General Description:
Diagnostic renal pathology depends on correlating light microscopy, immunofluorescence and electron microscopic findings with the patient's history and clinical presentation. Learning how to perform immunofluorescence and electron microscopies, and interpret these different tissue studies would take more time than is encompassed by the rotation. Therefore, the educational approach used is different than other anatomic pathology rotations. There are four major components to the rotation for learning renal pathology: mini-lectures/discussions with the faculty, reading about the specific disease entities, independent review of archived/study material of the various subjects covered, and looking at current cases (including non-neoplastic parenchyma from tumor nephrectomies) to arrive at differential diagnoses and review with the faculty. There are no formal sign-out experiences as the diagnoses depend on the interpretation of all of the methods performed on renal biopsies. Additionally, the resident is expected to attend the renal pathology conferences on Mondays 2-3 pm, Tuesdays 12-1 pm, Wednesdays 9:15-10:15 am (every other week), and Fridays at 12-1 pm, and become familiar with the technical aspects of tissue processing in IF and EM as well as how to grossly divide a renal biopsy for proper fixation. Lastly, the resident is expected to generate a quiz question and/or a case of month. During the rotation, the resident is expected to attend all required departmental conferences in addition to renal pathology related conferences.

Goals and Objectives:
Upon completion of this rotation, the resident will be able to:
- Develop an understanding of disease mechanisms, basic renal morphology and pathologic processes by light, immunofluorescence and electron microscopies, and how to integrate these with clinical presentations to arrive at a diagnosis. Be able to diagnose common non-neoplastic renal diseases.

The learning objectives below reference the corresponding ACGME core competencies: Patient Care (PC), Medical Knowledge (MK), Professionalism (Prof), Communication Skills (CS), Practice Based Learning and Improvement (PBLI), and Systems-Based Practice (SBP).

Patient Care:
- Understand the clinical syndromes in nephrology.
- Identify patterns of renal injury associated with the clinical syndromes.
- Understand how to integrate clinical history with light, IF and EM findings.
- Understand how to use clinical and morphologic findings to formulate diagnoses.
- Demonstrate knowledge of the common renal medical disorders.
- Demonstrate basic knowledge in morphologic aspects of renal transplant rejection and other aspects of renal transplant damage.
- Identify granules and ultrastructural organelles/features for diagnostic EM.

Medical Knowledge:
- Demonstrate knowledge of the Anderson chapter 65 introduction to renal pathology.
- Understand the reasons for the mandatory manners of examining renal tissue, including light, immunofluorescence and electron microscopies, from patients with medical renal disease.
- Know normal renal morphology and the basic patterns of pathologic processes in all parts.
of the renal parenchyma.

- Understand appropriate tissue collection, fixation and preparation procedures for light microscopy, IF and EM in renal pathology.
- Understand the pathogenesis and mechanisms of representative renal diseases.

**Interpersonal and Communication Skills:**
- Understand the reasons for the mandatory manners of examining renal tissue, including light, immunofluorescence and electron microscopies, from patients with medical renal disease.
- Know normal renal morphology and the basic patterns of pathologic processes in all parts of the renal parenchyma.
- Understand appropriate tissue collection, fixation and preparation procedures for light microscopy, IF and EM in renal pathology.
- Understand the pathogenesis and mechanisms of representative renal diseases.

**Professionalism:**
- Reliability in following instructions for obtaining information or doing additional reading.
- Attending all required conferences, mini-lectures and review on time.
- Reliability in following instructions for obtaining additional studies or information.
- Respect for patient privacy

**Practice-Based Learning:**
- Ability to appraise and assimilate patient history and scientific evidence to improve patient care.
- Set personal learning and improvement goals.
- Utilize evaluation feedback into daily practice.
- Synthesis of skills learned and applying them to other areas of diagnostic pathology.
- Demonstrate ability to perform a literature search or review textbooks to arrive at a diagnosis.
- Identify strengths, deficiencies, and limits in one’s knowledge and expertise.
- Asking questions.

**Systems-Based Practice:**
- Using the information provided by the clinician and/or seeking additional information to aid diagnosis.
- Ability to find clinician contact information.
- Knowing how to find resources.
- Ability to obtain and participate in intradepartmental consultations for optimal patient care.
- Participate in quality assurance/quality improvement projects to identify system errors and implement solutions.

**Topics Covered & Overall Expectations:**

**First day:**
- Review Goals and Expectations document for rotation at 9 am on the first day of the rotation
- Contact Dr. Bu by 9 am the first morning to review the rotation manual and organization, and obtain recommended study material.

**Mini-Lecture Format and Rotation Organization:**
- Rotate with one renal pathology faculty member for 4-5 consecutive days, depending on resident vacation and faculty schedule.
  - **Communication** with the faculty member is key for arranging lectures and slide reviews
- Schedule mini-lectures with the assigned attending. Following the lecture: Read about the topic in Heptinstall or current or classic papers, etc.
  - Review slides, IF and electron micrograph digital images of each disease entity covered; cases can be found in Copath. IF and EM images are on the Q drive at Q:\UMP-\Shares\UMP\SHAREDIR\PATHOLOGY-IMAGING\Electron-Microscopy-Imaging
  - Review examined cases with the faculty to answer questions you may have.
- Post-test and test review on last day of rotation.

**Tissue Handling/Processing Observation**
- Spend one morning each in the IF and EM laboratories to learn specimen processing in these areas.
- Arrange with the PA to attend at least one renal biopsy to see how the renal biopsy specimens are divided for fixation.

The following entities and topics will be selectively covered during the rotation:

- **Introduction**
- **Acute, Chronic Renal Failure**
  - Acute tubular necrosis
  - Acute interstitial nephritis
  - Chronic interstitial nephritis (obstruction, reflux)
- **Chronic inflammatory lesions**
  - Xanthogranulomatous pyelonephritis
  - Malakoplakia
- **Cystic and Genetic Diseases**
  - Autosomal dominant polycystic kidney disease
  - Autosomal recessive polycystic kidney disease
  - Cystic renal dysplasia
  - Acquired cystic disease
  - Fabry disease
- **Vascular Diseases**
  - Nephrosclerosis, Atheroemboli, Renal artery stenosis
  - Thrombotic microangiopathy
- **Systemic Diseases**
  - Diabetes mellitus
- Minimal change disease - Focal and segmental glomerulosclerosis
- **Complement Disorders**
  - Membranoproliferative glomerulonephritis I
  - Dense Deposit Disease
  - Post-infectious glomerulonephritis
- **Rapidly Progressive Glomerulonephritis (RPGN)**
  - Pauci-immune crescentic glomerulonephritis
  - Anti-GBM antibody nephritis
- **Hematuria**
  - IgA nephropathy
  - Thin basement membrane nephropathy/ Alport syndrome
- **Membranous glomerulonephritis**
- **Systemic Diseases**
  - Systemic lupus erythematosis
  - Plasma cell dyscrasias)
- **Transplantation**
  - Antibody mediated rejection
  - Cell mediated rejection
Calcineurin inhibitor nephrotoxicity
- Viral infections
- Post-transplant lymphoproliferative disorder
- Recurrent diseases

Assigned Reading:
- Robbin's pathology: Renal chapter
- Heptinstall’s Pathology of the Kidney, 7th Edition, topics as covered in mini-lectures
- Silva's Diagnostic Renal Pathology 2nd Edition

On-line Resource:

Other Resources:
- The renal biopsy slide files have all light microscopy materials available for review. Copath should be used to identify diseases discussed, and slides pulled from the renal pathology files to study and review with the attending.
  - The corresponding IF and EM images can be found at Q:\UMP-Shares\UMP\SHAREDIR\PATHOLOGY-IMAGING\Electron-Microscopy-Imaging

During the rotation, the trainee is expected to join the following Conferences:
- Resident Didactic Series: Wed 7:00-8:00 AM & 9:15-10:15 AM (weekly) – Mayo D175
- Lab Medicine/Pathology Grand Rounds: Wed 8:00-9:00 AM (weekly) – 450 MCRB
- Anatomic Pathology Consensus Conference: 2:00-3:00 PM (daily) – Mayo C456
- Renal Pathology conferences: Mon 2:00-3:00pm, Tues 12:00-1:00pm, Wed 9:15-10:15 (every other week) & Fri 12:00-1:00pm

Other Requirements:
- Maximum allowed time off is one week, coordinated with other residents on the rotation (if applicable) so that all rotating residents are present for the same 3 weeks.

Assessment methods:
Resident performance on this rotation will be assessed by:
- End of rotation multiple choice question exam based on the subjects reviewed with mini-lectures
- Formative feedback provided by attending physician(s)
- Performance evaluation completed by attending physician(s) at the end of the rotation