PLATFORM Short Abstract Presentations

Wednesday, May 6, 2015

Thursday, May 7, 2015

Location:

Wyndham Grand Pittsburgh Hotel

Kings Garden 1

Wednesday, May 6, 2015
9:00 am – 9:35 am

Re-imagining pathology consultations using the Scalable Adaptive Graphics Environment: A live demonstration

Bruce Levy, MD (bplevy@uic.edu)[1] , Tushar Patel, MD[1], Victor Mateevitsi[2]

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Content:
Whole-slide imaging (WSI), while technologically mature, has not become mainstream. One reason is that current methods of visualizing and using WSIs follow long-existing workflows for glass slides. If we take advantage of the digital nature of WSIs and use them in novel ways that were not possible with physical slides, we will make significant progress to convince pathologists to embrace this technology and advance medical care, research and education.

Technology:
The Scalable Adaptive Graphics Environment (SAGE) was developed at the University of Illinois at Chicago's Electronic Visualization Laboratory to facilitate collaborative efforts that require the sharing of data-intensive information for analysis. SAGE is an open-source visualization and collaboration windowing environment that runs in a web browser, enabling users to access, display and share a variety of data-intensive information, in a variety of resolutions and formats, from multiple sources, taking advantage of HTML5 and the high-performance graphics and networking capabilities contained in modern web browsers. A WSI-viewer for SAGE was developed.

Design:
We will demonstrate this technology through the performance of a live simulated pathology consultation between two pathologists. The pathologists will communicate through a videoconference window in SAGE while both macroscopic images and WSIs are displayed, manipulated and discussed in real-time. Given sufficient time, we hope to invite members of the audience to connect with the consultation through the creation of individual pointers on their personal devices.

Results:
In a previous demonstration, we successfully performed a consultation between two pathologists. In addition, this technology has been successfully used for multidisciplinary conferences and the education of medical students and pathology residents. We have shown in these scenarios that any number of users can connect to the specific instance of SAGE simultaneously via their computers, tablets or smart phones to view and manipulate WSI and other visual and non-visual information.

Conclusion:
SAGE is capable of using WSIs in ways that are not possible with glass slides or the current generation of WSI-viewers or web sharing technology. It can change the playing field in favor of WSIs.

9:45 am – 10:20 am

Implementation of the EPIC 2014 Beaker Clinical Pathology Module at Stanford Health Care

Brent Tan, MD, PhD, (btan@stanford.edu)

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Content:
An account of the Beaker Clinical Pathology implementation at Stanford Health Care, which went live on February 21, 2015.

Technology:
EPIC Beaker Clinical Pathology 2014 (Verona, WI, USA), 2 instances of EPIC EMR 2014 (Stanford Health Care instance with Beaker and Stanford Children's Hospital instance), EPIC-to-EPIC interface, EPIC Blood Administration Module version 0.9, CITRIX Web Interface XenApp 6.5, Data Innovations (South Burlington, Vermont, USA) Instrument Manager v8.13.00.10, SafeTrace version 3.9 (Braintree, MA, USA), Rhodes Group (Vernon, CT) Clinical Lab Repository, 716 Intermec (Fort Mill, SC, USA) PB50 mobile printers, 154 Intermec PC43D printers, 722 Datalogic (Bologna, Italy) Gryphon GD 4400- B 2D barcode readers, 35 EPIC Rover/Apple iPODs (Cupertino, CA, USA) with Honeywell (Fort Mill, SC, USA) Captuvo SL22h enterprise sleds, 3774 Windows 7 workstations.

Design:
The governance and information gathering process leading to selection of a new laboratory information system, including the rationale for selecting Beaker, will be shared. The project timeline and staffing requirements will be highlighted, including incremental deliverables from both information technology and laboratory operations. Hardware and software components and key aspects of system design will be reviewed, including system architecture, archival data strategy, and interfaces. The software build and design, testing process, user training, and sign-off for the system will be examined and compared to the vendor's recommendations. The cut-over and immediate support plan will be reviewed.

Results:
Key performance indicators including turn-around-times for tests and critical test value calls, and number of mislabeled specimens will be presented. Major issues encountered included: 1. Underestimation of the testing and iterative redesign process led to delays in the timeline and operational staffing shortages. 2. Training gaps related to overly generic training, lacking laboratory section specific processes and moderately complex workflows 3. Insufficient time to test auto verification programmed within Beaker. 4. Technical challenges with the EPIC-to-EPIC interface.

Conclusions:
EPIC Beaker version 2014 is a viable, fully functional laboratory information system. Strengths include vertical integration with the EPIC EMR for easier information exchange and integrated positive patient identification within nurse and clinic collections. Shortcomings include QC, aliquoting, lack of component level result verification, and critical call workflow.

11:20 am – 12:00 pm

Optical Coherence Tomography (OCT) imaging of Pathology specimens; Freedom from the tyranny of glass slides

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Content:
Optical coherence tomography (OCT) images often resemble whole slide images (WSIs), which may make OCT a natural choice for advanced imaging applications in pathology. This report details our early experience with OCT as a pathology imaging modality, including a pathologist-friendly introduction. We will present images from several tissue types, including breast and endometrium, and we will discuss our strategies for propelling current research into future clinical applications.

Technology:
Numerous formalin fixed, tissue block size tissue pieces were imaged by OCT (LightCT, LLTech SAS, Paris France), at 1.6 micron transverse (x,y) resolution by 1 micron axial (z) resolution. A variety of acquisitions were used, including wide-field 2D slices (mimics a histologic section), narrow-field stacks of 2D images (3D data set), and video files. Live images were viewed but were not acquired. OCT data was exported in multiple formats, including JPEG and 16-bit grayscale, and including DICOM formats. Generally, WSIs were thenb created from H&E slides made from the OCT-imaged tissue (Aperio ScanScope XT, Leica, Vista California). Image data manipulation was attempted using Adobe Photoshop and ImageJ (NIH) software.

Design:
OCT images were compared with WSIs and also were viewed under varying conditions, within the included viewer and also after export into other software. For OCT/WSI comparisons, full-size JPEG or TIFF files were compared side-by-side at similar zoom/magnification. For interpretation studies, collections of cropped images were placed into Microsoft PowerPoint presentations easier review by subject pathologists. Image manipulations included strategies: 1) look-up table (LUT) manipulation of 16-bit grayscale images, and 2) application of image filters followed by recombination of post-processed image with original image.

Results:
Some tissues are easily seen 'as is', such as endometrium; it is likely that intra-operative and/or in vivo endometrial assessment will future OCT applications based upon this early system's current image quality (Figure 1). Other tissues, such as breast, will likely require a combination of rigorous histopathology study and more sophisticated image processing, in order to yield reproducible clinical applications (Figure 2)

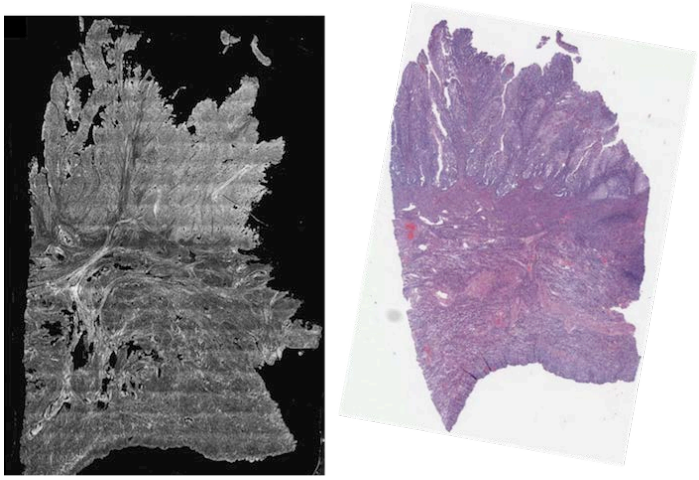

Figure 1. Endometrial cancer (OCT on left; WSI on right)
Figure 2 on next page

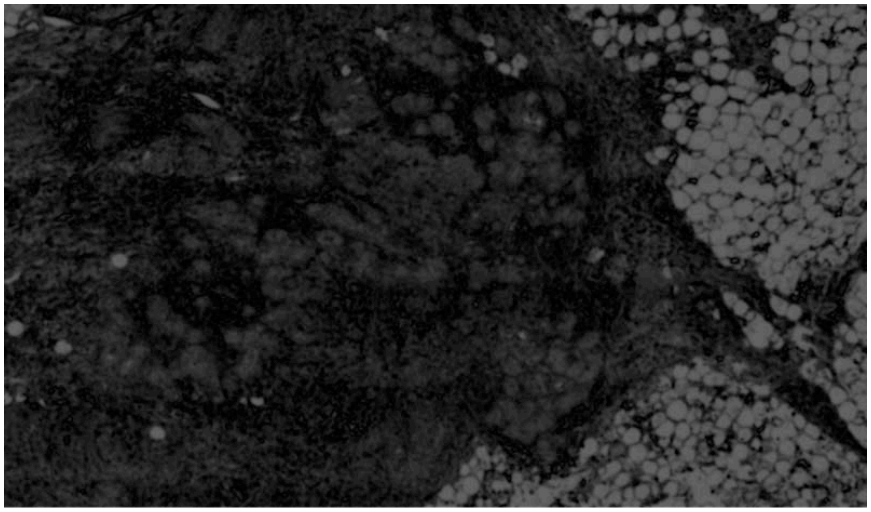

Figure 2. Post-processed OCT image of benign breast. Ducts and lobules appear as light shadows in the dark stroma (center and left). Fat is lighter (right).

Conclusions:

OCT is microscopy, therefore pathologists are a natural choice for providing OCT-based diagnosis. OCT is very promising provided that it is not seen as a direct WSI replacement; pathologists should seek to adapt OCT according to its strengths, for specific clinical applications. OCT is rapid, it does not require histology equipment or chemicals, and it may be possible to project OCT diagnostics into situations where slides cannot go (e.g., in vivo microscopy).

WCPI

4:00 pm – 4:35 pm

IT-Tools to Overcome Integration Problems in Digital Microscopy within Collaborative Research Networks

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Content:
Laboratory Information Management Systems (LIMS) are a comprehensive solution for a wide range of laboratory processes and provide valuable information regarding specimen. Despite the powerful features of modern LIMS there is a growing need for the integration of the new data sources – e.g. from new pathology methods. Within the scope of an infrastructure research project for the Competence Network Multiple Sclerosis, high resolution digital microscopic images should be made easily accessible while viewing the histology-specimen from which they originate. This requires integration of digital microscopy features into the LIMS. Here we present automated and manual tools by which LIMS can be interfaced with Digital Pathology System.

Technology:
An Olympus dotSlide virtual microscopy system was used for digitization process. Digital slides are stored on a Net Image Server (NIS) and laboratory information regarding the specimen is registered into the STARLIMS software.

Design:
Microscopic images are handled by a Digital Pathology System. A web based image database was set up and configured. Automated and manual tools were defined for the linkage of digital images to the corresponding specimen into the LIMS.

Results:
Digital images in conjunction with metadata are stored in the Digital Pathology System and they are freely accessible via the web based viewer from within our institution's secure network. Most LIMS allow customers to rapidly configure the system in a way that gives us the ability to easily customize a new tab for scanned images in order to manually link microscopic images to the corresponding specimen and facilitate viewing of specimen in conjunction with the digital images. Furthermore, our STARLIMS supports connectivity for multiple external applications via SOAP based web services. Using this web services interface, multiple images could be automatically linked to the corresponding specimen using unique identifiers.

Conclusions:
The proposed methods deliver a layout for an effective prototype for the integration of the digital microscopic images into the LIMS for the Competence Network Multiple Sclerosis IT infrastructure. These tools can significantly reduce workload and eliminate handling errors of specimen and this increase the quality of the collaborative research project.

Acknowledgements
This work was supported by the Competence Network Multiples Sclerosis (01GI1304B), funded by the German Federal Ministry of Education and Research.

WCPI

4:45 pm – 5:20 pm

The diagnostic accuracy of digital microscopy: a systematic review

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Content:
Digital microscopy in pathology involves the generation of digital images from glass slides. They can be viewed, stored, and shared virtually. At present, digital images are used routinely in both education and research. They are not currently used on a large scale in routine primary diagnosis, and are not approved for clinical use in all jurisdictions. No systematic review of their diagnostic accuracy has been performed.

This systematic review aims to assess the effect of digital microscopy on diagnostic accuracy when compared to glass slides. Secondary outcome measures, including the impact of the technology systems used, will also be assessed.

Technology:
A systematic review was performed. Studies examining the use of whole slide imaging, static telepathology, and dynamic telepathology in comparison to glass slides were included in the review. Studies comparing the different digital imaging technologies were also included.

Design:
The review was designed according to the Cochrane systematic review guidelines. The primary reviewer received specialist training in conducting systematic reviewers prior to undertaking the review. Multiple (n=5) electronic databases were searched, reference searching of included papers, and citation tracking were performed to retrieve studies. A search of the grey literature was performed to minimize bias. Two independent reviewers, one of whom an expert in the field, subjected all studies to a predefined screening algorithm. A third independent reviewer was consulted in cases where there was a disagreement. Data from all included papers was extracted using the EPOC data collection template and its quality subjected to the QUADAS tool by two independent reviewers.

Results:
A literature search retrieved 1256 studies that are currently being subjected to the screening algorithm. Univariable and multivariable logistic regression models, adjusted for study risk of bias, will be used to investigate associations between outcomes of interest and study-specific covariates. If justified, a meta-analysis of the data will be performed.

Conclusions:
Data analysis is ongoing and the results will be presented.

Thursday, May 7, 2015
9:00 am – 9:35 am

Clinical Reporting of Tumor DNA Sequencing results in Pathology.

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Context:
Clear and accurate reporting of Tumor DNA Sequencing results is essential to fulfill the promise of personalized medicine. The information that goes into molecular pathology reports is complex and diverse. It varies in significance and comes from sources that are frequently updated. Our knowledge of genomic variations often changes and new treatment targets routinely become available. Nationally and internationally funded genomic projects with manually curated resources are essential in providing timely information to molecular pathologists. New types of technology are required to assist molecular pathologists in integrating information from all available resources.

Technology:
Our "Downstream Reporting" software was written using the Java programming language and Open Source frameworks. Google Web Toolkit framework was used to build a web-based user interface that brings together external resources such as Pubmed, Enembl, OMIM, GeneCards, Cosmic, KEGG pathways and Uniprot via RESTful API. MongoDb – a modern no-SQL database was used to store data.

Design:
Downstream Reporting is designed to assist bioinformaticians who upload results of two parallel pipelines and Variant Effect Predictor files to produce a single Excel file with conveniently formatted raw data necessary to filter artifacts and select variants for further evaluation by molecular pathologists. It is also designed to assist molecular pathologists with access to discovered variants, patient information, previously reported variant archetypes and a range of external resources. Ultimately, this information is consolidated in a pathology report that is automatically uploaded into the Anatomic Pathology LIS.

Results:
The system consolidates access to raw data and facilitates a higher level of abstraction that culminates in creation of a tumor DNA sequencing evaluation report. The system improves efficiency and accuracy of reporting through flexible integration with internal and external resources.

Conclusions:
Accurate and clear reporting of tumor DNA sequencing results by molecular pathologists requires new types of technology solutions that can integrate already existing departmental resources with analytic pipelines and vast publicly available repositories of cancer genomic data. The Downstream Reporting application demonstrates a range of technical approaches that reduce the complexity of clinical reporting of tumor DNA sequencing results.

9:45 am – 10:20 am

Implementation and Optimization of Electronic Synoptic Reporting at a Large Academic Hospital

Veronica E. Klepeis, MD, PhD (vklepeis@partners.org), Thomas M. Gudewicz, MD, John R. Gilbertson, MD

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Content:
Synoptic reporting is considered superior to traditional narrative reporting, as it standardizes, simplifies and prioritizes recording of information. Beyond these benefits, electronic synoptic reporting has the potential to collect discrete data elements, resulting in advanced data-querying capabilities, automated analysis and decision support. This study presents key factors that influenced implementation of electronic synoptic reporting at a large academic hospital in three categories: workflow, synoptic design and synoptic content.

Technology:
Electronic synoptic reporting was implemented using mTuitive software (Centerville, MA, USA). Specifically, synoptic reports were designed using Agile Author (v2.0.1.6) and synoptic data was entered using xPert (v3.0.0.27).

Design:
Our anatomic pathology service is completely subspecialized. Until this implementation, paper synoptics were used, with the vast majority of pathologists relying heavily on transcriptionists. For this project, two paper synoptics per subspecialty were translated into electronic format, including both cancer and non-cancer synoptics. Additionally, new paper versions of the electronic synoptics were also made available. Pathologists and transcriptionists were individually trained on the software.

Results:
A major obstacle to incorporating electronic synoptic reporting into our workflow included inadequate and outdated sign-out rooms, making computers and monitors largely inaccessible to the pathologist. Factors having most significant impact on workflow included the resulting use of paper versions of electronic synoptics and therefore involvement of transcriptionists in data entry. Furthermore, to optimize synoptic design, we applied functionality that made data capture more efficient (decreasing number of clicks by defaulting answers, staging automatically, incorporating list-in-list features and branching logic), provided ample opportunity for free text entry to motivate compliance, and introduced elements that improved report readability (clearly defining parts of case included, presenting tumor stage summary up-front, removing extraneous information relevant only during data entry). Finally, it was necessary to address cancer synoptic content-related issues, which, while not specific to electronic reporting, were a deviation from our prior practice. Most important were incorporation of results from margins and lymph nodes separately submitted from the main specimen into cancer synoptics and integrating results from prior specimens.

Conclusion:
By paying attention to workflow, synoptic design and content, we identified and managed factors critical to optimal implementation of electronic synoptic reporting.

11:20 am – 12:00 pm

Telepathology Network for the New York-New Jersey VA Integrated Health System

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[2]Department of Veterans Affairs, Veterans Integrated System Network 3

Content:
A telepathology network has been implemented in the VA NY/NJ Veterans Healthcare Network in 2014. The pathology departments of six New York/ New Jersey VA Hospital units include Manhattan, Brooklyn, Bronx, New Jersey, Northport and Hudson Valley Veterans Administration hospitals.

Technology:
All six facilities have been networked with identical instrumentation including robotic microscopes, whole slide imaging, and gross specimen photographic equipment. Robotic microscopes, local dedicated server, and remote regional server were all provided by ApolloPACS (ApolloPACS, Falls Church, VA) for remote storage, access and retrieval by all six departments. Whole slide imaging systems, MikroScan D2 (Mikron Instruments, Carlsbad, CA) are installed for imaging, storage, and transmission to the ApolloPACS remote enterprise image management system. Gross specimen photographic imaging using the MacroPath (Milestone Medical Technologies, Kalamazoo, MI) will provide for surgical and autopsy gross specimen imaging, annotation, and distribution.

Design:
ApolloPACS enterprise image management system enables all six facilities to store, retrieve and integrate images from a regional server at the VA facility in Richmond, Virginia. Teleconferences of pathologists, laboratory technologists and VA network and telemedicine technical staff meet weekly to install equipment, to create technical policies and procedures, to develop standards for telepathology consultations, and for compliance with HIPAA and federal regulations. Validation of whole slide imaging for diagnosis is in progress to comply with CAP recommendations developed by experts in pathology informatics and endorsed by the College of American Pathologists.

Results:
Robotic microscopy consultation at all six VA hospitals using robotic microscopy is implemented for clinical review of consultation cases, or integrate into conference case review and discussion, for internal departmental consultation or for interdepartmental specialty conferences. Whole slide imaging validation for all six facilities is in progress to meet CAP guidelines in 2015.

Conclusions:
Weekly teleconferences for pathologists, laboratory technologists and telehealth network coordinators ongoing for 18 months was critical for implementation and integration of hardware, software and professional staff. VA Telehealth Support personnel is critical for successful integration, for compliance with federal regulatory requirements, and for consistent application of pathology practice guidelines.