



COLLEGE of AMERICAN
PATHOLOGISTS

Overview of Anatomic and Clinical Pathology

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The key take aways of this deck:

- 1. General understanding of Anatomic Pathology**
- 2. General understanding of Clinical Pathology**
- 3. General understanding of how broad pathology is**
- 4. Insight as to what a resident may do as part of an Anatomic or Clinical pathology rotation**

Anatomic and Clinical Pathology Overview

Introduction

- **Pathology is a specialty that offers a great deal of variety and contains two main divisions: Anatomic Pathology and Clinical Pathology.**
- **If you choose pathology for a career, there are three main options for residency training:**
 - **Combined Anatomic and Clinical Pathology (4 years)**
 - **Anatomic Pathology only (3 years)**
 - **Clinical Pathology only (3 years)**
- **Regardless of the track chosen, pathology residents are exposed to a wide range of topics and diagnostic methods and graduate with the ability to impact nearly every patient in the healthcare system.**

Anatomic Pathology

Anatomic Pathology- Definition

Anatomic pathology primarily consists of tissue evaluation—from individual cells from a Pap smear, a fine needle aspiration of a mass, or evaluation of the entire body in an autopsy, and everything in between.

Anatomic Pathology

- **Surgical**

- Primary components include gross dissection and histologic evaluation of specimens, as well as preparation and interpretation of frozen sections.

- **Cytopathology**

- The study of diseases on a cellular level.

- **Forensic**

- Perform autopsies to determine cause of death.

Anatomic Pathology

- Like many other residencies, a day in the life includes service work, didactics, and call (which primarily consists of frozen sections).
- Histologic diagnosis is the foundation of anatomic pathology.

Surgical Pathology

- **There are numerous ways a surgical pathology rotation can be structured; the primary components include:**
 - Gross dissection and histologic evaluation of specimens
 - Preparation and interpretation of frozen sections
- **Most residency programs have regular conferences scheduled, where residents and attendings come together and view cases, allowing for group discussion, teaching, and intradepartmental consultation.**

Surgical Pathology- Grossing

- **Gross dissection, or grossing of specimens, is the process by which specimens are prepared for processing.**
- **Specimens are rendered into slides, from which a histologic diagnosis can be made.**
- **Pathologists' assistants play an important role in teaching residents proper grossing techniques.**

Surgical Pathology- Histologic Evaluation

- In ‘real-world’ practice after residency, this is the major duty of an anatomic pathologist.
- Some practices employ specialists who only focus on a small number of organ systems, while others employ generalists who are expected to render diagnoses on tissue from anywhere.

Surgical Pathology- Histologic Evaluation

- **In residency:**
 - The goal is to look at as many slides as possible, to learn patterns and diagnostic features that will allow you to make accurate diagnoses as a practicing pathologist.
- **On a given day, you might diagnose:**
 - Prostate cancer in an elderly man
 - A colon polyp in a middle-age woman
 - Ensure that a child's removed tonsils do not show any significant abnormality

Surgical Pathology- Frozen Sections

- Requested by clinicians where having specific pathologic information helps determine the scope of a procedure.
- You need to act fast as expected diagnosis is about 20 minutes after receipt of tissue.
- During a frozen section, you may:
 - Access margins of a squamous cell carcinoma on the face
 - Confirm the neurosurgeon collected neoplastic tissue from an edematous tumor
 - Determine the depth of invasion for a uterine cancer which dictates if a surgeon removes lymph nodes for staging

Cytopathology

- **Cytopathology is the study of diseases on a cellular level**
- **Includes examination of cells in:**
 - Pap smears
 - Fine-needle aspirations of masses
 - Fluids such as pleural fluid or ascitic fluid from the abdomen
- **Relies on subtle cellular features to distinguish malignant from benign, classify cells based on origin, and ultimately direct further action (or inaction) for the patient.**

Cytopathology

- **Cytopathologists often perform fine needle aspirations (FNAs) by palpation or using ultrasound to collect diagnostic tissue of suspicious lesions or masses.**
- **Cytopathology is unique as it allows pathologists and residents to interact directly with patients and perform procedures.**
 - **Cytopathology is increasingly being used as it allows for the least minimal acquisition of tissue and provides valuable tissue that can be used for molecular studies.**

Cytopathology

- **Real-time services to clinicians who are collecting samples for cytology—determine whether a sample is adequate for cytologic evaluation or not.**
- **On a given day, you may diagnose:**
 - A woman's breast carcinoma
 - A malignant lung tumor
 - A benign salivary gland mass

Forensic Pathology

- **Autopsy pathologists evaluate corpses to determine why they died.**
- **Work closely with law enforcement to determine manner and cause of death.**
- **Required to appear in court from time to time to explain autopsy findings.**
- **Includes hospital autopsies to determine why patients died in the hospital.**
- **Residents are required to participate/conduct a specified number of autopsies by the end of residency.**

Clinical Pathology

Clinical Pathology

Clinical pathology covers most of laboratory medicine—including routine tests such as glucose and sodium, up to molecular tests for cancer markers and genome sequencing.

Clinical Pathology

- **Involves spending time in the laboratory learning about how lab tests are run.**
- **Includes numerous areas, such as blood bank, microbiology, hematology, chemistry, and molecular.**
- **Quality control, proficiency testing, and laboratory management are also important topics.**

Clinical Pathology

- **Understanding specimen requirements, testing methodology, and interpretation of results is key!**
- **May answer questions from ordering physicians regarding the appropriateness of a test or how to handle samples for certain tests.**

Blood Bank/Transfusion Medicine

- **Test for blood type and antibodies in order to determine what blood products may be suitable for a given patient in need.**
- **Identify antibodies in blood, determining the cause of a patients' transfusion reactions, and assisting in the determination of appropriate blood products to be transfused.**
- **Includes apheresis procedures and therapeutic phlebotomy, which are generally performed by laboratory/nursing staff and supervised by pathologists.**

Blood Bank/Transfusion Medicine Rotation

- **May include stem cell collection and transplant, HLA typing and matching, and blood donation services.**
- **Transfusion medicine pathologists will often see patients including performing physical examinations and taking histories.**
- **You may learn:**
 - **How to perform a type and screen and transfusion reaction workup**
 - **Talk to clinicians about what blood products are indicated for their patients**
 - **Perform a plasmapheresis procedure on a patient with Thrombotic Thrombocytopenic Purpura (TTP)**

Microbiology

- **Diagnosing bacterial, viral, and fungal infections using various laboratory testing methods.**
- **Residents will get hands-on experience with:**
 - **'Plating' specimens**
 - **Performing biochemical testing**
 - **Setting up tests for definitive organism identification and susceptibility testing**

Microbiology

- **Learn to identify organisms based on a variety of characteristics and tests.**
- **Molecular testing is increasingly used in microbiology to identify organisms and aid in detecting antibiotic resistance.**
- **Pathologists specializing in microbiology are frequently consulted and work closely with hospital infectious disease doctors and epidemiologists.**

Molecular Pathology

- **Classify disease based on macromolecules, such as RNA and DNA.**
- **Learn the steps required to access molecular data, exponentially increase the amount of data, and measure the intended target(s) from a given sample.**
- **Learn how laboratory tests can be used to determine the presence or absence of common genetic mutations in tumors, diagnose certain infectious diseases, such as herpes simplex virus or human papillomavirus, or evaluate segments of human DNA (or possibly the whole exome) for variants that may contribute to disease.**

Molecular Pathology

- **Residents will learn:**
 - What specimens can be used for molecular testing
 - Different indications for molecular testing
 - How to set up specimens for testing
 - How to perform quality control
 - How to interpret results

Hematopathology

- **Unique pathology subspecialty that involves both anatomic and clinical pathology**
 - Perform and interpret bone marrow biopsies
 - Lymph node analysis
 - Expertise in the hematology, flow cytometry, and coagulation sections of the laboratory
- **You might start your day in the lab, learning how to do a differential on a CBC, set up specimens for flow cytometry analysis, and diagnose coagulopathies.**

Hematopathology

- Hematopathologists work closely with Hematologists and Oncologists and use numerous ancillary tests such as immunohistochemical stains and cytogenetic/molecular tests to arrive at diagnoses.
- Patient population varies widely, from two-year old's with Acute Lymphoblastic Leukemia to 75-year old's with Chronic Myeloid Leukemia.
- And end your day at the microscope, looking at bone marrow biopsies and lymph nodes.

Informatics

- **Spans all areas of pathology and all of medicine.**
 - ACGME accreditation for Clinical Informatics fellowship came about in 2014
- **Laboratory was one of the first places in the healthcare system where informatics became rooted—laboratory analyzers, interfaces, and middleware have been around for many years.**
- **Endless applications in the pathology space—from building clinical decision support around laboratory values, to implementing and using whole slide imaging, to creating image analysis algorithms based on machine learning concepts.**

Informatics- Continued

- **One day you may attend meetings where Laboratory Information System (LIS) issues and solutions are discussed.**
- **Another day, you may meet with providers from different medical specialties to talk about ways to optimize the ordering and delivery of blood products in the electronic health record (EHR).**
- **Another day, you may meet with an attending pathologist and a researcher who are training a computer to recognize minute areas of carcinoma in breast biopsies.**
- **Pathology informatics work affects just about every healthcare worker and patient in the hospital.**

Conclusion

- **As you can see, there's no typical “day in the life” of a pathology resident—rotating through different subspecialties and areas of pathology means you're always being exposed to and learning about something new—there's rarely a dull moment!**
- **Pathologists are expected to have a wide knowledge of pathophysiology and disease that allows them to synthesize information from many clinical subspecialties to give the most accurate, comprehensive diagnoses possible.**
- **Pathologists are necessary to generate the majority of the objective data upon which treatment decisions are based, and they work with their clinical colleagues to ensure that patients receive the best possible care.**



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