

Resident Core Curriculum

Abdominal-Gastrointestinal Radiology and Fluoroscopy

General Goals: The goals include objectives required for every level of training with graduated levels of supervision and responsibility. During every training rotation, the resident will read the required literature and study the teaching file in abdominal and gastrointestinal radiology. Over time, the resident will become progressively more knowledgeable about normal radiographic anatomy, physiology of abdominal organs, and the radiological appearances of abdominal diseases, and gain competency to perform fluoroscopic procedures. In addition, the resident will demonstrate a progressively increased understanding of disease entities, their clinical presentations, and current modes of treatment.

Resident Daily Work Responsibilities (OVERALL BENCHMARKS/OBJECTIVES for Self-Evaluation)

1. Residents assigned to abdominal imaging will be available for consultations by fluoroscopy and CT technologists, clinicians, and other health care providers, except during conference times, when the attending faculty will cover.
2. Resident questions will be referred to the supervising faculty covering abdominal radiology.
3. Resident review of cases with the supervising faculty will be conducted as many times in the day as necessary to keep an efficient workflow.
4. All resident examinations will be dictated by the end of every working day.
5. Residents will ensure all the exams on the GI/GU worklist, including abdominal radiographs, fluoroscopic examinations, endoscopic procedure images (e.g., ERCP) and urologic procedure exams (e.g. videofluoroscopy and litho spot films) are interpreted by the end of the working day.
6. Residents will check and sign their reports prior to final verification by supervising faculty.
7. Residents must be familiar with the operation of all fluoroscopic equipment.
8. Residents must acquire knowledge of radiation protection and ways to reduce radiation exposure to both patients and hospital personnel. The resident will be supervised to assure that safe practices are followed.
9. Residents will learn the fluoroscopic techniques for performing high quality, state-of-the art diagnostic examinations throughout the body, but especially the gastrointestinal tract. Examinations will be checked before the patient leaves the department if requested to do so by the supervising faculty.
10. Residents will become familiar with the technique of performing CT colonography.
11. Residents must become proficient at detecting abnormalities demonstrated by abdominal plain films, contrast examinations of the alimentary tract, and CT colonography; and be able to generate meaningful differential diagnosis.
12. Residents will learn current methods for performing fluoroscopically-guided interventional diagnostic and therapeutic procedures, such as balloon dilation of the luminal gastrointestinal tract and gastrointestinal tube placements.
13. Residents will become knowledgeable about the use of different radiographic contrast agents (including their indications, contraindications, dosages, and side effects).
14. Residents will acquire an understanding of the proper preparation of patients for examinations and appropriate follow-up. At the start of every working day, the resident will be familiar with the patient schedule and anticipate the need for any procedures. The resident will check

requisitions for the next working day to evaluate for appropriateness of the requested procedure or if additional exams/protocols need to be performed. Absent clinical indication or seemingly inappropriate requests will be clarified and discussed with the referring physician.

15. Residents will do in-depth reading and study, along with a review of teaching file cases, to become knowledgeable about the normal anatomy and physiology of abdominal organs and the radiologic appearances of gastrointestinal diseases, and gain a general understanding of the disease entities, their clinical presentations, and certain modes of treatment.
16. Residents will serve as a secondary consultant to referring physicians regarding abdominal imaging. This will strengthen the confidence of the resident in the very important role every radiologist must perform throughout his/her career as a consultant to clinicians.
17. Residents will become prepared to pass the gastrointestinal section of the American Board of Radiology core examination.
18. Residents will teach and share knowledge with medical students, radiologic technologist students, and junior residents.
19. Residents will participate in the preparation and presentation of imaging studies at divisional interesting case conferences.

Supervising Faculty Responsibilities:

1. Supervising faculty will be available at all times for any questions or consultations needed by the resident.
2. Supervising faculty will review all cases with the residents before the end of the day.
3. Supervising faculty will provide the resident with constructive feedback in any problem areas encountered during the rotation.
4. Supervising faculty will verify resident-generated reports in a timely manner and inform the resident of any major changes made.

Educational Goals and Objectives (First Year Residents):

Patient Care and Technical Skills:

PCTS1: Consultant

- Demonstrate knowledge of the ACR practice guidelines and technical standards for fluoroscopy
- Efficiently use electronic and print sources to access information

PCTS2: Competence in Procedures

- Become familiar with the operation of fluoroscopic equipment
- Perform an adequate upper gastrointestinal series, barium swallow, barium enema, and cine swallow study
- Develop a knowledge of the preparation and aftercare required for the common examinations

Medical Knowledge:

MK1: Protocol and selection and optimization of images

- Learn the basic physics of radiography and fluoroscopy
- Observe and learn the techniques to achieve high-quality diagnostic examinations of the gastrointestinal tract

- Demonstrate the ability to recommend additional imaging studies as appropriate to better assess findings on abdominal imaging studies
- Explain the impact of the radiology findings on patient care, including what imaging studies may/may not be appropriate

MK2: Interpretation of examinations

- Develop a knowledge of normal and abnormal anatomy of the gastrointestinal tract as demonstrated on contrast studies
- Develop a knowledge of the normal and abnormal anatomy of the genitourinary tract as demonstrated on contrast studies
- Become knowledgeable about the different contrast agents available and begin to recognize abnormalities that are demonstrated on abdominal plain radiographs and fluoroscopic studies of the alimentary tract
- Recognize the more common abnormalities encountered in the GI tract, such as stricture, polyp, ulcer, and mass
- Develop a knowledge of the differential diagnoses of the more commonly encountered abdominal/gastrointestinal abnormalities
- Demonstrate the ability to recognize and describe common medical conditions depicted on abdominal imaging studies
- Recognize critical findings on emergency CT evaluations of the abdomen and pelvis

System-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, contrast safety, fluoroscopy safety, and sedation required in the performance of examinations
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

SBP2: Health care economics

- Demonstrate knowledge of ACR appropriateness criteria and cost effective imaging evaluation of common disorders
- Show ability to interact with clinicians regarding cost effective and streamlined evaluation for different clinical entities

Practice-Based Learning and Improvement:

PBLI1: Patient safety: contrast agents; radiation safety; MR safety; sedation

- Aware of the basic principles of radiation protection in order to minimize the radiation dose to the patient and reduce exposure to healthcare providers
- Understand the indications for, and contraindications to, use of intravenous and enteric radiographic contrast material, and be able to monitor its administration
- Recognize and treat reactions to intravenous and enteric contrast media
- State the proper assessment and treatment for allergic reactions to contrast media
- Understand the indications and contraindications to the different types of contrast material dosages, side effects, and the differences and relative merits of single and double contrast studies
- List the risk factors for allergic reaction to intravenous contrast media
- State the proper assessment and treatment for allergic reactions to contrast media

PBLI2: Self-Directed Learning

- Show evidence of independent study using textbooks from reading list
- Demonstrate appropriate follow up of interesting cases
- Research interesting cases as directed by faculty
- Identify, rectify, and learn from personal errors
- Incorporate feedback into improved performance

Professionalism:

PROF1: Professional Values and Ethics

- Demonstrate respect for patients, families, and all members of the healthcare team and be able to discuss significant radiology findings
- Respect patient confidentiality at all times
- Present oneself as a professional in appearance and communication
- Demonstrate a responsible work ethic with regard to work assignments

Interpersonal and Communication Skills:

ICS1: Effective communication with patients, families, and caregivers

- Communicate with the patient at all times during the examination to ensure that patient remains comfortable
- Adequately explain each examination to the patient in order to ensure that the patient feels comfortable. Provide patient care that is compassionate, appropriate, and effective.

ICS2: Effective communication with members of the health care team

- Communicate effectively with all members of the health care team (technologists, medical students, fellows, residents, allied health providers, support staff, and attending physicians/radiologists)
- Call results to the referring physicians and show ability to interact with referring physicians
- Interact with clinicians when reviewing cases involving radiographs and abdominal imaging studies and show ability to provide preliminary readings, follow up with attending radiologists, formulate a plan of complex cases, and communicate any changes to referring clinicians
- Use the PACS, voice recognition systems, and hospital information systems to become proficient in dictating reports of significant fluoroscopic and radiographic findings in a concise and clear manner
- Able and willing to participate in multidisciplinary clinical conferences in which imaging studies are used to guide patient care/evaluations and be able to demonstrate understanding of how imaging relates to the clinical care of the patient

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. At the end of each rotation, the resident will receive a consensus evaluation of performance from the faculty on service. Deficiencies or substandard performance will be discussed personally and privately with the resident and will be brought to the attention of the Residency Program Director by the attending radiologist. Resident performance is also evaluated through direct observation, case logs, multi-source professional evaluations, structured case discussion, review of patient outcomes, and other performance evaluation methods as determined by the program.

Educational Goals and Objectives (Second Year Residents):

The objectives from Year 1, as well as the following:

Patient Care and Technical Skills:

PCTS1: Consultant

- Demonstrate knowledge of ACR practice guidelines and technical standards for fluoroscopy and intravenous urography
- Familiarity with available medical records and how to access them for the purposes of patient care

PCTS2: Competence in procedures

- Develop knowledge of the preparation and aftercare required for more complex procedures.
- Develop knowledge and skills to perform and interpret CT colonography.
- Continue to develop skills for performing fluoroscopic and radiographic examinations, and tailor examinations to answer all questions being asked by the clinician; anticipate those questions that should have been asked but were not
- Show involvement in fluoroscopic-guided intervention involving the gastrointestinal and genitourinary systems and assist the attending radiologist as appropriate
- Observe fluoroscopically-guided interventional procedures and assist more senior residents and faculty as needed

Medical Knowledge:

MK1: Protocol selection and optimization of images

- Develop a knowledge of the physics of radiography and be able to explain the function of each part of the imaging chain, including the generator, the fluoroscopy unit, grids, and screens
- Recommend the appropriate study based on the clinical scenario and understand the relative strengths of each modality
- Demonstrate knowledge of indications for the examinations requested (when the reason for the examination is not clear, the resident will effectively communicate with the patient and referring physician until clarified)
- Protocol cases, in consultation with the attending, to assure that the fluoroscopy examination is appropriate and of sufficient quality to address the clinical concerns of the patient and referring physician

MK2: Interpretation of examinations

- Familiarity with the anatomy of the organs examined in every case
- Familiarity with imaging findings of common acute and chronic geriatric diseases evaluated with fluoroscopy
- Identify pathology in order to interpret routine fluoroscopy and CT colonography studies with accuracy appropriate to the level of training when presenting to the attending
- Distinguish between normal and abnormal abdomen and pelvis anatomy appropriate to level of training when presenting to the attending
- Detect abnormalities while the fluoroscopic procedures are in progress

- Continue to develop disease recognition skills on abdominal plain radiographs and contrast studies
- Begin to develop meaningful differential diagnoses for the pathology that is found
- Thorough dictations will be made with indications, techniques, findings, and conclusions
- Review all studies with the supervising faculty attending

Systems-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, contrast safety, fluoroscopy safety, and sedation required in the performance of examinations
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

SBP2: Health care economics

- Demonstrate knowledge of ACR appropriateness criteria and cost-effective imaging evaluation of gastrointestinal disorders

Practice-Based Learning and Improvement:

PBLI1: Patient safety: contrast agents; radiation safety; MR safety; sedation

- Understand the physics of radiation protection and how to apply it to routine studies
- Aware of the basic principles of radiation protection in order to minimize the radiation dose to the patient and reduce exposure to healthcare providers
- Understand the indications for and contraindications to use of intravenous and enteric radiographic contrast material, and be able to monitor its administration
- Recognize and treat reactions to intravenous and enteric contrast media
- Understand the indications and contraindications to the different types of contrast material dosages, side effects, and the differences and relative merits of single and double contrast studies
- List the risk factors for allergic reaction to intravenous contrast media
- State the proper assessment and treatment for allergic reactions to contrast media

PBLI2: Self-Directed Learning

- Identify, rectify and learn from personal errors
- Incorporate feedback into improved performance
- Demonstrate evidence of independent reading and learning through use of printed and electronic resources
- Follow up on abnormal or interesting cases through personal communication with the referring physician or patient medical records
- Recognize the role that fluoroscopy plays in the management of acute and chronic diseases

Professionalism:

PROF1: Professional Values and Ethics

- Demonstrate respect for patients and all members of the healthcare team (technologists, nurses, and other healthcare workers)
- Respect patient confidentiality at all times
- Present oneself as a professional in appearance and communication
- Demonstrate a responsible work ethic in regard to work assignments

- Observe ethical principles when recommending further work-up
- Promptness and availability at work are required of every resident
- Dress appropriately for work

Interpersonal and Communication Skills:

ICS1: Effective communication with patients, families, and caregivers

- Appropriately obtain informed consent
- Obtain consent for more complex procedures and answer all questions the patient may have
- Explain the nature of the examination or findings in an examination to patients and their families when needed
- Communicate with the patient at all times during the examination to ensure that patient remains comfortable

ICS2: Effective communication with members of the health care team

- Produce concise reports that include all relevant information
- Communicate effectively with all members of the healthcare team
- Communicate effectively the results of studies to referring clinicians whenever needed (for emergent studies, this will be accomplished in a timely manner)
- Effectively convey the findings of examinations through accurate dictation of reports
- Become competent in using PACS, voice recognition systems, and the hospital patient information systems in the daily accomplishment of the workload, and instruct others in their use
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition
- Provide preliminary reports to all referring clinicians if needed before the final review of cases (when there is a significant discrepancy between the preliminary reading and final reading, the resident will notify the referring clinician immediately)
- Use appropriate language in communicating to clinicians through reports or consultations so proper management decisions can be made

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. At the end of each rotation, the resident will receive a consensus evaluation of performance from faculty on service. Deficiencies or substandard performance will be discussed personally and privately with the resident and will be brought to the attention of the Residency Program Director by the attending radiologist. Resident performance is also evaluated through direct observation, case logs, multi-source professional evaluations, structured case discussion, review of patient outcomes, and other performance evaluation methods as determined by the program.

Educational Goals and Objectives (Third Year Residents):

The above objectives from Years 1 and 2, as well as the following:

Patient Care:

PCTS1: Consultant

- Demonstrate knowledge of ACR practice guidelines and technical standards for fluoroscopy and intravenous urography

- Become familiar with available medical records and how to access them for the purposes of patient care
- Act as a consultant in gastrointestinal radiology to the clinical services

PCTS2: Competence in procedures

- Perform the less common studies, including fistulograms/sinograms, loopograms, pouchograms, fluoroscopy of the diaphragm, T-tube cholangiograms, and enteroclysis
- Perfect diagnostic examination techniques and be very skilled and efficient in performing and interpreting all diagnostic and interventional procedures performed in the fluoroscopy suite, as well as CT colonography
- Show involvement in CT-guided intervention involving the gastrointestinal and genitourinary systems and assist the attending radiologist as appropriate
- Continue to develop skills in interventional procedures under the guidance of more experienced radiologists
- Know the proper preparation of patients for diagnostic and interventional procedures and the appropriate follow-up

Medical Knowledge:

MK1: Protocol selection and optimization of images

- Recognize the role that fluoroscopy plays in the management of acute and chronic diseases
- Understand the clinical management of the conditions encountered
- Demonstrate knowledge of indications for the examinations requested (when the reason for the examination is not clear, the resident will effectively communicate with the patient or referring physician until clarified)
- Protocol cases, in consultation with the attending, to assure that the fluoroscopy examination is appropriate and of sufficient quality to address the clinical concerns of the patient and referring physician
- Become familiar with the utility of contrast studies of the GI and GU tracts, and their relationship to other imaging modalities

MK2: Interpretation of examinations

- Develop a thorough knowledge of the differential diagnosis of abnormalities encountered on barium and water soluble contrast studies of the GI and GU tracts
- Develop a thorough knowledge of the differential diagnosis of fluoroscopic abnormalities
- Review all studies with the supervising faculty attending
- Relate the imaging findings to the clinical condition and its pathology
- Familiarity with the anatomy of the organs examined in every case
- Familiarity with imaging findings of common acute and chronic geriatric diseases evaluated with fluoroscopy
- Familiarity with imaging findings of CT colonography
- Identify pathology in order to interpret fluoroscopy imaging studies with accuracy appropriate to the level of training when presenting to the attending
- Distinguish between normal and abnormal abdomen and pelvis anatomy particularly as seen on fluoroscopy images, with excellent accuracy according to the level of training when presenting to the attending and demonstrate improvement compared to the prior rotation
- Proficient in detecting abnormalities on abdominal plain radiographs and fluoroscopic studies while in progress

- Development of appropriate differential diagnostic lists will be well advanced
- Obtain a broad understanding of abdominal and alimentary tract diseases, their clinical features, radiographic manifestations, and current modes of treatment
- Produce thorough dictations with indications, techniques, findings, and conclusions

Systems-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, contrast safety, fluoroscopy safety, and sedation required in the performance of examinations
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

SBP2: Health care economics

- Demonstrate knowledge of ACR appropriateness criteria and cost effective imaging practices in the evaluation of GI/GU disorders

Practice-Based Learning and Improvement:

PBLI1: Patient safety: contrast agents; radiation safety; MR safety; sedation

- Aware of the principles of radiation protection in order to minimize the radiation dose to the patient and reduce exposure to healthcare providers
- Understand the indications for and contraindications to use of intravenous and enteric radiographic contrast material, and be able to monitor its administration
- Recognize and treat reactions to intravenous and enteric contrast media
- Understand the indications and contraindications to the different types of contrast material dosages, side effects, and the differences and relative merits of single and double contrast studies
- List the risk factors for allergic reaction to intravenous contrast media
- State the proper assessment and treatment for allergic reactions to contrast media

PBLI2: Self-Directed Learning

- Identify, rectify, and learn from personal errors
- Incorporate feedback into improve performance
- Demonstrate evidence of independent reading and learning through use of printed and electronic resources
- Complete final preparations to pass the core examination of the American Board of Radiology

Professionalism:

PROF1: Professional Values and Ethics

- Respect patient confidentiality at all times
- Present oneself as a professional in appearance and communication
- Demonstrate a responsible work ethic in regard to work assignments
- Observe ethical principles when recommending further work-up for cases
- Promptness and availability at work are required of every resident
- Dress appropriately when reporting to work

Interpersonal Skills:

ICS1: Effective communication with patients, families, and caregivers

- Demonstrate respect for patients and all members of the healthcare team (technologists, nurses, and other healthcare workers)
- Appropriately obtain informed consent
- Communicate with the patient at all times during the examination to ensure that patient remains comfortable
- Explain the nature of the examination and/or findings of an examination to patients and their families when needed

ICS2: Effective communication with members of the health care team

- Communicate effectively with all members of the healthcare team
- Appropriately communicate results to patients and clinicians whenever needed (for emergent studies, this will be done in a timely manner)
- Produce concise reports that include all relevant information and be able to effectively convey the findings of examinations through accurate dictation of reports
- Assist with supervision and teaching of medical and radiology technologist students
- Competent in using PACS, voice recognition systems, and the hospital patient information systems in the daily accomplishment of the workload, and instruct others in their use
- Provide preliminary reports to all referring clinicians if needed before the final review of cases (when there is a significant discrepancy between the preliminary reading and final reading, the resident will notify the referring clinician immediately)
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition
- Use appropriate language in communicating to clinicians through reports or consultations so proper management decisions can be made
- Follow up on abnormal or interesting cases through personal communication with the referring physician or patient medical records

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. At the end of each rotation, the resident will receive a consensus evaluation of performance from faculty on service. Deficiencies or substandard performance will be discussed personally and privately with the resident and will be brought to the attention of the Residency Program Director by the attending radiologist. Resident performance is also evaluated through direct observation, case logs, multi-source professional evaluations, structured case discussion, review of patient outcomes, and other performance evaluation methods as determined by the program.

Reading List for Each Year

First Year

1. Davis M, Houston JD. *Fundamentals of Gastrointestinal Radiology*, W. B. Saunders Co., Philadelphia, PA, 2002. [171 pages. A good introduction to GI radiology.]

Second Year

2. Laufer I, Levine MS. *Double Contrast Gastrointestinal Radiology, 2nd Edition*. W. B. Saunders Co., Philadelphia, PA, 1992. [685 pages. By leaders in the field of double-contrast and biphasic-contrast radiography of the GI tract. Contains a large number of the prettiest GI tract pictures you'll ever see. Provides enough procedural and clinical information to get you through the written Boards. Highly recommended.]
3. Halpert RD. *Gastrointestinal Imaging, 3rd Edition - The Requisites*. Elsevier Mosby, St. Louis, MO, 2006. [384 pages. A current, concise book providing core material about conventional barium-contrast imaging and incorporating Ct, ultrasound, MRI, and other modalities. Uses the method of radiography pattern analysis for problem solving and provides meaningful differential diagnosis.]

Third Year

4. Johnson CD and GD Schmitt. *Mayo Clinic Gastrointestinal Imaging Review*. Mayo Clinic Scientific Press, Rochester MN, 2005. [737 pages. An excellent case book with discussions. Great for ABR oral board exam preparation.]

"Required" Reading for all Years

1. [Introduction to Gastrointestinal Radiology](http://www.med-ed.virginia.edu/courses/rad/gi/index.html). Located on the Department of Radiology Web Site <http://www.med-ed.virginia.edu/courses/rad/gi/index.html>

Core Knowledge Presentation Topics

Basic or General

Abdominal Plain Radiographs: Overview
Perforation and Obstruction of the GI Tract: Assessment by Conventional Radiology
Principles and Pitfalls of Double Contrast Interpretation
The Postoperative GI Tract
Treatment of Strictures and Leaks in the GI Tract

Pharynx and Hypopharynx

Normal Anatomy
Structural and Functional Abnormalities
Inflammatory and Neoplastic Diseases

Esophagus

Anatomy and Physiology

Structural Abnormalities (varices, webs, diverticula, perforation, imprints of anomalous vessels, etc.)

Functional Disorders (achalasia, chagas disease, scleroderma, spasm, etc.)

Esophagitis (reflux, barrett, infectious, chemical, etc.)

Neoplastic Diseases (benign & malignant, intrinsic & extrinsic)

Diagnosis & Treatment of Esophageal Foreign Bodies and Food Impactions

Stomach and Duodenum

Developmental, Functional, and Structural Disorders (diverticula, webs, pyloric hypertrophy, varices, volvulus, SMA syndrome, etc.)

Ulcers: Benign and Malignant

Other Inflammatory Diseases

Tumors and Tumor-Like Conditions (polyps, malignancies, extrinsic masses)

Small Bowel

Diagnosis Using Radiographic Pattern Analysis

Developmental, Functional, and Structural Disorders

Inflammatory Diseases

Neoplastic Diseases (benign, malignant, extrinsic masses)

Large Intestine

Developmental, Functional, and Structural Disorders (rotational anomalies, volvulus, intussusception, duplication, Hirschprung's disease, pseudo-obstruction, etc.)

Inflammatory Diseases

Colon Polyps, Polyposis Syndromes, and Colorectal Malignancies

Hepatobiliary System

Diseases of the Bile Ducts (ERCP, T-tube cholangiography)

Liver Masses

Pancreas

Embryology and Anatomy

Diseases of the Pancreas (ERCP)

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