

Resident Core Curriculum

Thoraco-Abdominal: Adult Ultrasound

General Goals: The specific goals include objectives required for every level of training with graduated levels of supervision and responsibility. All aspects of thoracoabdominal imaging are incorporated into the residency, including adult diagnostic ultrasound. During every training rotation, the resident will read the required literature and study the teaching file in thoracoabdominal radiology. Over time, the resident will become progressively more knowledgeable about normal radiographic anatomy, physiology of organs, and the radiological appearances of diseases. In addition, the resident will demonstrate a progressively increasing 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 Ultrasound imaging will be available for consultations by 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 Ultrasonographic imaging
3. Resident review of cases with the supervising faculty will be conducted as many times in the day as necessary to maintain an efficient workflow.
4. All resident examinations will be dictated by the end of every working day.
5. Residents will check and sign his/her reports prior to final verification by supervising faculty.
6. Residents must be familiar with the operation of all ultrasound equipment, including “knobology”, which transducer is best for deep versus superficial tissues and the basic physics of Ultrasonography.
7. Residents will learn the ultrasound techniques for performing high quality, state-of-the art diagnostic examinations throughout the body. Examinations will be checked before the patient leaves the department if requested to do so by the supervising faculty. If sonographers have questions regarding a study, the resident will actively participate with the sonographer to obtain the best study that answers the clinical questions.
8. Residents must become proficient at detecting abnormalities demonstrated by ultrasound imaging and be able to generate meaningful differential diagnosis.
9. Residents will acquire an understanding of the proper preparation of patients for examinations. At the start of every working day, the resident will be familiar with the patient schedule and anticipate need for any procedures. The resident will check requisitions when needed, 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.
10. 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 and the radiologic appearances of diseases, and gain a general understanding of the disease entities, their clinical presentations, and certain modes of treatment.
11. Residents will serve as a secondary consultant to referring physicians regarding ultrasound. 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.
12. Residents will become prepared to pass the certifying examination of the American Board of Radiology.
13. Residents will teach and share knowledge to medical students, radiologic technologist students, and junior residents.

14. Residents will participate in the preparation and presentation of imaging studies at the monthly Interesting Case Conference.

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. Faculty will draw attention to teaching points and discuss cases in a comprehensive manner in order to enhance the educational activity of the rotation.
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:

- Adequately explain each examination to the patient in order to ensure that the patient feels comfortable and to provide patient care that is compassionate, appropriate, and effective
- Familiarity with the operation of ultrasound equipment.
- Use the PACS, voice recognition systems, and hospital information systems to become proficient in dictating reports of significant radiographic findings in a concise and clear manner
- Demonstrate the ability to recommend additional imaging studies as appropriate to better assess findings on ultrasound imaging studies

Medical Knowledge:

- Learn the basic physics of ultrasound
- Observe, learn, and develop technical proficiency to achieve high-quality diagnostic ultrasound examinations of, in particular abdomen (RUQ and complete), renal, pelvis (transabdominal and transvaginal), first trimester OB, and DVT exams
- Develop a knowledge of normal and abnormal anatomy as demonstrated on ultrasound studies
- Develop a knowledge of the differential diagnoses of the more commonly encountered abnormalities
- Demonstrate the ability to recognize and describe common medical conditions depicted on ultrasound imaging studies
- Demonstrate knowledge of ultrasound protocols
- Develop a knowledge of ultrasound instruments and probes
- Understand how to optimize images (gain, focal zone, Doppler angle)
- Provide preliminary interpretation for all diagnostic exams
- Correlate ultrasound findings with other pertinent imaging

Practice-Based Learning and Improvement:

- 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

- Efficiently use electronic and print sources to access information

Interpersonal and Communication Skills:

- Communicate with the patient at all times during the examination to ensure that patient remains comfortable
- 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 ultrasound 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
- Produce concise reports that include all relevant information and appropriate ultrasound terminology

Professionalism:

- Demonstrate respect for patients, families, and all members of the healthcare team and be able to discuss significant radiology findings
- Explain the impact of the radiology findings on patient care, including what imaging studies may/may not be appropriate
- 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
- Demonstrate respect and empathy towards the sonographers and answer their questions regarding patient care

System-Based Practice:

- Able and willing to participate in 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
- Demonstrate knowledge of the ACR practice guidelines and technical standards for ultrasound
- 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 differing clinical entities

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. Toward the end of each rotation, the resident will receive an evaluation of performance from the section chief attending, if possible. If not, feedback should be done by the faculty that had most interaction with the resident. 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. Residents are evaluated monthly by faculty. 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.

Educational Goals and Objectives (Second Year Residents):

The objectives above as well as the following:

Patient Care:

- Understand the physics of ultrasound protection and how to apply it to routine studies
- Obtain consent for more complex procedures and answer all questions the patient may have
- Develop a knowledge of the preparation and aftercare required for more complex procedures
- Continue to improve skills for performing ultrasound examinations, and tailor examinations to answer all questions being asked by the clinician; anticipate those questions that should have been asked but were not
- 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)
- Familiarity with available medical records, EPIC, and how to access them for the purposes of patient care
- Protocol cases, in consultation with the attending, to assure that the ultrasound examination is appropriate and of sufficient quality to address the clinical concerns of the patient and referring physician
- Review all studies with the supervisor faculty attending
- 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)

Medical Knowledge:

- Recommend the appropriate study based on the clinical scenario
- Familiarity with the anatomy of the organs examined in every case
- Familiarity with imaging findings of common acute and chronic diseases evaluated with ultrasound
- Identify pathology in order to interpret routine ultrasound studies with accuracy appropriateness to the level of training when presenting to the attending
- Distinguish between normal and abnormal anatomy to level of training when presenting to the attending
- Detect abnormalities while the ultrasound procedures are in progress, such as 1) disease recognition skills will continue to increase, and 2) begin to develop meaningful differential diagnoses for the pathology that is found
- Discuss all aspects of ultrasound imaging, including indications, pathology, and correlative studies used for each examination
- Make preliminary decisions on all matters of ultrasound interpretation and consultation and recognize the need to obtain assistance in situations that require the expertise of an upper level trainee or faculty radiologist
- Demonstrate improved technical proficiency in the performance of routine ultrasound exams; expand skills to include abdominal Doppler exams (TIPS; transplant; renal artery stenosis); and 2nd/3rd trimester obstetric exams
- Assume greater responsibility in planning and performing complex interventional procedures: when they are indicated and make such recommendations to the clinical team

Practice-Based Learning and Improvement:

- 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
- Competent in using PACS, voice recognition systems, and the patient information systems in the daily accomplishment of the workload and instruct others in their use

Interpersonal and Communication Skills:

- 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, and this will be accomplished in a timely manner)
- Effectively convey the findings of examinations through accurate dictation of reports

Professionalism:

- 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
- Explain the nature of the examination or findings in an examination to patients and their families when needed
- Observe ethical principles when recommending further work-up
- Promptness and availability at work are required of every resident
- Dress appropriately for work

Systems-Based Practice:

- Demonstrate knowledge of ACR practice guidelines and technical standards for ultrasound
- Demonstrate knowledge of ACR appropriateness criteria and cost-effective imaging evaluations
- Familiarity with departmental procedures, safety, and sedation required in the performance of examinations
- Use appropriate language in communicating to clinicians through reports or consultations so proper management decisions can be made
- Thorough dictations will be made with indications, techniques, findings, and conclusions
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition
- Recognize the role that ultrasound plays in the management of acute and chronic diseases
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. Toward the end of each rotation, the resident will receive an evaluation of performance from each attending. 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. Residents are evaluated monthly by faculty. 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.

Educational Goals and Objectives (Fourth Year Residents):

The above objectives as well as the following:

Patient Care:

- Perfect diagnostic examination techniques and be very skilled and efficient in performing and interpreting all procedures performed
- 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)
- Familiarity with available medical records and how to access them for the purposes of patient care
- Protocol cases, in consultation with the attending, to assure that the ultrasound examination is appropriate and of sufficient quality to address the clinical concerns of the patient and referring physician
- Review all studies with the supervising faculty attending
- 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)

Medical Knowledge:

- Develop a thorough knowledge of the differential diagnosis of abnormalities encountered on ultrasound exams
- Relate the imaging findings to the clinical condition and its pathology
- Understand the clinical management of the conditions encountered
- Familiarity with the anatomy of the organs examined in every case
- Familiarity with imaging findings of common acute and chronic diseases evaluated with ultrasound, including hepatic, renal, gynecologic, vascular and pancreatico-biliary
- Identify pathology in order to interpret ultrasound imaging studies with accuracy appropriateness to the level of training when presenting to the attending
- Distinguish between normal and abnormal anatomy particularly as seen on ultrasound 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 ultrasound studies while in progress
- Development of appropriate differential diagnostic lists and be able to incorporate the appropriate clinical history, as well as other pertinent imaging modalities in order to arrive at a high level and narrow differential
- Continue to develop skills in procedures under the guidance of more experienced radiologists
- Know the proper preparation of patients for procedures, potential immediate and delayed complications and the appropriate follow-up afterwards
- Act as a consultant in ultrasound to the clinical services
- Obtain a broad understanding of diseases, their clinical features, radiographic manifestations, and current modes of treatment

Practice-Based Learning and Improvement:

- 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
- Follow up on abnormal or interesting cases through personal communication with the referring

physician or patient medical records

- Competent in using PACS, voice recognition systems, and the patient information systems in the daily accomplishment of the workload and instruct others in their use

Interpersonal Skills:

- 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
- Communicate effectively with all members of the healthcare team
- Assist with supervision and teaching of medical and radiology technologist students

Professionalism:

- 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
- Explain the nature of the examination of findings in an examination to patients and their families when needed
- Observe ethical principles when recommending further work-up for cases
- Promptness and availability at work are expected of every resident
- Dress appropriately when reporting to work

Systems-Based Practice:

- Demonstrate knowledge of ACR practice guidelines and technical standards for ultrasound
- Demonstrate knowledge of ACR appropriateness criteria and cost effective imaging practices in ultrasound
- Complete final preparations to pass the certifying examination of the American Board of Radiology
- Familiarity with departmental procedures, safety, and sedation required in the performance of examinations
- Use appropriate language in communicating to clinicians through reports or consultations so proper management decisions can be made
- Produce thorough dictations with indications, techniques, findings, and conclusions
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. Toward the end of each rotation, the resident will receive an evaluation of performance from each attending. 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. Residents are evaluated monthly by faculty. 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.

Reading List for All Years

1. William D. Middleton and Alfred B. Kurtz. *Ultrasound: The Requisites*. Mosby, 2nd Edition, 2003.
2. William E. Brant. *The Core Curriculum: Ultrasound*. Lippincott Williams & Wilkins, 1st Edition, 2001.
3. Carol Rumak, Stephanie Wilson, J. William Charboneau, and Jo-Ann Johnson. *Diagnostic Ultrasound: 2-volume Set*. Mosby, 3rd Edition, 2004.
4. CD-ROMS available from the Radiology Library

Other Requirements/Expectations

We wish to extend to you a warm welcome to the section of Ultrasound. Your focus during the Ultrasound rotation will be adult diagnostic ultrasound imaging. The scope of examinations performed in Ultrasound is broad encompassing nearly every organ of the body. The challenge to you as a resident is to acquire skill in both the interpretation as well as the performance of ultrasound exams. The sonographers will assist you in acquiring the technical skills needed to perform high quality ultrasound. There is no substitute for plunging in and taking hold of the transducer. Ultrasound is both a science and an art, therefore hands on experience is key. We have arranged for residents assigned to ultrasound service for the first rotation to work with some of our most highly skilled sonographers in learning how to use the ultrasound machines and hands-on scanning skills. The current schedule is for residents to scan with our sonographer-instructor on Mondays and Wednesdays of each week.

The day begins at 8:00 a.m. with check out of the cases performed on call. You are expected to attend this review session. The day ends at or after 5 PM. You are excused at 5PM if you are on call; otherwise you are expected to stay until the day's schedule is completed. All ultrasound examinations performed before 5 PM at any of our ultrasound imaging sites must be interpreted before the same day. Priority reads should always be done for ER and "going to clinic patients", those labeled "high priority", 1 – 4 in our EPIC system.

The Ultrasound service is a busy one with an average of 50 or more cases per day. About 1/3 are pre-scheduled out patients. The rest are same day requests from inpatient services, the Emergency Department, various clinics, the cancer center, or Health South. In addition to our Ultrasound Department in the hospital, ultrasound services are offered at UVA Northridge and at the UVA Imaging Center. In addition some ultrasound examinations may be sent by tele-radiology from remote sites.

Adult Ultrasound Schedule

8-9 AM Monday-Friday: 1590 Ultrasound checkout with faculty
8-12PM Scan Patients, Review Cases, Dictate Reports
12-1 PM Resident Conference
1-5PM Scan Patients, Review Cases, Dictate Reports

Core Knowledge Presentation Topics Integrated into Each Year Competencies

1. Gallbladder and biliary ultrasound: cholelithiasis, cholecystitis, and biliary obstruction.
2. Liver: segmental liver anatomy and normal ultrasound appearance, diffuse liver disease (fatty liver, cirrhosis), liver lesion identification and characterization.
3. Renal ultrasound: normal anatomy and ultrasound appearance, hydronephrosis, medical renal

disease, renal cyst/mass identification and characterization, renal calculi.

4. Pelvic ultrasound: Normal anatomy; changes in the appearance of the endometrium and the ovaries during the menstrual cycle, normal vs. abnormal endometrial stripe thickness for pre vs. post-menopausal women; fibroids; benign ovarian masses (hemorrhagic cysts, dermoids); ovarian cancer, adnexal masses and the appropriate differential diagnosis, depending on age, clinical presentation.
5. First trimester obstetrics ultrasound: Normal development; ectopic pregnancy; early pregnancy failure. Basic congenital anomalies diagnosed during second and third trimester scanning to include and not limited to diaphragmatic hernia, omphalocele and gastrochisis, renal hypoplasia, intracardiac defects, biliary atresia.

Anomalies related to maternal and placental imaging including placenta previa and abruption, cervical os incompetency, placenta accreta.

6. Testicle: Normal anatomy; testicular pathology including torsion, trauma, epididymitis/orchitis, neoplasia.
7. Thyroid/parathyroid: Normal anatomy; multinodular goiter, thyroiditis; thyroid nodule characterization; follow up of thyroid cancer resection, and parathyroid adenoma.
8. Venous Doppler imaging: Upper and lower venous anatomy; criteria for diagnosis of deep venous thrombosis, venous insufficiency; AV fistula; pseudoaneurysm
9. Liver biliary imaging, including all of the findings associated with cirrhosis; be able to discuss the differential diagnosis of diffuse and focal liver disease; understand the ultrasound characterization of focal liver masses, and be able to provide a differential diagnosis.
10. Pancreas: Identify acute and chronic inflammatory processes of the pancreas: identification of pancreatic cysts and tumors.
11. Renal urinary tract: Tumors, stones and inflammatory processes.
12. Pelvic ultrasound: Diagnosis of uterine and ovarian cancers; be able to provide differential diagnosis for adnexal masses; based on the ultrasound features of an adnexal mass; distinguish between the probably benign ovarian mass versus the probably malignant. Be familiar with appropriate recommendations for follow-up ultrasound versus other imaging (CT vs. MRI) or surgery.
13. Second and third trimester OB ultrasound including normal anatomy, fetal anomalies and growth abnormalities (IUGR/macrosomia). Be familiar with the ultrasound findings in Turner's syndrome and most frequently encountered trisomies including trisomy 21 (Down's syndrome), trisomy 15 and 18.
14. Abdominal Doppler: Be familiar with the normal Doppler waveform for all of the major abdominal vessels (hepatic veins, hepatic artery, portal veins, splenic vein, superior mesenteric vein, renal artery, renal vein, iliac artery, iliac vein, IVC). Know the diagnostic criteria for hemodynamically significant stenosis (TIPS, renal artery). Understand the spectrum of vascular complications in transplants (liver, pancreas, and kidney).
15. Carotid Doppler: Review chapter in Polak. May observe carotid exams real time in the Heart Center if pre-approved.