

Oncologic Pathology: Gaps and Challenges to High-Quality Cancer Diagnosis in Clinical Practice

Michael B. Cohen, MD



Conflict of Interest Disclosure

Medical Advisor to SynderBio, Inc.

“As is our pathology so is our practice...what the pathologist thinks today, the physician does tomorrow.”

Sir William Osler, M.D. (1849-1919)



Patient Expectation

- No preventable errors.
- Failures of ignorance are forgiven...however, if knowledge exists and not applied correctly, it infuriates the public and is regarded as INEPTITUDE.

A. Gawande. *The Checklist Manifesto*, 2009.

Anatomic Pathology

- AP = anatomic pathology
- includes surgical pathology (tissue), cytopathology (cells), autopsy pathology
- AP makes use of “ancillary studies” for diagnosis, prognosis, and prediction; methodologic examples: IHC (immunohistochemistry), FISH (fluorescent in situ hybridization), PCR (polymerase chain reaction), NGS (next generation sequencing); specific examples: ER/PR/Her2, BCR/ABL, Kras, whole exome sequencing

Value of the Autopsy

“33/334 cases (9.9%) were identified as class I discrepancy, where the autopsy revealed a discrepant diagnosis with a potential impact on survival or treatment. Critical findings, such as untreated infection (15/33 cases; 45.5%), pulmonary embolism (8/33 cases; 24.2%), and undiagnosed malignancy (6/33 cases; 18.2%), were found in these cases. Major significant findings that had not been clinically detected, whether clinically manageable or not (class I and II), were found in 65/334 cases (19.5%).”

Marshall, Milikowski. Arch. Pathol. Lab. Med. 2017; 141: 1262-6

What is the error rate for AP?

Surgical Pathology Error

- Estimated at approximately 1.5%-5.7%
- Depends on definition of error, anatomic site, etc.

Arch Pathol Lab Med. 2006; 130: 620-625

- If AP reaches 0.1% error rate =
 - 2 unsafe plane landings at O' Hare per day
 - 16,000 pieces of lost mail per hour
 - 32,000 checks deducted from wrong bank account per hour

Mandatory Second Opinion in Surgical Pathology Referral Material: Clinical Consequences of Major Disagreements

- Major diagnostic disagreements were categorized by organ system and according to the clinical significance of the changed diagnosis based on clinical and pathologic follow-up. Second opinion surgical pathology resulted in 132 (2.3% of total cases) major diagnostic disagreements and 507 (9.0%) cases with minor disagreements. The organ systems involved in the majority of the major disagreements were the female reproductive tract (32), gastrointestinal tract (27), and skin (24).

Medical Malpractice

- Cases with a diagnosis-related allegations is #1, and represent 20% of **CRICO CBS** volume and 27% of dollars
- Pathology accounts for 7% of ambulatory diagnosis related claims (Radiology is 14%)
- In 14% of cases pathology was the responsible service (both academic & community)

Malpractice, cont.

From the **Doctors Company** (largest national insurer of medical professional liability for physicians):

- Non-surgical specialties #1 in allegation of diagnosis-related claim (31%)
- Cancer diagnostic errors are relatively common—lung, colorectal, breast, prostate
- Common in Pathology: missed diagnosis of melanoma; interpretation of breast biopsies; prostate biopsies (under- & over-call); gyn surgical pathology and cytology

Molecular Diagnostics

- A rapidly evolving area with numerous “boutique” companies that use multiplex and –omics-based tests and proprietary algorithms. Interpretation of such results by providers can be challenging especially if relevant expertise is not readily at hand.
- *Examples:* Color Genomics, FoundationOne, Invitae, Myriad Genetics, OncoPrint DX, 23Me

Solutions

CAP-ADASP Recommendations

- Develop procedures for review of cases in order to detect disagreements and potential interpretive errors
- Perform case reviews in a timely manner
- Documented review procedures
- Continuously monitor and document results of case review
- Take steps to improve agreement if needed

Arch Pathol Lab Med 2017; 140: 29-40.

Cancer Protocol Templates

- In accordance with the American Joint Committee on Cancer (AJCC), the CAP recommends that hospitals and groups start using the CAP Cancer Protocols containing tumor staging from the 8th edition of the *AJCC Cancer Staging Manual* on January 1, 2018.

Sign out room as the airline cockpit?



Diagnostic Assessment of Deep Learning Algorithms for Detection of Lymph Node Metastases in Women With Breast Cancer

“some deep learning algorithms achieved better diagnostic performance than a panel of 11 pathologists participating in a simulation exercise designed to mimic routine pathology workflow; algorithm performance was comparable with an expert pathologist interpreting whole-slide images without time constraints. Whether this approach has clinical utility will require evaluation in a clinical setting.”

Benjordi, et al. JAMA. 2017;318(22):2199-2210 .
doi:10.1001/jama.2017.14585

Might we soon see a Department of Diagnostic Imaging*?

- Pathology accounts for ~3% of healthcare costs
- Radiology accounts for 10-15% of healthcare costs
- Both are based on imaging
- Digital imaging is the future