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Laboratory Information Systems

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Walter H. Henricks

Laboratory information systems (LISs) supply mission-critical capabilities for the vast array of information-processing needs of modern laboratories. LIS architectures include mainframe, client-server, and thin client configurations. The LIS database software manages a laboratory's data. LIS dictionaries are database tables that a laboratory uses to tailor an LIS to the unique needs of that laboratory. Anatomic pathology LIS (APLIS) functions play key roles throughout the pathology workflow, and laboratories rely on LIS management reports to monitor operations. This article describes the structure and functions of APLISs, with emphasis on their roles in laboratory operations and their relevance to pathologists.

Bar Coding and Tracking in Pathology

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Matthew G. Hanna and Liron Pantanowitz

Bar coding and specimen tracking are intricately linked to pathology workflow and efficiency. In the pathology laboratory, bar coding facilitates many laboratory practices, including specimen tracking, automation, and quality management. Data obtained from bar coding can be used to identify, locate, standardize, and audit specimens to achieve maximal laboratory efficiency and patient safety. Variables that need to be considered when implementing and maintaining a bar coding and tracking system include assets to be labeled, bar code symbologies, hardware, software, workflow, and laboratory and information technology infrastructure as well as interoperability with the laboratory information system. This article addresses these issues, primarily focusing on surgical pathology.

Enhancing and Customizing Laboratory Information Systems to Improve/Enhance Pathologist Workflow

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Douglas J. Hartman

Optimizing pathologist workflow can be difficult because it is affected by many variables. Surgical pathologists must complete many tasks that culminate in a final pathology report. Several software systems can be used to enhance/improve pathologist workflow. These include voice recognition software, pre-sign-out quality assurance, image utilization, and computerized provider order entry. Recent changes in the diagnostic coding and the more prominent role of centralized electronic health records represent potential areas for increased ways to enhance/improve the workflow for surgical pathologists. Additional unforeseen changes to the pathologist workflow may accompany the introduction of whole-slide imaging technology to the routine diagnostic work.

Specialized Laboratory Information Systems

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Bryan Dangott

Some laboratories or laboratory sections have unique needs that traditional anatomic and clinical pathology systems may not address. A specialized laboratory information system (LIS), which is designed to perform a limited number of functions, may perform well in areas where a traditional LIS falls short. Opportunities for specialized LISs continue to evolve with the introduction of new testing methodologies. These systems may take many forms, including stand-alone architecture, a module integrated with an existing LIS, a separate vendor-supplied module, and customized software. This article addresses the concepts underlying specialized LISs, their characteristics, and in what settings they are found.

Laboratory Information Systems Management and Operations

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Ioan C. Cucoranu

The main mission of a laboratory information system (LIS) is to manage workflow and deliver accurate results for clinical management. Successful selection and implementation of an anatomic pathology LIS is not complete unless it is complemented by specialized information technology support and maintenance. LIS is required to remain continuously operational with minimal or no downtime and the LIS team has to ensure that all operations are compliant with the mandated rules and regulations.

Molecular Pathology Informatics

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Somak Roy

Molecular informatics (MI) is an evolving discipline that will support the dynamic landscape of molecular pathology and personalized medicine. MI provides a fertile ground for development of clinical solutions to bridge the gap between clinical informatics and bioinformatics. Rapid adoption of next generation sequencing (NGS) in the clinical arena has triggered major endeavors in MI that are expected to bring a paradigm shift in the practice of pathology. This brief review presents a broad overview of various aspects of MI, particularly in the context of NGS based testing.

Pathology Gross Photography: The Beginning of Digital Pathology

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B. Alan Rampy and Eric F. Glassy

The underutilized practice of photographing anatomic pathology specimens from surgical pathology and autopsies is an invaluable benefit to patients, clinicians, pathologists, and students. Photographic documentation of clinical specimens is essential for the effective practice of pathology. When considering what specimens to photograph, all grossly evident pathology, absent yet expected pathologic features, and gross-only specimens should be thoroughly documented. Specimen preparation prior to photography includes proper lighting and background, wiping surfaces of blood, removing material such as tubes or bandages, orienting the specimen in a logical fashion, framing the specimen to fill the screen, positioning of probes, and using the right-sized scale.

- Advanced Imaging Techniques for the Pathologist** 89
Jeffrey L. Fine
- Advanced imaging refers to direct microscopic imaging of tissue, without the need for traditional hematoxylin-eosin (H&E) microscopy, including microscope slides or whole-slide images. A detailed example is presented of optical coherence tomography (OCT), an imaging technique based on reflected light. Experience and example images are discussed in the larger context of the evolving relationship of surgical pathology to clinical patient care providers. Although these techniques are diagnostically promising, it is unlikely that they will directly supplant H&E histopathology. It is likely that OCT and related technologies will provide narrow, targeted diagnosis in a variety of *in vivo* (patient) and *ex vivo* (specimen) applications.
- Overview of Telepathology** 101
Navid Farahani and Liron Pantanowitz
- Telepathology is the practice of remote pathology using telecommunication links to enable the electronic transmission of digital pathology images. Telepathology can be used for remotely rendering primary diagnoses, second opinion consultations, quality assurance, education, and research purposes. The use of telepathology for clinical patient care has been limited mostly to large academic institutions. Barriers that have limited its widespread use include prohibitive costs, legal and regulatory issues, technologic drawbacks, resistance from pathologists, and above all a lack of universal standards. This article provides an overview of telepathology technology and applications.
- Selection and Implementation of New Information Systems** 113
Keith J. Kaplan and Luigi K.F. Rao
- The single most important element to consider when evaluating clinical information systems for a practice is workflow. Workflow can be broadly defined as an orchestrated and repeatable pattern of business activity enabled by the systematic organization of resources into processes that transform materials, provide services, or process information.
- Health Information Systems** 133
S. Joseph Sirintrapun and David R. Artz
- This article provides surgical pathologists an overview of health information systems (HISs): what they are, what they do, and how such systems relate to the practice of surgical pathology. Much of this article is dedicated to the electronic medical record. Information, in how it is captured, transmitted, and conveyed, drives the effectiveness of such electronic medical record functionalities. So critical is information from pathology in integrated clinical care that surgical pathologists are becoming gatekeepers of not only tissue but also information. Better understanding of HISs can empower surgical pathologists to become stakeholders who have an impact on the future direction of quality integrated clinical care.

Translational Bioinformatics and Clinical Research (Biomedical) Informatics

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S. Joseph Sirintrapun, Ahmet Zehir, Aijazuddin Syed, JianJiong Gao,
Nikolaus Schultz, and Donovan T. Cheng

Translational bioinformatics and clinical research (biomedical) informatics are the primary domains related to informatics activities that support translational research. Translational bioinformatics focuses on computational techniques in genetics, molecular biology, and systems biology. Clinical research (biomedical) informatics involves the use of informatics in discovery and management of new knowledge relating to health and disease. This article details 3 projects that are hybrid applications of translational bioinformatics and clinical research (biomedical) informatics: The Cancer Genome Atlas, the cBioPortal for Cancer Genomics, and the Memorial Sloan Kettering Cancer Center clinical variants and results database, all designed to facilitate insights into cancer biology and clinical/therapeutic correlations.

Training in Informatics: Teaching Informatics in Surgical Pathology

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Lewis Allen Hassell and Kenneth E. Blick

This article presents an overview of the curriculum deemed essential for trainees in pathology, with mapping to the Milestones competency statements. The means by which these competencies desired for pathology graduates, and ultimately practitioners, can best be achieved is discussed. The value of case (problem)-based learning in this realm, in particular the kind of integrative experience associated with hands-on projects, to both cement knowledge gained in the lecture hall or online and to expand competency is emphasized.