

Resident Core Curriculum Adult Ultrasound

Overview: 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.

General Goals: The goals include objectives required for every level of training with graduated levels of supervision and responsibility. All aspects of abdominal imaging are incorporated into the residency, including adult diagnostic ultrasound. During every rotation, the resident will read the required literature and study the teaching file in abdominal radiology as relating to ultrasound imaging. Over time, the resident will become progressively more knowledgeable about normal radiographic anatomy, physiology of organs, and the radiological appearances of diseases. The resident will gain competency in the use of ultrasonic imaging equipment. 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 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.
2. Residents assigned to Ultrasound imaging should be available for consultations by technologists, clinicians, and other health care providers, except during conference times, when the attending faculty will cover.
3. Resident questions will be referred to the supervising faculty on service.
4. Resident review of cases with the supervising faculty will be conducted as many times in the day as necessary to maintain an efficient workflow.
5. All resident examinations should be dictated by the end of every working day.
6. Residents will check and sign his/her reports prior to final verification by supervising faculty.
7. Residents will learn the ultrasound techniques for performing high quality 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. Absent clinical indication or seemingly inappropriate requests should 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 core examination of the American Board of Radiology.
13. Residents will teach and share knowledge to medical students, radiologic technologists technology students, and junior residents.

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 and Technical Skills:

PCTS1: Consultant

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

PCTS2: Competence in Procedures

- Familiar with the operation of ultrasound equipment and has the knowledge of US probes
- 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

Medical Knowledge:

MK1: Protocol Selection and Optimization of Images

- Learn the basic physics of ultrasound
- Understands how to optimize images (gain, focal zone, Doppler angle).
- Demonstrate the ability to recommend additional imaging studies as appropriate to better assess findings on ultrasound 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

- Differentiate 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
- Provide preliminary interpretation for all diagnostic exams

System-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, safety, and sedation required in the performance of examinations

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

differing clinical entities

Practice-Based Learning and Improvement:

PBLI2: Self-Directed Learning

- Show evidence of independent study using textbooks from reading list and websites
- Demonstrate appropriate follow up of interesting cases
- 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
- Demonstrate a responsible work ethic with regard to work assignments
- Demonstrate respect and empathy towards the sonographers and answer their questions regarding patient care

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 and to 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)
- Interact with clinicians when reviewing cases 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
- Call results to the referring physicians and show ability to interact with referring physicians
- Effectively communicates emergent and relevant incidental findings to the ordering provider and clinical team
- Produce concise reports that include all relevant information and appropriate ultrasound terminology
- 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

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 attending, if possible. 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 at the end of rotation by 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 for Year 1 above, as well as the following:

Patient Care and Technical Skills:

PCTS1: Consultant

- Demonstrate knowledge of ACR practice guidelines and technical standards for ultrasound

PCTS2: Competence in Procedures

- Develop a knowledge of the preparation and aftercare required for procedures
- Continue to improve skills for performing ultrasound examinations, and tailor examinations to answer all questions being asked by the clinician.
- Assume greater responsibility in planning and performing interventional procedures

Medical Knowledge:

MK1: Protocol Selection and Optimization of Images

- Recommend the appropriate study based on the clinical scenario
- Understand the physics of ultrasound and how to apply it to routine studies
- 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)

MK2: Interpretation of Examinations

- 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 appropriate to the level of training when presenting to the attending
- Detect abnormalities while the ultrasound procedures are in progress, such as 1) disease recognition skills and 2) begin to develop meaningful differential diagnoses for the pathology that is found
- 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
- Review all studies with the supervisor faculty attending

Systems-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, safety, and sedation required in the performance of examinations

SBP2: Health Care Economics

- Demonstrate knowledge of ACR appropriateness criteria and cost-effective imaging evaluations

Practice-Based Learning and Improvement:

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

Professionalism:

PROF1: Professional Values and Ethics

- Demonstrate respect for patients and all members of the healthcare team
- Respect patient confidentiality at all times
- Demonstrate a responsible work ethic in regard to work assignments
- Promptness and availability at work are required of every resident

Interpersonal and Communication Skills:

ICS1: Effective Communication with Patients, Families, and Caregivers

- Obtain consent for 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

ICS2: Effective Communication with Members of Healthcare Team

- Communicate effectively with all members of the healthcare team
- Communicate effectively the results of studies to referring clinicians whenever needed
- Effectively convey the findings of examinations through accurate dictation of reports
- Produce concise reports that include all relevant information
- 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
- Use appropriate language in communicating to clinicians through reports or consultations so proper management decisions can be made
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition

Educational Goals and Objectives (Senior Years Residents, R3/R4):

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

Patient Care and Technical Skills:

PCTS1: Consultant

- Demonstrate knowledge of ACR practice guidelines and technical standards for ultrasound
- Familiarity with available medical records and how to access them for the purposes of patient care
- Act as a consultant in ultrasound to the clinical services

PCTS2: Competence in Procedures

- Perfect diagnostic examination techniques and be very skilled and efficient in performing and interpreting all procedures performed
- Continue to develop skills in procedures under the guidance of experienced radiologists
- Know the proper preparation of patients for procedures, potential immediate and delayed complications and the appropriate follow-up afterwards

Medical Knowledge:

MK1: Protocol Selection and Optimization of Images

- 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 ultrasound examination is appropriate and of sufficient quality to address the clinical concerns of the patient and referring physician

MK2: Interpretation of Examinations

- Develop a thorough knowledge of the differential diagnosis of abnormalities encountered on ultrasound exams
- 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 diseases evaluated with ultrasound
- Distinguish between normal and abnormal anatomy particularly as seen on ultrasound images
- 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

Systems-Based Practice:

SBP1: Quality Improvement (QI)

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

Practice-Based Learning and Improvement:

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
- Understand the clinical management of the conditions encountered

Professionalism:

PROF1: Professional Values and Ethics

- Demonstrate respect for patients and all members of the healthcare team
- 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 expected of every resident
- Dress appropriately when reporting to work

Interpersonal Skills:

ICS1: Effective Communication with Patients, Families, and Caregivers

- Appropriately communicate results to patients and members of the healthcare team
- Explain the nature of the examination of findings in an examination to patients and their families when needed

ICS2: Effective Communication with the Healthcare Team

- Communicate effectively the results of studies to referring clinicians whenever needed
- Effectively convey the findings of examinations through accurate dictation of reports

- Assist with supervision and teaching of medical and radiology technologist students
- 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
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition

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
5. Stat Dx

Other Requirements/Expectations

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 day begins at 8 AM and ends at or after 5 PM. You are excused at 5 PM if you are on swing shift or call (Friday); 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 HealthSouth. In addition to our Ultrasound Department in the hospital, ultrasound services are offered at UVA Northridge, UVA Zion center and at the UVA Imaging Center. In addition some ultrasound examinations may be sent by tele-radiology from remote sites.

Adult Ultrasound Schedule

8-12 PM: Review Cases, Dictate Reports

12-1 PM: Resident Conference

1-5 PM: Review Cases, Dictate Reports

In downtime: Go over cases in teaching file or scan patients with sonographer

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 Turners 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.