Time for a Reality Check

Education

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Introduction

• Digital imaging, and Internet-based pathology services, will become transforming technologies for anatomic pathology.

• The question is, how disruptive will this be?

• Also, will the medical education model change in ways that effect the profession of pathology?
Current Status

• Digital imaging technologies have been shown to be effective in pathology education programs.

• At the medical student education level, digital imaging is beginning to replace, or has replaced at many institutions, conventional light microscopy.
University of Arizona
DMetrix Virtual Slide Laboratory
Acute Inflammation – Laboratory

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Laboratory Objectives

1. To observe the morphologic changes in tissue with acute inflammation.
2. To identify (when possible) the underlying process which induced the acute inflammation.
3. To recall the cellular events, which produced the microscopic appearance observed (chemotaxis, margination, etc.).
4. To relate the microscopic findings to gross and clinical findings.

Microscopic Slides

Slide #40 (Acute appendicitis): This is a cross-section of an appendix. If you look at it on low power, you can see the mucosal ulceration (discontinuity), which gave rise to the inflammatory response. This is an area where the normal colonic mucosal glands are missing. Something (perhaps a hard fragment of stool termed a fecolith) injured the mucosa and allowed the bacterial flora of the gut access to the underlying connective tissue of the appendix wall. Notice the sea of white blood cells (granulocytes) around the area of the
DMetrix virtual slide
Predictions

• All medical schools will abandon glass slides within the next five years.

• Resident training programs will incorporate virtual slides into both their didactic programs and their pathology practices, sooner than later.
Predictions

• Biomarkers of expertise will be used to credential sub-specialist pathologists.

• Globalization of pathology services and educational programs will accelerate.

• The United States will become an exporter nation for laboratory services.
Economic Implications

- Students at all levels will have easy access to training from the best sub-specialists over the Internet.

- The needs of individual institutions for sub-specialists on staff will decrease.

- Cost savings will be through outsourcing subspecialty teaching cases to service consortia in exchange for education program subscription discounts.
Manpower Implications

- Manpower implications are difficult to predict.
- As medical schools move increasingly to small group discussion-based learning, pathologists will be incentivized to serve as discussion group facilitators.
- Generalists will be regarded as more effective teachers than sub-specialists in this education model.
- On-site subspecialty pathologists could be devaluated both as educators and service providers.
Pressures for Implementation

- High costs of producing quality Internet-based teaching modules, and the spotty distribution of bona fide experts, will drive forward the current trend to form multi-institution education consortiums.

- Top medical schools will have staffing and marketing advantages over the rest of the flock.

- Reduced medical school budgets and poorer reimbursement levels for pathologists’ professional services will further drive the use of shared education resources obtained from consortium and/or professional societies.

- The benefits of economies of scale will incentivize deans to favor the development of shared resources among institutions over the development of local departments.
Barriers to Implementation

• There will be few technical barriers to implementation.

• Reimbursement for educational services will erode in a competitive market. Many current services can be out-sourced.

• Subspecialty pathologist-faculty members will need to strengthen their relationships with educational consortium and virtual group practices.
Potential Solutions to Barriers

• “If you can’t beat them, join them”.

• Individual institutions should identify their strengths, develop them, and market them to potential consortium partners.

• Get “virtual” quick!
Next Generation Disruptive Technologies

- Biomarkers-of-expertise competency testing
Original contribution

Eye-movement study and human performance using telepathology virtual slides. Implications for medical education and differences with experience

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Summary A core skill in diagnostic pathology is light microscopy. Remarkably little is known about human factors that affect the proficiency of pathologists as light microscopists. The cognitive skills of pathologists have received relatively little attention in comparison with the large literature on human performance studies in radiology. One reason for this lack of formal visual search studies in pathology has been the physical restrictions imposed by the close positioning of a microscope operator’s head to the microscope’s eyepieces. This blocks access to the operator’s eyes and precludes assessment of the microscopist’s eye movements. Virtual slide microscopy now removes this barrier and opens the door for studies on human factors and visual search strategies in light microscopy. The aim of this study was to assess eye movements of medical students, pathology residents, and practicing pathologists examining virtual slides on a digital display monitor. Whole histopathology glass slide digital images,
DMetrix Breast Virtual Slides
Biomarkers of Expertise Studies at the University of Arizona
Biomarkers of Expertise Program
Post-sophomore Fellow
Biomarkers of Expertise Program

Post Sophomore Fellow

Senior Resident

Pathologist

Pathologist
Useful Visual Field = 5 deg
Next Generation Disruptive Technologies

- Biomarkers-of-expertise competency testing

- Next generation laboratory workflow management tools (to manage national and even international virtual group practices)
Laboratory Command and Control Center
Phoenix, Arizona

Call Centers

5 foot X 24 foot Video cube wall

UltraClinics® Patent Pending
Goal: Increase Anatomic Pathologists’ Productivity 25-40%
Virtual Microscopy
Fundamentals • Applications • Perspectives of Electronic Tissue-based Diagnosis

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534 References
Thank you!

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