Digital Pathology: The Pathologist’s Perspective

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Digital Pathology: A Pathologist’s Perspective

• What Digital Pathology *IS?*
• What are the Future Roles of a Digital Pathologists?
• Why is pathology changing now?
• Why Will Digital Pathology Take Off?
What Digital Pathology IS?

• Use of computer technology to convert analog microscopic images into digital images.

• Synonyms: digital imaging, virtual slides, or virtual microscopy
What Digital Pathology IS NOT?

- The elimination of glass slides
- The elimination of histology
- *In vivo* imaging
- Abandonment of 100+ years of morphology
- Replacement of established image analysis concepts
- Computer diagnosis
Where Does Digital Pathology Fit?

- Will affect everything between image acquisition to image analysis
  - Begins right after the slide is created
  - All the way up to the delivery of the final interpretation to the provider

- Will extend diagnostics
  - Complement a century of morphology knowledge with the emerging world of functional and structural molecular biomarkers, effectively redefining the diagnostic process
What are the Future Roles of a Digital Pathologist?

- Consult
- Evaluate
- Report
- Communicate
- Recommend

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The New Paradigm

- Comprehensive integrated consultations with imaging, biochemical, histologic, molecular, cytogenetic and epigenetic data

• The Pathologist’s Cockpit
Digital Pathology Will Lead to:

• Much improved reports
  o Off-time to near real-time
  o Single modality to multi-modality
  o Integrated within pathology (AP, CP, molecular, etc)
  o Integrated within diagnostic medicine - pathology, radiology, nuclear medicine, etc

• Access to the right pathologist at the right time

• Cost effectiveness to the healthcare system and laboratory

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Why is Pathology Changing Now?

• Advances in digital technology

• Economics

• Fewer pathologists
What Do We Know About This Change?

- Radiology already made this change
  - The basic technology is here and it is being applied, delivered, and improved
- Differences between pathology and radiology will dictate different courses
What Agencies are Involved in Oversight?

- CMS
  - Enforces CLIA
  - Approves private accrediting organizations
- CAP
  - Functions as CMS-approved private accrediting organization
- Develops evidence based guidelines
  - Eg, “Validation on Whole Slide Imaging Systems for Diagnostic Use in Pathology”
- FDA
  - Ensures device safety and effectiveness
Impediments to Widespread Adoption of Digital Pathology

• Primary data acquisition – completely digital?
  o Nearly 100% optical acquisition today

• Glass slides and paraffin blocks?
  o Still need to fix/process/embed/cut tissue, create slides

• Where’s the Beef ?? Value ??
  o Workflow, workflow, workflow
    − Grossing, processing, histology
  o Pathologist case-centric workflow will be critical
Why Will Digital Pathology Take Off?

- All-digital environment will allow easy integration of:
  - Paper and electronic documents
  - Gross specimens & reports
  - Slide processing status
  - Whole slide images
  - Patient clinical background
  - Resident and peer collaboration
  - Prior cases, images, results
  - Radiology images
  - Reporting
Why Will Digital Pathology Take Off?

- Increased Efficiencies
  - Productivity increases due to workflow enhancements
  - Improved report TAT – days to hours
  - Archiving and retrieval of images allows comparisons
  - Easier tumor boards and conferences
  - Remote case review
  - Clinician viewing increases participation
  - Screening studies
  - Quantification
  - Improved slide availability, fewer handling errors
Why Will Digital Pathology Take Off?

- New Tools & Services
  - Quantitative comparison
  - Case sharing and collaboration
  - Computer aided image analysis
  - 3D tissue imaging, multiprotein colocalization, full dynamic quantitation
  - Remote frozen sections
  - Personalized medicine
  - Onshoring?
  - Immediate on-site contextual access to anatomy atlas, similar cases, expert opinion, other imaging modalities, etc.
Obstacles to Address

- Adoption
  - Technology: science and information
  - Practice integration
  - Market

- Quality requirements
  - Accuracy, sensitivity, specificity, reproducibility, validity

- Financial / Reimbursement

- Regulatory

- Medical ethics

- New mindsets are required