Scott and White Diagnostic Radiology Residency
Gastrointestinal/Genitourinary (GI/GU) Rotation
Goals, Objectives and Curriculum

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This rotation involves primarily the traditional modalities (e.g. such as fluoroscopy, intravenous urography, hysterosalpingography, etc.) that were available to evaluate the gastrointestinal and genitourinary tracts before cross sectional imaging techniques were widely used. There techniques are still important parts of radiologic practice. The resident is expected to correlate these traditional examinations performed on this rotation with results from nuclear medicine, ultrasound, CT, MR, and angiography as well as with clinical history and other medical tests when caring for patients. It is expected that the radiology resident will review the clinical history, surgical procedures performed, and other medical tests and examinations prior to beginning an examination in the GI/GU rotation.

Below there are five sections to the GI/GU Goals, Objectives and Curriculum:

I. GOALS AND OBJECTIVES FOR THE COMBINED GI/GU ROTATION

II. INTRODUCTION TO THE GASTROINTESTINAL RADIOLOGY SECTION OF THE ROTATION

III. INTRODUCTION TO THE GENITOURINARY RADIOLOGY SECTION OF THE ROTATION

IV. THE GASTROINTESTINAL RADIOLOGY SECTION CURRICULUM, which is based largely on curriculum developed by the Society of Gastrointestinal Radiology

V. THE GENITOURINARY RADIOLOGY SECTION CURRICULUM, which is based largely on the curriculum developed by the Society of Uroradiology

Separate conferences/lectures will be provided by the faculty to cover the Gastrointestinal and Genitourinary sections of the curriculum.
I. GOALS AND OBJECTIVES FOR THE GI/GU ROTATIONS

Many of the goals and objectives apply to all GI/GU rotations and are listed immediately below. Those goals that are more specific to a particular rotation are listed separately.

The Goals and Objectives for ALL GI/GU Rotations

1. Patient Care skills include understanding what examination is appropriate. Before starting the examination, you should review the request and all applicable clinical history and previous laboratory tests and previous imaging studies to be certain that the proper test has been ordered, that the study is safe, and that any necessary preparation for the test has been completed before starting the examination. If the indication for the examination is unclear, contact the referring physician or another of the patient’s appropriate and knowledgeable health care providers. You should learn how to perform the procedures safely, efficiently and gently from your attending and senior residents. Often experienced technologists are a valuable source of information. Department protocols and other references provide guidance. You should be able to recognize and respond to an adverse reaction to contrast material (intravenous or oral) or to other medications such as glucagon.

2. Medical Knowledge skills are outlined below for each rotation. In addition to reading the suggested texts, reading AJR, Radiology and Radiographics, and the articles for journal club, you should look up any topics about you are not familiar. Internet-based learning is also available in your work area, resident office and the department library. Additionally, attend the departmental conferences.

3. Interpersonal and Communications skills include being able to obtain a history from the patient, referring provider, or other authorized personnel. Important components of the history include the reason for the examination, the relevant diagnosis and conditions that the patient has, any contraindications to the study, the patient’s anxieties or concerns regarding the test, the patient’s signs and symptoms, and the precise nature of any relevant past surgical procedures. If you have any questions about the procedure, discuss them with your radiology attending or the referring health care provider before starting the procedure. You should notify the referring health professional or other appropriate designee of the referring health professional or, if they are not available, other appropriate health care provider of any serious or unexpected findings. A good review is the ACR Practice Guideline for Communication: Diagnostic Radiology. 


Learn to dictate reports in an expeditious, clear, concise and yet comprehensive manner. Teaching the patient, and when appropriate the patient’s family, your peers, medical students, the staff, speech pathologists, physicians, nurses and health professionals for other departments, and, when appropriate, the public are important
communication skills as well as a characteristic of professionalism. In addition to one-on-one communication, the resident should develop skills in presenting at conferences within the department and to other departments.

4. **Professionalism** is a set of many skills; however, three of the cardinal principles of professionalism are (1) the patient’s interests are always paramount (2) always treat the patient, family, visitors and other health professionals with respect (3) know when to ask for help. Some of the components of professionalism include altruism, compassion, excellence, continuous learning, honesty with patients and staff, honor and integrity, avoiding conflict of interests when accepting gifts from patients and vendors and sensitivity to patient needs and viewpoints. Other components of professionalism are a respect for patients rights (including the right to refuse treatment, right to privacy and modesty, and pain management), avoiding sexual or other types of harassment, sensitivity to issues of impairment, a strong work ethic, punctuality (the work day usually starts at 8 a.m. or when teaching conferences are over), professional appearance and understanding biomedical ethics. Scholarly pursuits such as reviewing cases with a given diagnosis, reviewing cases with a new technique, research, presentations at professional meetings or societies or publishing reviews or case reports are encouraged and will be supported by the faculty.

5. **Systems Based Practice** skills include the skills needed to obtain previous patient information before starting an examination using the information based systems (such as PIE, Sequioia and IBEX). You should also use the ACR Appropriateness Criteria and the ACR Practice Guidelines and Technical Standards to learn which tests are considered appropriate and how to perform these tests. ([www.acr.org](http://www.acr.org)). You should understand the requirements of HIPPA, the rulings of the State Health Department, the requirements of health care payers, corporate compliance, and other components of our health care system that impact on patient care. Attendance at national meetings such as the RSNA provides additional training and experience. Participation on hospital or professional society committees or leadership is another valuable learning opportunity.

**Practice Based Learning and Improvement**

You should review each GI/GU case and decide on your impressions and diagnosis *before* you review the case with your attending to maximize your learning from the case. If there are suboptimal studies performed by the staff, you should instruct them diplomatically on how to improve the studies and, when appropriate, identify problem cases to the supervisor. Read about how studies are performed elsewhere to see if you can make suggestions for improvement. Show interesting cases to other members of the department. Follow up results of surgery or examinations performed by other clinical services to determine final diagnosis. When studies (such as ERCP’s) are sent for interpretation by the radiologists after they have been performed by other services (such as gastroenterology) review the films and make your own assessment of the study.
and diagnosis before reviewing the report of the gastroenterologist’s impressions form endoscopy and fluoroscopy. In patients in who require an examination but are at increased risk for complication of procedure (for example at greater risk for renal failure after intravenous contrast was administered) follow patient for laboratory or clinical evidence of untoward effects of the required examination.

**Assessment tools for all GI/GU Rotations:**

1. Reviewing rotation curriculum, goals, and objectives as a benchmark for progress of resident and success of faculty is educating the resident. Discussion regarding the specifics of the document is encouraged to promote improvement of the resident’s learning and the program’s teaching. Positive points and deficiencies and unfulfilled goals and objectives should be discussed by the residents and faculty.
2. Global ratings by faculty including rotation evaluation sheet
3. Resident’s performance discussing unknown cases in conference (one of the metrics on Global Evaluation sheet is particularly important)
4. Conference attendance logs
5. In-service examination
6. Fluoroscopy time log submitted by physicist to Program Director

**Specific Patient Care and Medical Knowledge Goals and Objectives for Rotation 1**

**Patient Care**

At the end of the rotation, the resident should be able to:

1. Use equipment efficiently and safely to perform fluoroscopy examinations including proper KV techniques for the various procedures, radiation safety features of the machines, and proper radiation safety techniques.
2. Fluoroscopy standard views should be mastered during the following examinations:
   a) Barium swallow (esophagram)
   b) Gastrograфин swallow
   c) Upper Gastrointestinal Series
   d) Barium Enema
   e) Air contrast barium enema
   f) Water Soluble Enema
   g) Fistulogram
   h) Intravenous Urogram
   i) Cystogram
   j) Voiding cystourethrogram
   k) Hysterosalpingogram
3. Demonstrate usage of proper KV techniques, patient positioning, and type of after-films that should be taken for the procedures listed in #2 above.
4. Demonstrate initial fluoroscopic skills by identifying the more common abnormalities during the performance of the studies.

**Medical Knowledge**

At the end of the rotation, the resident should be able to:
1. Discuss the proper clinical and radiologic indications for the following studies:
   a) Barium swallow (esophagram)
   b) Gastrografin swallow
   b) Upper Gastrointestinal Series
   c) Barium Enema
   d) Air contrast barium enema
   e) Water Soluble Enema
   e) Small Bowel Follow-through
   f) Endoscopic Retrograde Cholangiopancreatogram
   g) Fistulogram
   h) Intravenous Urogram
   i) Cystogram
   j) Voiding cystourethrogram
   k) Hysterosalpingogram
2. State the physiologic properties, proper concentrations and proper indications for the use of the following contrast material:
   a) Barium
   b) Water soluble contrast media (oral Hypaque or Gastrografin)
   c) Ionic intravenous contrast media
   d) Non-ionic intravenous contrast media
3. Discuss the following information about glucagon:
   a) Proper indications and dosages used in GI radiology
   b) Physiologic effects
   c) Side effects
   d) Contraindications
4. List the high risk factors for allergic reaction to intravenous contrast media.
5. State the proper assessment and treatment for allergic reactions to contrast media.
6. Recognize the normal radiographic appearance of structures of the GI/GU tract.
7. Given an appropriate radiograph, demonstrate a basic knowledge of radiographic abnormalities of the GI/GU tract.
8. Understand the indications and technique for enteroclysis
Specific Patient Care and Medical Knowledge Goals and Objectives for Rotation 2

Patient Care
At the end of the rotation, the resident should be able to:
1. Better perform the GI/GU studies listed in the first rotation.
2. Identify the abnormality at fluoroscopy and modify the technique or change the patient's position or obtain special views or perform special maneuvers to obtain diagnostic fluoroscopic spot films.
3. Decreasing fluoroscopic time needed to perform a study without compromising diagnostic acumen.
4. Demonstrate more confidence when evaluating and integrating data from other studies (CT, MRI, sonography and nuclear medicine) of the GI/GU tract to make recommendations to the referring physician about more appropriate or additional diagnostic studies needed for evaluation of the patient's abnormality.
3. Read and dictate studies with less assistance from the faculty radiologist.

Medical Knowledge
At the end of the rotation, the resident should be able to:
1. Demonstrate review and/or retention of knowledge requirements set forth for the first rotation.
2. Describe and/or discuss GI/GU tract pathology in specific detail.
3. Learn the radiographic appearance of specific diseases on the following procedures:
   a) Barium swallow
   b) Upper gastrointestinal series (UGI)
   c) Barium enema (BE)
   d) Air contrast barium enema (ACBE)
   e) Small bowel follow through (SBFT)
   f) Enteroclysis
   g) Endoscopic retrograde cholangiopancreatogram (ERCP)
   h) Fistulograms
   i) Intravenous Urogram (IVU)
   j) Cystogram
   k) Voiding cystourethrogram
   l) Hysterosalpingogram (HSG)

Specific Patient Care and Medical Knowledge Goals and Objectives for Rotation 3

Patient Care
At the end of the rotation, the resident should be able to:
1. Better perform the GI/GU studies listed in the first two rotations.
2. Read and dictate studies with minimal assistance from the faculty radiologist.
Medical Knowledge
At the end of the rotation, the resident should be able to:
1. Demonstrate review and/or retention of knowledge requirements set forth for the first two rotations.
2. Discuss, with increased understanding, GI/GU tract pathology.
3. Learn the basic concepts of surgical procedures, their indications, their normal radiographic appearance, and finally the radiographic appearance of their complications. In addition to traditional surgical procedures, this would include new procedures such as new laproscopic GI and GU procedures.
4. Learn the indications and techniques and interpretation of Sitzmark studies.
5. Learn the indications and techniques and interpretation of defocacography studies.

Specific Patient Care and Medical Knowledge Goals and Objectives for Rotation 4

Patient Care
At the end of the rotation, the resident should be able to:
1. Perform, interpret, and dictate the GI/GU studies with sufficient competence to be able to practice independently.

Medical Knowledge
At the end of the rotation, the resident should be able to:
1. Demonstrate review and/or retention of knowledge requirements set forth for the first three rotations.
2. Understand the role and basic principles of newly evolving and potential future new examinations such as CT urography, MR angiography, CT/PET, and molecular imaging in the evaluation of GI/GU disease.

II. INTRODUCTION TO THE GASTROINTESTINAL RADIOLOGY SECTION OF THE ROTATION

It is the goal of the Gastrointestinal Division that residents are instructed in the operational use of fluoroscopic equipment and proper techniques for performing studies of the alimentary tract. The residents are taught and expected to learn the indication for these procedures, appropriate protocols including tailored studies for examinations based on clinical indications. Further they are taught the limitations, risks, and complications of these studies. They further become equipped to select appropriate order of multiple GI studies. The rotations require ability on the part of the resident to prioritize emergencies and incorporate them in the schedule of the day. The relevant pharmacology of all drugs and contrast media employed in the above examinations are stressed with thorough knowledge of managing complications. The importance of obtaining an adequate study
while minimizing radiation exposure to the patients as well as the attending staff is stressed as well.

Over the years of training and several rotations in Gastrointestinal Radiology, the residents are exposed to a wide variety of pathology and clinical problems related to the gastrointestinal tract. They are taught normal morphology and function and are expected to indentify both aberrant anatomy and pathology, are to formulate an intelligent differential diagnosis and plan for further investigation to clarify the diagnosis. This requires, at the outset, review, of all requisitions from referring physicians for appropriateness and if necessary, obtaining additional clinical data. Prior relevant studies, both radiological and clinical (endoscopy, etc.) should be obtained for correlation and comparison. The residents are involved in quality assurance discussions as to how our working procedures are improved from learning from experiences in which problems are identified.

Our goal is that the residents, upon completing Gastrointestinal Radiology will be able to advise referring physicians as to the appropriate study for their patients’ complaints/condition, to perform and interpret these studies upon completion, providing an appropriate accounting of the findings and a well formulated conclusion including appropriate differential diagnosis and recommendations.

Residents are expected to read the basic recommended GI radiology texts and monographs during their initial rotation, and more advance textbooks on their second and third rotations. Teaching of residents occurs during daily supervision of cases (generally performed in the morning), and review of these cases (generally performed in the afternoon), as well as monthly GI radiology noon conferences and visiting professor lectures.

**Recommended GI Resident Rotation Reading**

1\(^{st}\) Rotation: Gastrointestinal Radiology Requisites, 2\(^{nd}\) Edition by Halpert & Feczko.

2\(^{nd}\) Rotation: Gastrointestinal Radiology Requisites, 2\(^{nd}\) Edition by Halpert & Feczko.

3\(^{rd}\) Rotation: Diagnostic Imaging: Abdomen.

4\(^{th}\) Rotation: Diagnostic Imaging: Abdomen.

**Reference Text Books**

- Textbook of GI Radiology by Gore, Laufer and Levine
- Double Contrast Gastrointestinal Radiology by Levine, et al.
- Dynamic Radiology of the Abdomen by Myers
- The Abdominal Plain Film with Correlative Imaging by Baker & Cho
III. INTRODUCTION TO THE GENITOURINARY RADIOLOGY
SECTION OF THE ROTATION

The Genitourinary Radiology curriculum consists of (1) a body of medical knowledge, (2) skills and techniques in performing diagnostic and therapeutic radiology examinations and procedures, (3) developed interpersonal and communication skills with other health professionals and patients, (4) providing quality and compassionate medical care, (5) teaching students and other health professionals and patients, (6) improving the practice of medicine based on practice-based experiences, (7) professionalism, and (8) understanding the role of specific radiological procedures and examinations in the institution and health care system. This Genitourinary Curriculum is learned not only on the GI/GU rotations, but also on the Body Imaging CT/MR/Ultrasound, Interventional Radiology, Pediatric, and Nuclear Medicine rotations and lectures/conferences. Formal Medical Physics training, Journal Club articles, Radiology Grand Rounds, Interdepartmental conferences with pathology and urology, the AFIP rotation and many other experiences during your residency contribute to the curriculum.

Some of the techniques and equipment with which the resident should become competent include: radiographic equipment with tomography and fluoroscopy, ultrasound equipment including Doppler techniques, computed tomography, magnetic resonance imaging, nuclear medicine, PET/CT, angiography and interventional radiology.

General Principals applicable to all areas of Uroradiology:

1. The indications, contraindications and complications of each method should be studied. The resident should learn the basic principles of selecting the appropriate imaging evaluation for genitourinary disorders (e.g. ACR appropriateness criteria, and recognized critical pathways), understand the risk/benefit factors of radiologic procedures as they relate to genitourinary tract disease, and understand the principles of outcomes research as applied to the GU tract.
2. Factors affecting the selection of contrast media for radiographic, CT and MRI procedures and radiopharmaceuticals and the proper use and adverse affects of all relevant agents as well as the treatment of adverse reactions are to be learned.
3. The physiology of the urinary tract as it pertains to the use of diagnostic contrast agents and procedures should be mastered.

A more complete list of procedures to understand is provided in the Procedures section of the Syllabus below. However, specific techniques to become competent to perform include:

1. Plain radiographs of the abdomen and pelvis
   Plain tomography of the kidney
2. Urography
   Intravenous urography
   Retrograde pyelogram
   Nephrostograms
3. Lower tract radiography
   - Cystography
   - Voiding cystograms (including pediatric) and cystourethograms
   - Retrograde urethrograms

4. Genital radiography
   - Hysterosalpingography

5. Ultrasonography
   - Renal sonography with various Doppler techniques
   - Renal transplant imaging including various Doppler techniques
   - Adrenal evaluation
   - Ureteral evaluation
   - Bladder evaluation
   - Scrotal ultrasound including Doppler techniques
   - Gynecologic and obstetrical sonography including Doppler and transvaginal techniques

6. Computed tomography and computed tomographic angiography
   - Renal mass evaluation and staging
   - CT IVU technique and interpretation
   - Renal/ureteral calculus CT technique and interpretation
   - PET/CT

7. Magnetic resonance imaging and magnetic resonance angiography
   - Renal mass/cyst evaluation and classification
   - Renal artery MRA
   - Renal vein or IVC tumoral involvement

8. Angiography and venography of the kidney
   - Renal artery stenting

9. Nuclear medicine of the urinary tract
   - Renal scintigraphy
   - Diuretic renography
   - Screening for renovascular hypertension
   - Renal transplant evaluation
   - Scrotal scintigraphy
   - Vesicoureteral reflux studies
   - PET/CT

10. Interventional radiology
    - Percutaneous nephrostomy
    - Percutaneous biopsy
    - Percutaneous abscess drainage

Additional goals and objectives for the GU curriculum:

1. The resident should attend all genitourinary lectures and conferences.

2. The resident should read a basic textbook, either:
   - The Genitourinary Radiology Requisites, 2nd Edition by Zagoria
3. On later rotations, consult and be familiar with Diagnostic Imaging: Abdomen.

3. References to consult:
   Radiology of the Kidney and Genitourinary Tract by Davidson, et al.
   Clinical Urography by Pollack.

4. Review the ACR Appropriateness Criteria for Genitourinary Radiology as well as pertinent ACR Standards.

IV. THE GASTROINTESTINAL RADIOLOGY SECTION CURRICULUM

Developed by the Society of Gastrointestinal Radiology

I. Physics
   A. Composition of standard contrast agents
   B. KVp setting for standard studies

II. Pharynx
   A. Technique of examination
   B. Normal anatomy
   C. Benign diseases
      1. Congenital disorders
         a. Branchial cleft cysts
         b. Thyroglossal duct cysts
      2. Webs
      3. Diverticula
      4. Foreign bodies
      5. Trauma
   D. Malignant tumors
      1. Primary squamous cancer
      2. Salivary gland tumors
      3. Lymphoma
      4. Metastases
   E. Motility disorders
      1. Normal pharyngeal motion
      2. The modified barium swallow
   F. The postoperative pharynx
      1. Total laryngectomy
      2. Partial laryngectomies

III. Esophagus
   A. Technique of examination
   B. Normal anatomy
   C. Benign diseases
      1. Congenital abnormalities
      2. Diverticula
3. Trauma
4. Esophagitis
   a. Reflux
   b. Infectious
   c. Caustic
   d. Drug-induced
5. Barrett's esophagus
6. Rings, webs, strictures
7. Varices
8. Benign tumors and tumor-like conditions
9. Extrinsic processes affecting the esophagus
   a. Vascular structures
   b. Mediastinal structures
   c. Pulmonary abnormalities
   d. Vertebral and paravertebral structures

D. Malignant tumors
   1. Squamous
   2. Adenocarcinomas
   3. Other malignant tumors

E. Motility disorders
   1. Normal esophageal motility
   2. Primary motility disorders
   3. Secondary motility disorders

F. The postoperative esophagus

IV. Stomach
   A. Normal anatomy and variations
   B. Technique of examination
   C. Benign diseases
      1. Congenital
      2. Diverticula
      3. Gastritis
         a. Erosive
         b. Hemorrhagic
         c. Atrophic
         d. Granulomatous and gummatous
            i. Sarcoidosis
            ii. Crohn's
            iii. Syphilis
         e. Infectious
         f. Miscellaneous
            i. Eosinophilic
               ii. Amyloidosis
   4. Peptic ulcer disease
      a. Epidemiology
      b. Etiology
      c. Healing of peptic ulcers
d. Complications
5. Hypertrophic gastropathy
6. Varices
7. Motility disturbances
D. Malignant diseases
1. Primary
   a. Adenocarcinoma
   b. Lymphoma
   c. GIST (Gastrointestinal stromal tumors)
   d. Carcinoid
2. Metastatic
   a. Hematogenous
   b. Lymphatic
   c. Peritoneal
E. The postoperative stomach
   1. Technique of examination
   2. Expected surgical appearance
   3. Complications
V. Duodenum
   A. Benign diseases
      1. Congenital abnormalities
      2. Diverticula
      3. Hernia
      4. Trauma
      5. Inflammation
         a. Duodenitis
         b. Duodenal ulcers
         c. Crohn's
      6. Varices
      7. Aortoduodenal fistula
      8. Systemic diseases
         a. Sprue
         b. Whipple's
         c. Scleroderma
      9. Benign tumors
   B. Malignant diseases
      1. Adenocarcinoma
      2. Lymphoma
      3. Metastatic disease
VI. Small Intestine
   A. Technique of examination
   B. Normal anatomy and variants
   C. Benign diseases
      1. Congenital disorders
      2. Diverticula
      3. Trauma
4. Vascular diseases
   a. Intestinal ischemia and infarction
   b. Radiation enteritis
   c. Scleroderma
   d. Vasculitides
      i. Henoch-Schonlein purpura
      ii. Polyarteritis nodosa
      iii. Systemic lupus erythematosus
   iv. NSAIDS enteritis
   e. Varices

5. Malabsorption
   a. Sprue
   b. Lymphangiectasia

6. Inflammatory diseases
   a. Crohn's
   b. Infectious and parasitic diseases

7. Benign tumors
   a. Sporadic
   b. Associated with polyposis syndromes

D. Malignant tumors
   1. Adenocarcinoma
   2. Lymphoma
   3. Carcinoid
   4. GI stromal tumors
   5. Metastases
      a. Hematogenous
      b. Peritoneal

VII. Colon and Appendix
   A. Technique of examination
   B. Normal anatomy
   C. Benign diseases
      1. Congenital abnormalities
      2. Diverticular disease
         a. Demographics
         b. Pathogenesis
         c. Diverticulitis
      3. Inflammatory diseases
         a. Crohn's
         b. Ulcerative colitis
         c. Infectious colitis
            i. Pseudomembranous
            ii. Viral
            iii. Bacterial
            iv. Colitis in AIDS
         d. Appendicitis
      4. Ischemic colitis
      5. Benign neoplasms
         a. Adenoma
b. Mesenchymal tumors
c. Polyposis syndromes

6. Motility disorders
   a. Demographics
   b. Etiology
   c. Dynamic proctography
      i. Technique
      ii. Findings
      iii. Surgical decision-making

D. Malignant diseases
   1. Adenocarcinoma
      a. Demography
      b. Etiology and risk factors
      c. Biologic behavior
      d. Staging
      e. Surgical decision-making
   2. Other malignant tumors
      a. Lymphoma
      b. Metastases

VIII. Pancreas
   A. Normal anatomy
   B. Congenital abnormalities and variants
   C. Imaging methods
   D. Pancreatitis
      1. Etiology
      2. Clinical staging
   E. Pancreatic neoplasms
      1. Duct cell adenocarcinoma
      2. Cystic pancreatic neoplasms
      3. Islet cell tumors

IX. Liver
   A. Normal anatomy
      1. Classical gross anatomy
      2. Couinaud segmentation
   B. Congenital abnormalities
   C. Imaging methods
   D. Diffuse diseases of the liver
      1. Cirrhosis
      2. Diseases associated with infiltration
         a. Fatty infiltration
         b. Hemochromatosis
         c. Storage diseases
      3. Vascular diseases
         a. Portal hypertension
         b. Portal vein occlusion
         c. Hepatic venous hypertension
   E. Focal diseases of the liver
1. Benign
   a. Focal fatty infiltration
   b. Cavernous hemangioma
   c. Liver cell adenoma
   d. Focal nodular hyperplasia
   e. Regenerating nodules in cirrhosis

2. Malignant
   a. Hepatocellular carcinoma
      i. Epidemiology
      ii. Etiology and risk factors
      iii. Surgical decision-making
   b. Metastases
      i. Variation in appearance
      ii. Pitfalls in diagnosis
      iii. Surgical metastasectomy
   c. Other malignant liver lesions

F. Liver transplantation
   1. Surgical candidates
   2. Expected postoperative appearance
   3. Complications

X. Spleen
   A. Normal anatomy and variants
   B. Congenital abnormalities
   C. Splenomegaly
   D. Focal lesions
      1. Cysts
      2. Hemangioma
      3. Infarction
      4. Abscess
      5. Granulomatous disease

XI. Bile Ducts and Gallbladder
   A. Normal anatomy and variants
   B. Techniques of examination
   C. Congenital abnormalities
      1. Choledochal cysts
      2. Caroli's disease
   D. Inflammatory diseases
      1. Gallbladder
         a. Acute cholecystitis
            i. Calculous
            ii. Acalculous
         b. Chronic cholecystitis
      2. Biliary ducts
         a. Primary sclerosing cholangitis
         b. Ascending cholangitis
         c. Recurrent pyogenic cholangitis
d. AIDS cholangiopathy
e. Ischemic injury
f. Surgical injury
   i. Mechanisms
   ii. Bismuth classification
   iii. Surgical decision-making

XII. Peritoneal Spaces
   A. Normal anatomy and embryology
   B. Distribution of fluid collections
   C. Diseases of the peritoneum
      1. Inflammatory diseases
         a. Bacterial peritonitis
         b. Sclerosing peritonitis
      2. Primary tumors
      3. Metastatic tumors

XIII. Retroperitoneum
   A. Normal anatomy and embryology
   B. Retroperitoneal spaces
   C. Retroperitoneal planes
   D. Benign diseases
      1. Fibrosis
      2. Inflammatory diseases
   E. Malignant tumors

XIV. Mesenteries
   A. Normal anatomy and embryology
   B. Relationship to retroperitoneum
   C. Pathologic conditions
      1. Primary
      2. Arising in the bowel
      3. Arising in the retroperitoneum
      4. Arising in the peritoneum
      5. Systemic diseases

XV. Percutaneous Biopsy and Fluid Aspiration

XVI. Multisystem Disorders
   A. Acute abdomen
   B. Trauma to the abdomen
   C. Collagen vascular diseases
   D. Syndromes involving the Gastrointestinal Tract

V. THE GENITOURINARY RADIOLOGY SECTION CURRICULUM

The curriculum is based in large part on the syllabus developed by the Committee on Resident Curriculum of the Society of Uroradiology.

ANATOMY AND EMBRYOLOGY OF THE GENITOURINARY TRACT
EMBRYOLOGY of the genitourinary system, adrenal

CONGENITAL ANOMALIES

Renal
- Anomalies of number
  - Agenesis
  - Supernumerary kidney
- Fusion anomalies
  - Horseshoe kidney
  - Cross fused ectopia
- Positional anomaly
  - Malrotation
  - Pelvic, inferior ectopic
  - Intrathoracic kidney

Ureteral
- Blind ureter
- Duplication
  - Partial
  - Complete
  - With ectopia
    - ectopic ureterocele
  - Heterotopic ureterocele
- Ectopic insertions

Obstructions
- UPJ obstruction
- Obstructive megaureter
- Ureteral stricture

Bladder
- Exstrophy
- Urachal anomalies
- Duplication
- Congenital diverticula

Urethra
- Epispadias
- Hypospadias
- Duplications
- Urethral obstructions
  - Posterior valves
  - Anterior valves
  - Meatal stenosis
  - Diverticulum

Male genital
- Cryptorchidism
- Agenesis seminal vesicles
- Utricular cysts
Female
Vaginal agenesis
Uterine anomalies
   Agenesis
   Unicornuate uterus
Fusion anomalies
   Septate uterus
   Bicornuate uterus
   Uterus didelphys

Intersex States

NORMAL ANATOMY
Renal
Ureter
Bladder
   Extraperitoneal pelvic spaces
Urethra
Male Genital
Female Genital
Adrenal
Retroperitoneum

PROCEDURES - Diagnostic and therapeutic (basic principles of computers, digital imaging, PACS, and teleradiology should be understood.)
Contrast media (pharmaceuticals)
   History
   Principles, physiology ionic contrast
   Non ionic contrast
   MRI contrast media
   Radiopharmaceuticals for urinary tract evaluation
Contrast for hysterosalpingography
   Oil based
   Water soluble
   Saline
Pathophysiology, incidence, classification and treatment of contrast reactions
Diagnostic procedures
   Radiography - kidney
      Plain radiography
      Intravenous urography
      Retrograde pyelography
      Antegrade pyelography
   Radiography - lower urinary tract
      Plain radiography
      Cystography
      Voiding cystourethrography
Retrograde urethrography
Conduitograms & diversions
continent diversion
Radiography - genital
Cavernosography
Hysterosalpingography
Ultrasonography
Real time, gray scale imaging
Doppler imaging
Renal, ureteral
ureteral jets
Bladder
Scrotum and contents
Female genital
Obstetric
Transvaginal
Adrenal
Transrectal prostatic
Penile gray scale, Doppler (impotence)
Computed tomography
Magnetic resonance imaging
Adrenal mass
Renal mass
Prostate gland
Urinary bladder
Gynecological mass and anomalies
Renal and transplant MRA
Arteriography, venacavography
Renal- including selective, digital arteriography
Renal venography, renal vein sampling
Pudendal, penile arteriography
Testicular venography
Adrenal venography, venous sampling
Nuclear medicine diagnostic procedures
Therapeutic procedures
Percutaneous nephrostomy
Techniques of tube placement and management
Whitaker test
Percutaneous stone treatment
Mass biopsy
Cyst aspiration and/or ablation
Renal mass biopsy
Lymph node biopsy
Angioplasty
Abscess drainage
Embolization of renal tumors
Embolotherapy of varicocele
Gynecologic interventions
  Fallopian tube recanalization
Ureteral interventions
Stone removal
Brush biopsy
Stent placement
Occlusion
Urethral interventions

KIDNEY
Normal anatomy and physiology
  Normal renal size, growth
    Measurements-radiographic, sonography
Normal variants
  Pseudotumors (column Bertin)
Cystic disease
  Isolated cysts
  Simple cortical cysts
  Complicated cortical cysts
  Milk of calcium cysts
  Perinephric cysts
  Autosomal dominant cystic disease
  Autosomal recessive cystic disease
  Multicystic dysplastic kidney
  Medullary sponge kidney
  Medullary cystic disease
  Cysts of renal sinus
  Pyelocalyceal diverticulum
  Cysts associated with other diseases
  Acquired cystic disease (dialysis)
  Van Hippel Lindau
  Tuberous sclerosis
Renal neoplasm
Benign
  Mesoblastic nephroma, nephroblastomatosis
  Multilocular cystic nephroma
  Angiomyolipoma
  Adenoma
  Oncocytoma
  Leiomyoma
  Juxtaglomerular cell tumor
Malignant neoplasms - (knowledge base should include
  pathology: imaging features, and staging criteria)
  Wilms' tumor
  Adenocarcinoma of kidney
Cystic variant
Papillary
Sarcomatoid
Medullary carcinoma
Bellini duct carcinoma
Renal sarcomas and mesenchymal tumors
Leiomyosarcoma
Malignant fibrous histiocytoma
Transitional cell carcinoma of kidney
Secondary (metastatic) neoplasms of kidney
Metastasis to kidney
Renal lymphoma
Inflammatory disease of the kidney
Acute infection – pyelonephritis
Emphysema pyelonephritis
Reflux nephropathy
Renal abscess
acute
chronic
Chronic infection
chronic pyelonephritis
tuberculosis
xanthogranulomatous pyelonephritis
malakoplakia
Pyonephrosis
Nonbacterial
Fungal
Parasitic
HIV-associated nephropathy
Vascular disease
Normal vasculature and variants
Renal hypertension, stenosis
Atherosclerotic disease
Fibromuscular dysplasia
Aneurysms
Arteriovascular malformations, arteriovascular fistulas
Vasculitis
Venous anatomy and anomalies
Venous occlusions
Renal vein thrombosis
Renal vein varices
Stone disease and its complications and treatment
Incidence and physiology of stone disease
Nephrocalcinosis, types and causes
Cortical
Medullary
Nephrolithiasis
  Different stones, radiologic properties, techniques for evaluation
  Urography, sonography, computed tomography, radiographs
  Complications of stones
  Treatment of stones
    Expectant
    Percutaneous, endourologic
    ESWL
    Surgical
Renal failure, medical nephropathies
  Pathology and physiology of acute and chronic renal failure
  Imaging investigation
    Acute renal failure
    Chronic renal failure
  Techniques
    Intravenous urography
    Ultrasound
    CT
    Retrograde pyelography
    Nuclear imaging
    MRI
  Specific disorders
    Chronic obstructive uropathy
    Nephrosclerosis
    Glomerulosclerosis
    Renal papillary necrosis (various causes)
    Other nephridites, including drug induced, SLE, etc.

Obstructive uropathy
  Acute ureteral obstruction – physiology
    Imaging features
    Pyelorenal backflow
  Chronic ureteral obstruction
    Imaging features
    Obstructive atrophy of kidney

Renal transplantation and complications
  Selection of donors, surgical technique, anatomy of transplants
  Evaluation of rejection, ATN
  Urologic complications
    Ureteral obstruction
    Urinary leak
  Vascular complications
    Vascular thrombosis
    Arterial stenosis
AV fistula
Peritransplant fluid collections

URETER
Normal anatomy
Normal course
Variants, herniation, simple ureterocele (see congenital abnormalities above)
Ureteral dilatation
Congenital obstruction
UPJ
Primary megaloureter
Congenital stricture
Vesicoureteral reflux
Nonobstructive dilation
Hydronephrosis of pregnancy
Acquired stricture
Ureteral neoplasms
Benign
Fibroepithelial polyp
Papilloma
Malignant
Transitional cell carcinoma
Squamous cell carcinoma
Adenocarcinoma
Secondary tumors of the ureter
Retroperitoneal adenopathy
Extrinsic tumors
Metastases to ureter
Intrinsic ureteral inflammation
Pyeloureteritis cystica
Pseudodiverticulosis
Tuberculosis
Schistosomiasis
Extrinsic diseased involving ureter
Vascular compressions
Retroperitoneal fibrosis
Endometriosis
Inflammatory bowel disease
Pelvis inflammatory disease

BLADDER
Normal physiology and function
Urodynamic techniques
Variants and abnormal position
Herniation
Prolapse
Displacement by extrinsic mass

Functional disorders
  Incontinence
  Stress incontinence
  Urge, other incontinence

Neurogenic bladder
  Uninhibited bladder
  Detrusor hyperreflexia
    Autonomic dysreflexia
  Detrusor areflexia

Outlet obstruction
  Compensatory hypertrophy, radiography

Diverticula

Intraluminal filling defects
  Clot
  Calculi
  Foreign body
  Fungus ball

Neoplasms
  Benign
    Fibroepithelial polyp
    Leiomyoma
    Papilloma
    Neurofibroma
    Nephrogenic adenoma
    Pheochromocytoma
  Malignant
    Transitional cell carcinoma
    Squamous cell carcinoma
    Adenocarcinoma
    Urachal carcinoma
    Rhabdomyosarcoma
    Carcinosarcoma
    Lymphoma

Secondary neoplasms of the bladder
  Metastases
  Extrinsic invasion
  Lymphoma

Inflammation
  Bacteria infections
    Cystitis
      acute
      emphysematous cystitis
      chronic
      alkaline encrustation cystitis
cystitis cystica and cystitis glandularis

Other infections
- Tuberculosis
- Fungal
- Schistosomiasis
- Malakoplakia

Noninfectious
- Drug induced (e.g. cyclophosphamide)
- Chemical cystitis
- Radiation induced
- Eosinophilic cystitis
- Cystitis glandularis
- Interstitial cystitis

Involvement by extrinsic inflammation
- Endometriosis
- Inflammatory bowel disease

Bladder fistulas
- Enterovesical
- Colovesical
- Vesicovaginal
- Vesicouterine
- Vesicocutaneous

Extrinsic diseases involving bladder
- Pelvic lipomatosis
- Retroperitoneal fibrosis
- Prostate enlargement
- Uterine and masses

Urinary diversions and replacement techniques
- Ileal conduit
- Colonic diversions
- Continent diversions
  - Iliocecal
  - Koch pouch

URETHRA

Normal structure and function
- Male
- Female
- Intersex states

Congenital deformities and structures

Neoplasms and masses
- Benign
  - Condylomata
  - Fibroepithelial polyp
- Malignant
  - Squamous cell carcinoma
Transitional cell carcinoma

Inflammatory
  Urethritis
    Gonococcal
    Nongonococcal
  Tuberculosis
  Schistosomiasis
  Female urethral syndrome
    Female urethral diverticulum

Strictures, fistula
  Inflammatory
  Post-traumatic
  Iatrogenic
  Surgical treatments

Artificial urethral sphincters

MALE GENITAL TRACT

Prostate
  Normal structure and function
    (including zonal anatomy on MRI and ultrasound)
  Prostatic calcification
  Benign prostatic hypertrophy
  Malignant neoplasms
    Rhabdomyosarcoma
    Adenocarcinoma
  Prostatitis
  Prostatic abscess

Seminal vesicles
  Normal structure and function
  Congenital and acquired cysts
  Neoplasms
    Primary
    Invasion by prostatic carcinoma
  Duct obstruction (obstructive azoospermia)

Testicles
  Normal structure and function
    Cryptorchidism
    Testicular failure
  Testicular cysts
  Neoplasms
    Benign
    Malignant
      Germ cell tumors
      Nongerm cell tumors
        lymphoma
        metastases
Microlithiasis
Inflammation
   Orchitis
   Abscess

Testicular torsion
Scrotum
   Normal structure and function
   Hydrocele
   Epididymitis
   Tumors of the spermatic cord, epididymis and rete testes
   Varicocele
   Scrotal stones
   Fournier’s gangrene

Penis and corpora
   Normal structure and function
   Erectile physiology
   Impotence
      Psychogenic
      Arteriogenic
      Venous insufficiency
   Peyronie’s disease
   Priapism
   Penile implants

FEMALE GENITAL TRACT
Uterus and tubes
   Normal anatomy and function
   Infertility due to anomalies (see Anatomy and Embryology/Female above)
   Neoplasms
      Benign
         Adenomyosis
      Cervical carcinoma
      Endometrial carcinoma
   Pelvic inflammatory disease
      Hydrosalpinx
      Salpingitis isthmica nodosum
      Granulomatous disease

Ovaries
   Normal structure and function
   Ovarian failure
   Ovarian neoplasms
   Inflammatory disease
   Endometriosis
ADRENAL GLANDS
   Normal anatomy and function
   Endocrine disorders
      Cushing’s syndrome
      Hyperaldosteronism
      Virilization
      Catecholamine excess
      Adrenal insufficiency
   Nuclear medicine imaging
   Hyperplasia
      Congenital hyperplasia, adrenogenital syndrome
      Secondary
         Excess ACTH
      Secondary hyperaldosteronism
   Primary acquired hyperplasia
   Neoplasms
      Cortical adenoma
      Nonhyperfunctioning
         Imaging
            CT without and with contrast
            MRI – in phase and out of phase
         Fine needle biopsy techniques
      Hyperfunctioning
      Medullary
      Neuroblastoma
      Pheochromocytoma (including MEN, VHL, neurofibromatosis)
         Paraganglioma
      Ganglioneuroma, ganglioneuroblastoma
      Nuclear medicine imaging and MRI
   Adrenal carcinoma
   Secondary neoplasm of adrenal
      Metastases
      Lymphoma
   Myelolipoma
   Inflammatory
      Tuberculosis
      Histoplasmosis
      Abscess
         Meningococcemia
   Non-neoplastic masses
      Adrenal cysts
      Adrenal hematoma

RETROPERITONEUM
   Normal anatomy, compartment
Retroperitoneal fibrosis
   Idiopathic
   Secondary
Retroperitoneal neoplasms
   Primary
   Metastatic

TRAUMA OF THE URINARY TRACT
Modification of procedures in trauma setting
   “One-shot IVP”
Renal
   Blunt trauma – role of CT
Bladder
   Conventional or CT cystogram
   Appropriate patient selection
Renal trauma
   Minor injuries
      Contusion
      Hematomas
   Moderate injuries
      Lacerations
   Severe injuries
      Deep lacerations
      Fracture
   Vascular injuries
   Sequelae or renal injuries
   Iatrogenic injury
      Post biopsy AV fistula or pseudoaneurysm
Bladder trauma
   Contusion
   Rupture
      Intraperitoneal
      Interstitial
      Extraperitoneal
   Iatrogenic bladder injury
Urethral trauma
   Anterior urethra
      Straddle injury
   Posterior urethral injury
      Types I through V
   Penetrating trauma
   Female urethral injury
Penile trauma
   Fracture of penis
Scrotal trauma
   Testicular and epididymal hematoma
Testicular rupture
Adrenal trauma
  Neonatal adrenal hematoma
  Adult adrenal trauma