ed. San Francisco, CA: Jossey-Bass; 2011.
	 Pages 1-15. An overview of strategy. Pages 21-46. Linkage of IT strategy to organizational strategy. Pages 47-81. The information technology asset characteristics. Page 109. Strategy considerations and conclusions.
Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i> . Chicago, IL: ASCP Press; 2012.
	• Pages 117-33. Golightly C, Tuthill JM. Laboratory information systems operations.
<u>Course</u>	Brassel JH. Interfaces and middleware: laboratory information system (LIS) connectivity options that can improve and streamline laboratory operations. College of American Pathologists; 2012. Updated 2018.
<u>Journal</u>	Friedman BA, Mitchell W. An analysis of the relationship between a pathology department and its laboratory information system vendor. <i>Am J Clin Pathol</i> . 1992;97(3):363-8.
Journal Login or fees may apply	Kaplan JK, Rao LK. Selection and implementation of new information systems. <i>Surg Pathol Clin.</i> 2015;8(2):239-53.
<u>Journal</u>	Sinard JH, Castellani WJ, Wilkerson ML, Henricks WH. Stand-alone laboratory information systems versus laboratory modules incorporated in the electronic health record. <i>Arch Pathol Lab Med.</i> 2015 Mar;139(3):311-8.
Other Login or fees may	de Baca ME, Spinosa JC, eds. <i>Clinical Informatics Resource Guide</i> . Northfield, IL: College of American Pathologists; 2018.
apply	 Pages 109-13. 4.1 Selection and purchasing process. Pages 119-29. Sinard J. Information system (LIS) selection process. Pages 130-6. Carter AB. What needs to be in the purchasing contract for a new laboratory information system or middleware? Pages 348-9: 10.4 CAP LAP: accreditation.
<u>Other</u>	Jansen W, Grance T. <i>Guidelines on Security and Privacy in Public Cloud Computing.</i> Gaithersburg, MD: National Institute of Standards and Technology; 2011. Special publication 800-144.

Essentials 4 – PIER Resource Options, Topic 1, cont'd

Recommended Resources Cont'd (Check options for residents to complete)

<u>Website</u> Spiltz AR, Balis UJ, Friedman BA, Tuthill JM. Using the LIS toolkit: a methodology for assessing functionality and enabling comparisons among competing systems (white paper). Association for Pathology Informatics website. 2013.

Practical Exercises (Check options for residents to complete)

The exercises for this topic may be best accomplished as part of the resident's management experience or rotation.

Have the resident review a LIS RFP and vendor response, if available.

- Identify important information to provide the vendor.
- Identify portions most important for pathologist input.
- Understand who created the RFP.

Have the resident review an LIS vendor contract if available. Identify key elements such as:

- Licensing model (eg, per seat)
- Pricing
- Vendor support agreement (eg, 24/7, phone, email)

Provide resident access to documentation for a recent LIS upgrade in your laboratory. This may include vendor-provided information about the upgrade, testing documentation, training documentation (overlaps with an exercise for Essentials 3, Topic 1 and Essentials 3, Topic 2). Resident should review with emphasis on communication planning and role of the vendor.

Have the resident review different job descriptions for pathology IT personnel.

Resident should be able to identify and contact the individual who is designated for notification of unexpected LIS downtime. Resident should be able to describe how the laboratory director learns of LIS system problems and under what circumstances (ie, what is the escalation process).

Have the resident name the vendor(s) of the following systems in use: LIS(s), EHR, laboratory web portal, and any major middleware information handling systems, including point of care testing data management. For LIS(s), have residents determine the version name/numbers that the laboratory is using.

Have the resident review the IT related policies, check against LAP Checklist items, verify compliance and/or list problem areas.

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions.	Date topic completed:

Table of Contents Resou

Resource Library Essentials 1

Essentials 2

Essentials 3

Essentials 4

© 2018 APC/API/CAP. All rights reserved.

Resources for Advanced Learning (Optional) Wagar EA, Horowitz RE, Siegal GP, eds. Laboratory Administration for Pathologists. Northfield, Book IL: Cap Press; 2011. Pages 7-118. Harrison J. Management of pathology information systems. **Book** Heerken GR. Project Management. New York, NY: McGraw-Hill; 2002. Online Everson J. The implications and impact of 3 approaches to health information exchange: Journal community, enterprise, and vendor-mediated health information exchange. Learning Health Systems. 2017 Jan 6;1(2). Other Documentation from recent LIS upgrade. Other Job descriptions for LIS support staff. Other List of LIS vendors in use in local laboratory. Other Local SOPs/LIS procedure manual. Other RFP for LIS in use and/or LIS vendor contract (if available).

Essentials 4 - PIER Resource Options, Topic 1, cont'd

Table of Contents Resource Library Essentials 1

Essentials 2

© 2018 APC/API/CAP. All rights reserved.

Essentials 4 – PIER Resource Options, Topic 2

Topic 2: Order & Results Management		
Rationale	Pathologists need to oversee the identification and resolution of problems related to lab orders and test results.	
PIER Outcomes	Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test orders.	
	Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test results.	
Content	 Decision support Order entry process and troubleshooting. Laboratory results/reports and troubleshooting (eg, test result display, result integrity) QM and patient safety related to orders/results 	

Reco	Recommended Resources (Check options for residents to complete)		
	Course CAP login required	Beckwith B, Gumpeni P, Rainer RD. Medical coding basics. College of American Pathologists; 2018.	
	Course CAP login required and fees apply	Hendricks W. Working with electronic health records: practical insights for pathologists. College of American Pathologists; 2016.	
	<u>Journal</u>	Baron JM, Dighe AS. Computerized provider order entry in the clinical laboratory. <i>J Pathol Inform</i> . 2011;2:35.	
	<u>Journal</u>	Castellani WJ, Sinard JH, Wilkerson ML, Whitsitt MS, Henricks WH. Accreditation and regulatory implications of electronic health records for laboratory reporting. <i>Arch Pathol Lab Med.</i> 2015;139(3):328-31.	
	<mark>Journal</mark> Login or fees may apply	Jackson BR. Laboratory formularies. Clin Chim Acta. 2014 Jan 1;427:151-3.	
	Other eBook free download	Balogh EP, Miller BT, Ball JR, eds. <i>Improving Diagnosis in Health Care</i> . The National Academies of Sciences, Engineering, Medicine. Washington, DC: The National Academies Press. 2015.	
	<u>Other</u>	Office of the National Coordinator for Health IT. Safety assurance factors for EHR resilience (SAFER) guide for test results reporting and follow-up. March 15, 2017.	

Practical Exercises (Check options for residents to complete)

Learning Outcomes: Through these exercises, residents will be introduced to quality management and patient safety issues related to clinical order entry, result display and integration of laboratory results into clinical practice.

During a rotation, have the resident observe any clinician order a laboratory test and see how they look up and use AP and CP laboratory results in the EHR when rounding (time estimate one hour).

During rotations, have a resident review at least one problem case that arises in which there is evidence that a laboratory order in CPOE was incorrect or incomplete (time estimate one hour).

During rotations, have a resident review at least one problem case that arises in which there is a problem with interpretation or availability of a laboratory result in the EHR (time estimate one hour).

As part of each rotation, have the resident compare the display of test results/reports in the LIS(s) to the display of the same result in the EHR. The relevance of any differences should be noted (time estimate one hour).

Essentials 4 – PIER Resource Options, Topic 2, cont'd

Practical Exercises (Check options for residents to complete)

Program recommendation: Create a file of documentation or examples about problems that arise in EHR display of results in your institution. Over time, this can become a teaching file for residents.

Program recommendation: Create a file of documentation about problems or examples that occur related to CPOE for laboratory tests in your institution. Over time, this can become a teaching file for residents.

Self-inspection exercise: Have the resident compare the CAP General Checklist requirements for laboratory reports with current format of both clinical and anatomic laboratory reports. Have them verify that the laboratory reporting format and content meets stated requirements.

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic	progress or	
resident's questions.		

Date topic completed:

Resources for Advanced Learning (Optional)

Book	Baron J. Informatics, analytics, and decision support in utilization management. In: Lewandrowski K, Sluss PM, eds. <i>Utilization Management in the Clinical Laboratory and other</i> <i>Ancillary Services</i> . Cham, Switzerland: Springer International Publishing; 2017:39-52.
<u>Journal</u>	Delvaux N, Van Thienen K, Heselmans A, et. al. The effects of computerized clinical decision support systems on laboratory testing ordering: a systematic review. <i>Arch Pathol Lab Med.</i> 2017 Apr;141(4):585-95.
Journal Login or fees may apply	Gascon F, Herrera I, Vazquez C, et al. Electronic health record: design and implementation of a lab test request module. <i>Int J Med Inform</i> . June 2013;82(6):514-21.
<u>Journal</u>	Passiment E, Meisel JL, Fontanesi J, Fritsma G, Aleryani S, Marques M. Decoding laboratory test names: a major challenge to appropriate patient care. <i>J Gen Intern Med.</i> 2013 Marh;28(3):453-8.
<u>Journal</u>	Zhi M, Din EL, Theisen-Toupal J, Whelan J, Arnaout R. The landscape of inappropriate laboratory testing: a 15-year meta-analysis. <i>PLOS One</i> . 2013 Nov 15;8(11):e78962.
<u>Other</u>	Centers for Medicare & Medicaid Services, Department of Health and Human Services. Laboratory requirements. Clinical Laboratory Improvement Amendments. Standard: test report 42 CFR §493.1291. 2010.

Essentials 2 Essentials 3

Essentials 4 – PIER Resource Options, Topic 3

Topic 3: Laboratory Data for Quality Improvement & Research		
Rationale	Pathology data is needed for research efforts and enterprise quality improvement.	
PIER Outcomes	Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.	
	Contribute to the definition and creation of integrated health care data sets from multiple disparate sources in order to support useful, accurate, and reliable data analysis.	
Content	1. Regulations for secondary use of clinical data	
	2. Data warehousing	
	3. Data integration	
	4. Advanced analytics (data mining and predictive modeling)	
	5. Research informatics	

Recommended Resources (Check options for residents to complete)

Book	Pantanowitz L, Tuthill JM, Balis UGJ, eds. <i>Pathology Informatics: Theory and Practice</i> . Chicago, IL: ASCP; 2012.
	 Pages 320-1. Dangott B, Pantanowitz L, Parwani A. Biomedical and research informatics.
<u>Journal</u>	Baron JM, Dighe AS, Arnaout R, et al. The 2013 symposium on pathology data integration and clinical decision support and the current state of field. <i>J Pathol Inform</i> . 2014 Jan 31;5:2.
<u>Journal</u>	Robb JA, Bry L, Sluss PM, Wagar EA, Kennedy MF, College of American Pathologists Diagnostic Intelligence and Health Information Technology Biorepository Working Group 2 (2015). A call to standardize preanalytic data elements for biospecimens, part II. <i>Arch Pathol Lab Med</i> . 2015;139(9):1125-8.
<u>Journal</u>	Williams CL, Bjugn R, Hassel LA. Current status of discrete data capture in synoptic surgical pathology and cancer reporting. <i>Pathol Lab Med Int</i> . 2015 Jun 9:7:11-22.

Practical Exercises (Check options for residents to complete)

Table of Contents

Resource Library

Have a resident perform a search in the LIS for a specific cohort of cases (ie, meeting certain criteria).

Have the resident use data mining techniques/business intelligence tools in the performance of a laboratory quality improvement project.

Have the resident use informatics in the performance laboratory quality improvement project.

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

Identify how to solve this case: performing biomarker testing on needle core biopsies of breast cancers may minimize the costs to the health care system by providing treatment-related information earlier in the process versus waiting for the excised specimen. However, repeat testing is often needed owing to inadequate material. Also testing may not be performed when it should be. How would one establish criteria for appropriate testing with contributions from available data sets?

Essentials 2

Essentials 3

Essentials 4

Appendix

Essentials 4 – PIER Resource Options, Topic 3, cont'd

Practical Exercises, CONt'd (Check options for residents to complete)

Have a resident perform a search that requires pathology and non-pathology data for a specific cohort of cases (ie, meeting certain criteria).

Assign one AP and one CP rotations to do a literature search of evidence-based medicine for cost analyses.

Assign a CP rotation to do an appropriateness of testing assignment for review by an attending.

Comments and Observations

Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions. Date topic completed:

Resources for Advanced Learning (Optional)

<u>Journal</u>	Abhyankar S, Demner-Fushman D, McDonald CJ. Standardizing clinical laboratory data for secondary use. <i>J Biomed Inform</i> . 2012 Aug;45(4):642-50.
<u>Journal</u>	Carter AB. Clinical requests for molecular tests: the 3-step evidence check. <i>Arch Pathol Lab Med.</i> 2012 Dec;136(12):1585-92.
<u>Journal</u>	Chelico JD, Wilcox AB, Vawdrey DK, Kuperman GJ. Designing a clinical data warehouse architecture to support quality improvement initiatives. <i>AMIA Annu Symp Proc. 2016</i> . 2016 Feb 10;381-90.
<u>Journal</u>	Dash RC, Robb JA, Booker DL, Foo WC, Witte DL, Bry L. Biospecimens and biorepositories for the community pathologist. <i>Arch Pathol Lab Med.</i> 2012 Jun;136(6):668-78.
<u>Journal</u>	Henricks WH, Wilkerson ML, Castellani WJ, Whitsitt MS, Sinard JH. Pathologists as stewards of laboratory information. <i>Arch Path Lab Med</i> . 2015 Mar;139(3):332-7.
<u>Journal</u>	Krasowski MD, Schriever A, Mathur G, Blau JL, Stauffer SL, Ford BA. Use of a data warehouse at an academic medical center for clinical pathology quality improvement, education, and research. <i>J Pathol Inform.</i> 2015 Jul 28;6:45.
Journal Login or fees may apply	Lyman JA, Scully K, Harrison JH. The development of health care data warehouses to support data mining. <i>Clin Lab Med</i> . 2008 Mar;28(1):55-71.
Journal Login or fees may apply	Stockwell DC, Kirkedall E, Muething SE, et al. Automated adverse event detection collaborative: electronic adverse event identification, classification, and corrective actions across academic pediatric institutions. <i>J Patient Safety</i> . 2013;9(4):203-10.
<u>Other</u>	Managing Data for Performance Improvement. US Department of Health and Human Services Health Resources and Services Administration.
<u>Website</u>	How to improve. Institute for Health care Improvement website.

Essentials 4 – PIER Resource Options, Topic 4

Topic 4:	Laboratory Data & Enterprise Health Care Analytics
Rationale	Integrating pathology data into the health care enterprise is necessary for high quality patient care.
PIER Outcomes	Recognize applications of ancillary information systems to optimize clinical, operational, and financial performance of the laboratory (eg, middleware, financial systems, business intelligence).
	Understand the special difficulties of information flow to and from the local information ecosystem (eg, for outreach programs) and strategies for overcoming the obstacles.
	Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.
Content	1. Business intelligence
	2. Population statistics
	3. Test utilization by providers
	4. Pathology's place in ACOs
	5. Clinical and financial value of laboratory testing

Recommended Resources (Check options for residents to complete)				
Book	 Benson T. <i>Principles of Health Interoperability; HL7 and SNOMED 2nd</i>. London, England: Springer-Verlag: 2012. Pages 21-31. Chapter 2: Why interoperability is hard. Pages 51-70. Chapter 4: UML and XML. Pages 83-98. Chapter 6: Standards development organizations. Pages 101-19. Chapter 7: HL7 & version 2.x. Pages 201-79. Part III SNOMED and terminology. 			
<mark>Journal</mark> Login or fees may apply	Baron JM, Dighe AS. The role of informatics and decision support in utilization management. <i>Clin Chem Acta</i> . 2014 Jan 1;427:196-201.			
<u>Other</u>	Gross DJ. White paper - contributions of pathologist in accountable care organizations: a case study. College of American Pathologists. May 2012.			

Practical Exercises (Check options for residents to complete)

If a health system data warehouse analytics group is available, a residency program could collaborate with them to express the sorts of analytics that are currently of interest at a site and how they are approaching that need in terms of personnel, skill sets, and toolkits.

Use informatics in a QA or test utilization project.

Provide the resident the opportunity to view business intelligence dashboards that are in use that have key performance indicators in use by the laboratory. The resident should be able to identify the source of data presented in this dashboard.

The resident should know which metrics the laboratory is expected to report for institution-level quality activities.

As part of a management rotation or experience, the resident should meet with the financial manager to review how billing for services is performed and what information systems and sources are used.

Appendix

Essentials 4 - PIER Resource Options, Topic 4, cont'd

Comments and Observations Use this area to enter additional information, resources, and record notes related to the topic progress or resident's questions. Date topic completed:

Resources for Advanced Learning (Optional)			
Book eBook	O'Reilly T, Loukides M, Steele J, Hill C. <i>How Data Science is Transforming Health Care</i> . Sebastopol, CA: O'Reilly Media, Inc; 2012.		
<u>Course</u>	Balis U. Introducing the world to "encoded data" for predictive laboratory medicine results. Presented at: Pathology Informatics 012 Annual Meeting; November 11-12; Scottsdale, AZ.		
<u>Journal</u>	Berman JJ. Pathology data integration with extensible markup language. <i>Hum Pathol</i> . February 2005;36(2):139-45.		
<u>Journal</u>	Fernandez Perez ER, Winters JL, Gajic O. The addition of decision support into computerized physician order entry reduces red blood cell transfusion resource utilization in the intensive care unit. <i>Am J Hematol.</i> 2007;82(7):631-3.		
<u>Journal</u>	Friedberg RC. Utility of alert-based CDSS in CPOE to improve compliance with plasma transfusion guidelines. <i>J Pathol Inform.</i> 2014;5:6.		
<u>Journal</u>	Fryer AA, Smellie WSA. Managing demand for laboratory tests: a laboratory toolkit. <i>J Clin Pathol.</i> 2013;66:62-72.		
<u>Journal</u>	Gainer VS, Cagan A, Castro VM, et. al. The Biobank Portal for Partners Personalized Medicine: a query tool for working with consented biobank samples, genotypes, and phenotypes using i2b2. <i>J Pers Med.</i> 2016 Feb 26;6(1).		
<u>Journal</u>	Georgiou A, Lang S, Rosenfeld D, Westbrook JI. The use of computerized provider order entry to improve the effectiveness and efficiency of coagulation testing. <i>Arch Pathol Lab Med.</i> 2011 Apr;135(4):495-8.		
<u>Journal</u>	Henricks WH, Wilkerson ML, Castellani WJ, Whitsitt MS, Sinard J. Pathologists' place in the electronic health record landscape. <i>Arch Path Lab Med</i> . 2015 Mar;139(3):307-10.		
<u>Journal</u>	Klann JG, Murphy SN. Computing health quality measures using informatics for integrating biology and bedside. <i>J Med Internet Res.</i> 2013 Apr 19;15(4):e75.		
<u>Journal</u>	Mandel JC, Kreda DA, Mandl KD, Kohane IS, Ramoni RB. SMART on FHIR: a standards-based, interoperable apps platform for electronic health records. <i>J Am Med Inform Assoc</i> . 2016 Sep;23(5):899-908.		
<u>Journal</u>	Procop GW, Yerian LM, Wyllie R, Harrison AM, Kottke-Marchant K. Duplicate laboratory test reduction using a clinical decision support tool. <i>Am J Clin Pathol.</i> 2014 May 14;141(5):718-23.		
<u>Journal</u>	Shirts BH, Jackson BR, Baird GS, et al. Clinical laboratory analytics: challenges and promise for an emerging discipline. <i>J Pathol Inform</i> . 2015 Feb 24;6:9.		
Local	Local Business Intelligence tool and dashboards in use (if available).		



PIER Essentials 4 – Outcomes Achievement Checklist ACGME Milestone 4 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)

Resident Name:

LIS Management & Oversight				
Outcome Statement	Results			
Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the laboratory.	Achieved			
Supervise the LIS team in the creation and updating of the LIS procedure manual.	Achieved			
Identify opportunities to modify the LIS to improve operations.	Achieved			
Contribute to analysis and interpretation of integrated pathology and enterprise data sets for improving care, quality, and increasing the efficiency of care delivery.	Achieved			
Order & Results Management				
Outcome Statement	Results			
Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test orders.	Achieved			
Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test results.	Achieved			
Laboratory Data for Quality Improvement & Research				
Outcome Statement	Results			
Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.	Achieved			
Contribute to the definition and creation of integrated health care data sets from multiple disparate sources in order to support useful, accurate, and reliable data analysis.	Achieved			
Laboratory Data & Enterprise Health Care Analytics				
Outcome Statement	Results			
Recognize applications of ancillary information systems to optimize clinical, operational, and financial performance of the laboratory (eg, middleware, financial systems, business intelligence).	Achieved			
Understand the special difficulties of information flow to and from the local information ecosystem (eg, for outreach programs) and strategies for overcoming the obstacles.	Achieved			
Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.	Achieved			

Continue to the next page for comments and signatures.

Table of Contents Resource Library

Essentials 1

Essentials 2 Essentials 3

PIER Essentials 4 – Outcomes Achievement Checklist, cont'd

Comments and Observations Use this area to add additional comments or observations regarding the resident's accomplishments for the topics in Essentials 4.

This resident has successfully achieved the PIER Essentials 4 Outcomes/ACGME Informatics Milestone Level 4

Evaluator's Signature:

Date:

Resident's Signature:

Appendix

APPENDIX A – PIER RESIDENT PROGRESS REPORT

The PIER Resident Progress Report is an optional tool that you can provide to your residents when you start PIER implementation. This self-reporting progress tool allows your residents to monitor their own progress towards the attainment of the PIER Essentials Outcomes. In addition, the residents can identify if they have previous knowledge related to a PIER Outcome prior to entering their residency.

Click on the Year drop down box (see section 1) to indicate the completion year of PIER Outcomes for a specific topic (ie, pre-residency, PGY-1, PGY-2, PGY-3, PGY-4) and then use the Rotation field to enter the specific rotation where the training occurred.



Use Practical Exercises (see section 2) to indicate the completion of one or more practical exercises. Enter the project, exercise, or other activities (use a separate line for each project or activity) that align with the topic's PIER Outcome statements. Then use the Year drop down list to select the year of training in which the exercise was completed and use the **Rotation** field to enter the specific rotation.

Table of Contents Resource Library Essentials 1 **Essentials 2 Essentials 3**

72
Program Director Notes

© 2018 APC/API/CAP. All rights reserved.

PIER Resident Progress Report

Essentials 1/ACGME Milestone 1

Topic 1: Informatics in Pathology Practice		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)		Rotation
Explain the relevance of informatics in pathology practice.		
Describe the difference between IT and informatics.		
 Explain the salient differences and similarities among pathology informatics, bioinformatics, public health informatics, health care IT, and health knowledge informatics. 		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)		Rotation
Topic 2: Information Systems Fundamentals		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)	Year	Rotation
Use correct terminology to describe the major types and components of computer hardware, software, and computer networks.		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 2 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)	Year	Rotation

Essentials 2

Essentials 3

Essentials 4

Appendix

Essentials 1

Table of Contents

Resource Library

Essentials 1/ACGME Milestone 1, cont'd

Topic 3: Importance of Databases		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)		Rotation
 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. 		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 3 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)		Rotation
Topic 4: Introduction to Data Standards		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)	Year	Rotation
• Define the types and roles of standards used in pathology, at a basic level.		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 4 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)	Year	Rotation

Essentials 4

Essentials 1/ACGME Milestone 1, cont'd

Topic 5: Data Availability & Security		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)YearRotat		Rotation
• Understand the elements of system and data availability as a key part of security.		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 5 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)YearRotation		Rotation

Essentials 2/ACGME Milestone 2

Topic 1: LIS Components & Functions			
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)		Year	Rotation
•	Describe LISs and the role they play in efficient lab operations and health care delivery.		
•	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).		
•	Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow.		
•	Comply with positive patient identification processes/protocols.		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)YearRotati			
Pra Top pro	actical Exercises (Document exercises, projects, or other activities that align with the pic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these ojects took place. Use a separate line for each project.)	Year	Rotation
Pra Top pro	actical Exercises (Document exercises, projects, or other activities that align with the pic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these ojects took place. Use a separate line for each project.)	Year	Rotation
Pra Top pro	actical Exercises (Document exercises, projects, or other activities that align with the pic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these ojects took place. Use a separate line for each project.)	Year	Rotation
Pra Top pro	actical Exercises (Document exercises, projects, or other activities that align with the pic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these ojects took place. Use a separate line for each project.)	Year	Rotation

Essentials 2/ACGME Milestone 2, cont'd

	Topic 2: Specialized LISs & Middleware			
PII Ro	PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.) Year Rotation			
•	Describe LISs and the role they play in efficient lab operations and health care delivery.			
•	Describe middleware, how it relates to the LIS, and roles for middleware in laboratory operations.			
•	Understand capabilities and limitations of electronic interfaces between an LIS and instrumentation, middleware, and other information systems.			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 2 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.) Year Rotation		Rotation		
	Topic 3: Data & Communication Standards			
PII Ro	ER Outcomes (Use the Year field to select when the PIER Outcome was met and use the tation field to enter the rotation where it was met.)	Year	Rotation	
•	Define the key features of communication standards used in pathology, such as HL7).			
•	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.			
•	Recognize the advantages of standardized terminology for creating interchangeable data that can be retrieved and summarized.			
•	Understand the basics of the standards development process.			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 3 Outcomes. Use the Year and Rotation fields to enter where and when these projectsYearRotationtook place. Use a separate line for each project.)YearRotation				

Table of Contents

Resource Library Essentials 1

Essentials 2/ACGME Milestone 2, cont'd

Topic 4: Digital Imaging			
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)		Year	Rotation
•	Determine the appropriate digital image resolution for a particular use.		
•	Articulate potential roles, uses, and limitations of WSI in the laboratory environment.		
•	Determine the appropriate telemicroscopy technology to use for a particular application.		
•	Utilize digital imaging systems such as WSI, dynamic telemicroscopy, and image analysis (as appropriate to practice setting).		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 4 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)YearRotation		Rotation	
	Topic 5: Basics of the Health Care Information Ecosystem	1	
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.) Year Rotation		Rotation	
٠	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).		
Pra Top pro	actical Exercises (Document exercises, projects, or other activities that align with the bic 5 PIER Outcomes. Use the Year and Rotation fields to enter where and when these jects took place. Use a separate line for each project.)	Year	Rotation

Essentials 3/ACGME Milestone 3

Topic 1: Pathologist Role in LIS & EHR Projects			
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.) Year Rotation			
• Explain the role and responsibility of pathologists with regard to selection, oversight, and use of informatics systems in the laboratory.			
Describe the difference between IT and informatics.			
• 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).			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)		Rotation	
Rotation field to enter the rotation where it was met.)	Year	Rotation	
• Provide input to the LIS selection team to ensure that an optimal fit between a purchased system and departmental needs is attained.			
• Work with information systems personnel to ensure that reports are properly formatted (eg, synoptic format and other standardized formats as appropriate).			
• Recognize limitations and information gaps resulting from the limitations of the data analysis capability of the LIS.			
• Understand the process and requirements for test definition and other information maintenance in the LIS.			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 2 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)	Year	Rotation	

s 1 Essentials 2

<u>Essentials 3</u>

Essentials 3/ACGME Milestone 3, contrd

Topic 3: Information Systems & Laboratory Performance			
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.) Year Rotation			
• Describe LISs and the role they play in efficient lab operations and health care delivery.			
• Describe patient and asset identification standards and tracking systems and how they are used to improve patient safety and laboratory workflow.			
 Identify opportunities to modify the LIS to improve operations. 			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 3 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)		Rotation	
Topic 4: Data Security, Regulatory, & Accreditation Requirem	ents	1	
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)	Year	Rotation	
 Maintain compliance with electronic information management requirements of regulatory and/or accreditation agencies. 			
 Recognize situations under which information technology may be subject to FDA regulation (eg, blood banking and WSI). 			
 Interpret regulations to determine how they affect laboratory information management needs and the role of the lab within the health care system. 			
 Adhere to HIPAA and other security and privacy requirements for the communication and storage of patient data. 			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 4 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.) Year Rotation			

orary Essentials 1

Essentials 2

Essentials 4/ACGME Milestone 4

Topic 1: LIS Management & Oversight		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)	e Year	Rotation
• Explain the role and responsibility of pathologists with regard to the selection, oversight, and use of informatics systems in the laboratory.		
Supervise the LIS team in the creation and updating of the LIS procedure manual.		
Identify opportunities to modify the LIS to improve operations.		
• Contribute to analysis and interpretation of integrated pathology and enterprise data sets for improving care, quality, and increasing the efficiency of care delivery.		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 1 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.) Year Rotation		
Topic 2: Order & Results Management		
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)	^e Year	Rotation
 Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test orders. 		
 Anticipate (and recommend remediation for) issues, potential problems, and challenges in EHR handling of laboratory test results. 		
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 2 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)YearRotation		Rotation

Essentials 2

Essentials 1

Essentials 3

Essentials 4

Appendix

Table of Contents

Resource Library

Essentials 4/ACGME Milestone 4, cont'd

Topic 3: Laboratory Data for Quality Improvement & Research			
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Rotation field to enter the rotation where it was met.)YearYear			
 Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery. 			
• Contribute to the definition and creation of integrated health care data sets from multiple disparate sources in order to support useful, accurate, and reliable data analysis.			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 3 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projects took place. Use a separate line for each project.)		Rotation	
Topic 4: Laboratory Data & Enterprise Health Care Analytics			
PIER Outcomes (Use the Year field to select when the PIER Outcome was met and use the Near field to enter the rotation where it was met.) Year Rotation		Rotation	
• Recognize applications of ancillary information systems to optimize clinical, operational, and financial performance of the laboratory (eg, middleware, financial systems, and business intelligence).			
• Understand the special difficulties of information flow to and from the local information ecosystem (eg, for outreach programs) and strategies for overcoming the obstacles.			
• Contribute to the analysis and interpretation of integrated pathology and enterprise data sets for improving care quality and increasing the efficiency of care delivery.			
Practical Exercises (Document exercises, projects, or other activities that align with the Topic 4 PIER Outcomes. Use the Year and Rotation fields to enter where and when these projectsYearRotationtook place. Use a separate line for each project.)YearRotation		Rotation	

rary Essentials 1

Essentials 2

Additional Notes

Essentials 2 Essentials 3

APPENDIX B - ACRONYMS USED IN TOOLKIT

The following is a list of all acronyms used in the PIER Resources Toolkit.

Acronym	Definition		
AABB	American Association of Blood Banking		
ACGME	Accreditation Council for Graduate Medical Education		
ACO	Accountable Care Organization(s)		
AP	Anatomical pathology		
APLIS	Anatomical pathology laboratory information system		
CAP	College of American Pathologists		
СР	Clinical pathology		
CPOE	Computerized physician order entry		
СРТ	Current procedural terminology		
СТ	Computed tomography		
DICOM	Digital imaging and communications in medicine		
E1	Essentials 1		
E2	Essentials 2		
E3	Essentials 3		
E4	Essentials 4		
EHR	Electronic health record		
EMR	Electronic medical record		
FDA	Food and Drug Administration		
FTE	Full time equivalent		
HHS	Human Health and Services		
HIPAA	Health Insurance Portability and Accountability Act		
HITECH	Health Information Technology for Economic and Clinical Health (Act)		
HL7	Health level seven		
ICD 10	International Classification of Diseases		
IHE	Integrating the Healthcare Enterprise		
IP	Internet protocol (address)		
ISO	International Organization for Standardization		
ІТ	Information technology		
LIS	Laboratory information system(s)		
LOINC	Logical observation identifier name code		
NCBO	National Center for Biomedical Ontology		
ONC	Office of the National Coordinator		
PIER	Pathology Informatics Essentials for Residents		
ble of Contents	Resource Library Essentials 1 Essentials 2 Essentials 3 Essentials 4	Apper	

 Table of Contents
 Resource Library
 Essentials 1 Essentials 2

Essentials 3

Appendix

© 2018 APC/API/CAP. All rights reserved.

QA	Quality assurance
QM	Quality management
RFP	Request for proposal
SNOMED	Systematized nomenclature of medicine
SOP	Standard operating procedures
ТАТ	Turnaround time
TJC	The Joint Commission
WSI	Whole slide image

s 1 Essentials 2

2 Essentials 3



85