

Point of Care Ultrasonography - Curriculum

Welcome to the Point of Care Ultrasound Rotation! In preparation for your rotation, you need to do THREE things:

1. Contact Dr. Aaran Drake (adrake@mfa.gwu.edu) and Ayshia Coletrane (acoletrane@email.gwu.edu) to confirm the dates of your rotation and ensure you have access to our course calendar. If you have any special schedule requests related to family events, interviews, etc, you will need to contact Dr. Drake prior to the rotation to make arrangements.
2. Download the primary reading source for the rotation which is Introduction to Bedside Ultrasound by Dawson and Mallin. This E-book is [free](#).
3. Please read the chapters covering physics as well as the FAST exam prior to the first day of the rotation.

General Expectations:

The rotations begin on the Monday of the week of your rotation. We will meet in the GWU Emergency Department at 9:00am to begin your first scan shift. This will be followed by Quality Assurance (QA) at 1pm in the GW Department of Emergency Medicine administrative office (2120 L Street NW in Suite 450 (on the 4th floor), Washington, DC 20037).

It is expected that every time the ultrasound probe touches a patient, images (still and video) will be captured that are properly labeled with patient identifiers, and that every study will be subsequently documented in Q-Path (the online PACS system for the ED).

At the beginning of each scan shift, please prepare by cleaning the machine and restocking supplies. Machines should be cleaned before and after each patient. Machines should be cleaned a final time at the end of your shift.

EM Residents: At the end of each scan day, you should look up any comprehensive imaging (CT, US) for the exams performed and add these data to your Q-Path documentation before submitting for QA. This allows us to focus primarily on the images and teaching during the Monday sessions, rather than having to spend a lot of time looking up information on the patient. Any unsubmitted scans will result in no credit.

Off Service Residents & Students: You will not have access to Qpath independently, so you will review your previous day's scans with the attending on each scan shift.

You will participate in our weekly QA sessions and monthly Journal Clubs if the journal club date falls within your rotation block. Please see the course calendar for details.

Goals and Objectives (as per ACEP Guidelines):

“Physics & Instrumentation

- Explain ultrasound physics relevant to EUS:
- Piezoelectric effect, Frequency, Resolution, Attenuation, Echogenicity, Doppler including pulse wave, color and power
- Operate the EUS system as needed to obtain and interpret images adequate for clinical decision making including:
 - Image mode, Gain, Time gain compensation, Focus, Probe types
 - Recognize common ultrasound artifacts including:
 - Reverberation, Side lobe, Mirror, Shadowing, Enhancement, Ring-down

Trauma

- Describe the indications, clinical algorithm, and limitations of EUS in blunt and penetrating thoracoabdominal trauma.
- Perform the EUS protocol for Trauma.
- Identify relevant US anatomy including the pleura, diaphragm, inferior vena cava, pericardium, liver, spleen, kidneys, bladder, prostate and uterus.
- Recognize pathologic findings and pitfalls in the evaluation of pneumothorax, hemothorax, hemopericardium, cardiac activity, volume status, and hemoperitoneum.
- Integrate Trauma EUS findings into individual patient, departmental, and disaster management.

First-Trimester Pregnancy

- Describe the indications, clinical algorithm, and limitations of EUS in first-trimester pregnancy pain and bleeding.
- Understand the utility of quantitative B-HCG in the evaluation of first-trimester pregnancy pain and bleeding.
- Perform EUS protocols for transabdominal and transvaginal views as needed, including fetal heart rate and gestational age measurement techniques.
- Identify relevant US anatomy including the cervix, uterus, adnexa, bladder and cul-de-sac.
- Recognize the relevant findings and pitfalls when evaluating for intrauterine and ectopic pregnancy:
 - Early embryonic structures including the gestational sac, yolk sac, fetal pole, and heart
 - Location of embryonic structures in pelvis
 - Embryonic demise
 - Molar pregnancy
 - Findings of ectopic pregnancy including pseudogestational sac, free fluid, and adnexal masses
- Integrate First Trimester Pregnancy EUS findings into individual patient and departmental management.

Abdominal Aorta

- Describe indications, clinical algorithm, and limitations of EUS in the evaluation of aortic pathology.
- Perform EUS protocols to evaluate the abdominal aorta including measurement techniques.
- Identify relevant US anatomy including the aorta with major branches, inferior vena cava, and vertebral bodies.
- Recognize pathologic findings and pitfalls when evaluating for aortic aneurysm and dissection.
- Integrate Aorta EUS findings into individual patient and departmental management.

Echocardiography and HD Assessment

- Describe the indications and limitations of emergency echocardiography.
- Perform standard echocardiography windows (subcostal, parasternal, and apical) and planes (four chamber, long and short axis).
- Identify relevant US anatomy including pericardium, cardiac chambers, valves, aorta and inferior vena cava.
- Estimate qualitative left ventricular function and central venous pressure to guide HD assessment of patient.
- Recognize cardiac arrest, pericardial effusions with or without tamponade, and dilation of the aortic root or the descending aorta.
- Integrate Emergency echocardiography findings into individual patient and departmental management.

Biliary Tract

- Describe the indications and limitations of EUS of the biliary tract.
- Perform EUS protocols to evaluate the biliary tract.
- Identify relevant US anatomy including the gallbladder, portal triad, inferior vena cava, and liver.
- Recognize the relevant findings and pitfalls when evaluating for cholelithiasis and cholecystitis.
- Integrate EUS of the biliary tract into individual patient and departmental management.

Urinary Tract

- Describe the indications and limitations of EUS of the urinary tract.
- Perform EUS protocols to evaluate the urinary tract.
- Identify relevant US anatomy including the renal cortex, renal pelvis, ureter, bladder, liver, and spleen.
- Recognize the relevant findings and pitfalls when evaluating for hydronephrosis, renal calculi, renal masses, and bladder volume.
- Integrate EUS of the urinary tract into individual patient and departmental management.

Deep Vein Thrombosis

- Describe the indications and limitations of EUS for the detection of deep venous thrombosis.
- Perform EUS protocols for the detection of deep venous thrombosis of the upper and lower extremities including vessel identification, compression, doppler imaging of respiratory variation and augmentation.
- Identify relevant US anatomy of the upper and lower extremities including the deep venous and arterial systems, major nerves, and lymph nodes.
- Recognize the relevant findings and pitfalls when evaluating for deep venous thrombosis.
- Integrate EUS for deep venous thrombosis into individual patient and departmental management.

Soft Tissue & Musculoskeletal

- Describe the indications and limitations of soft tissue and musculoskeletal EUS.
- Perform EUS protocols for the evaluation of soft tissue and musculoskeletal pathology.
- Identify relevant US anatomy including skin, adipose, fascia, muscle, tendons and ligaments, muscles, lymph nodes, bones and joints
- Recognize the relevant findings and pitfalls when evaluating the following:
 - Soft tissue infections: Abscess versus cellulitis
 - Subcutaneous fluid collection identification
 - Foreign body location and removal
- Tendon injury (laceration, rupture)
- Fractures
- Joint identification
- Integrate soft tissue and musculoskeletal EUS findings into individual patient and departmental management.

Thoracic

- Describe the indications and limitations Thoracic EUS
- Perform EUS protocols for the detection of pneumothorax, pleural effusion, alveolar interstitial syndromes
- Identify relevant US anatomy of thoracic structures.
- Recognize the relevant findings and pitfalls when evaluating for thoracic pathology
- Recognize the sonographic findings of tracheal and esophageal anatomy, especially in regard to EM procedures
- Integrate thoracic EUS findings into individual patient and departmental management.

Ocular

- Describe the indications and limitations of ocular EUS.
- Perform EUS protocols for the detection of vitreous hemorrhage, retinal detachment, and other pathology.
- Identify relevant US anatomy of the globe and orbital structures.
- Recognize the relevant findings and pitfalls when evaluating for ocular pathology.
- Integrate ocular EUS into individual patient and departmental management.

Procedural Guidance

- Describe the indications and limitations when using US guidance for bedside procedures
- Perform EUS protocols for procedural guidance including both transverse and longitudinal approaches when appropriate.
- These procedures may include:
 - Vascular access: Central and peripheral
 - Confirmation of endotracheal intubation
 - Pericardiocentesis
 - Paracentesis
 - Thoracentesis
 - Foreign body detection removal
 - Bladder aspiration
 - Arthrocentesis
 - Pacemaker placement and capture
 - Abscess identification and drainage
- Identify relevant US anatomy for each particular procedure
- Recognize the relevant findings and pitfalls when performing EUS for procedural guidance.
- Integrate EUS for procedural guidance into individual patient and departmental management.

Bowel

- Describe the indications and limitations of Bowel EUS
- Perform EUS protocols for the detection of appendicitis, bowel obstruction, pneumoperitoneum, diverticulitis, hernia, pediatric (intussusception and pyloric stenosis)
- Identify relevant US anatomy of bowel structures.
- Recognize the relevant findings and pitfalls when evaluating for bowel pathology
- Integrate bowel EUS findings into individual patient and departmental management.”

Methods

1. Reading- The Primary text is the E-Book *Introduction to Bedside Ultrasound Volume 1 and Volume 2* by Mallin and Dawson. Please read all core application chapters during your rotation. These include: Physics, FAST, Cardiac, Aorta, Lung, Renal, Hepatobiliary, 1sttrimester, soft tissue/MSK, DVT, Bowel, Ocular and Procedural guidance.
2. There are several free open access medical (FOAM) tools available to you to enhance your ultrasound education.

- [ACEP ultrasound guidelines](#)
- [Ultrasound Podcast](#)
- [Sonoguide](#)
- [Ultrasound G.E.L. Podcast](#)
- [5minuteSono](#)
- [SonoMojo](#)
- [Ultrasound of the week](#)

- [Emergency ultrasound teaching](#)

3. Practical- The 4 week rotator should have a goal to perform at least 150 exams with confirmatory studies during the rotation. There should be 25 scans of each of ACEP's primary indications (FAST, 1sttrimester, cardiac, AAA, procedural, biliary, renal) as well as in DVT and musculoskeletal ultrasound. Shorter rotations image acquisition requirements are reflected above.

Please note: EM residents are required to perform the 150 exams of credentialing quality prior to graduation. Credentialing of EM residents is available on completion of these scans, required modules and an Objective Structured Clinical Examination (OSCE).

Successful completion of these exams will be accomplished through precepted "scanning shifts" with ultrasound faculty as well as QA sessions.

Scan Shifts

Sign up for seven 4-hour scan shifts/week of your rotation via MFA google calendar.

- At least three shifts of these per week should be with a dedicated ultrasound attending. For optimal learning conditions, we recommend only 3 rotators sign up for a given faculty scan shift.
- Four shifts/week will be "solo scans" without faculty at the bedside with you. For these scans, the patient MUST be scheduled for a comprehensive imaging (add link) test that will "check" your work to ensure that incomplete scans do not compromise patient safety. For these "solo scans", it is preferable to pair up with a resident/fellow for at least part of the scan shift. Whenever schedules allow, try to arrange it for when sonography faculty are working clinically in the ED. ED attendings will have their clinical shifts entered on the course calendar.
- Your scanning shifts will be arranged on the Monday of each week, as the faculty schedules are so variable.

1-week rotator will have

- 5 hours of QA
- 28 hours of scanning
- +/- journal club
- Completed US Passport- Minimum of 30 scans which meet credentialing criteria

2-week rotator will have

- 10 hours of QA
- 56 hours of scanning
- +/- journal club
- Completed US Passport- Minimum of 75 scans which meet credentialing criteria
- Emergency Medicine Residents will also be assigned to either give a 15 minute lightning rounds presentation or submit a video loop case with explanation of findings.

4-week rotator will have

- 20 hours of QA
- 112 hours of scanning
- +/- journal club
- Completed US Passport- Minimum of 150 Scans which meet credentialing criteria
- 20 minute presentation on US topic of your choice to be delivered on the final Monday of your rotation. Please note: a draft of your presentation will be due 1 week prior to your presentation date (ie the 3rdMonday of your rotation).

4. Administrative- The rotator will learn about and participate in the administration of the ED ultrasound program, including quality assurance, machine maintenance, credentialing, and reimbursement issues.

5. Teaching

For EM rotators: The resident will be assigned a lightning review presentation or a video loop case.

Lightning Review: During the rotation, the resident will give a 10-15 minute lightning review of an ultrasound application related to the topic being covered in the emergency medicine core curriculum that month. (For example: If infectious disease (ID) is being covered during the month of your rotation, the presentation will cover an ultrasound topic related to ID). Presentations will be given during QA in the 2nd week of your rotation. Presentation must be completed and submitted to a faculty member at least 72 hours prior due date for review.

Video loop Case: In the case that a core curriculum topic has already been covered during the month of your rotation, submit a short paragraph on how image was acquired, explain any associated pathology/diagnostic criteria and provide references regarding topic. Case must be submitted to faculty at least 72 hours prior to completion of rotation for review.

For the 4 week rotator: 20 minute presentation on US topic of your choice to be delivered on the final Monday of your rotation. Please note: a draft of your presentation will be due 1 week prior to your presentation date (ie the 3rdMonday of your rotation).

Evaluation

1. Complete the appropriate US Passport for the length of your rotation
2. Feedback will be given in real-time at the bedside by the ultrasound faculty, the ultrasound fellows, and other attendings and residents facile with the use of emergency ultrasound.
3. Digital still and video images will be reviewed for technique, image acquisition, and interpretation.
4. An objective standard clinical exam (OSCE) of core applications will be completed by an attending or fellow for emergency medicine residents at the end of your rotation.

1 week Rotators: OSCE to include Knobology, FAST & related artifacts

2 week Rotators: OSCE to include Knobology, FAST, Cardiac, Thoracic & related artifacts. Residents must demonstrate proficiency in Qpath.

4 week Rotators: OSCE to include Knobology, FAST, Cardiac, Thoracic & related artifacts

You will need to sign up for your OSCE on your last faculty mentored scanning shift. Please arrange this at the beginning of your rotation.

5. All images must be submitted in Qpath to pass the rotation.

