

# CURRICULUM

## A Formalized Three-Year Emergency Medicine Residency Ultrasound Education Curriculum

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### ABSTRACT:

**Audience and type of curriculum:** The Ohio State University Wexner Medical Center Emergency Medicine Residency Program Ultrasound Education Curriculum is a three-year curriculum for PGY-1 to PGY-3 learners.

**Introduction/Background:** Each year of the three-year The Ohio State University Wexner Medical Center Emergency Medicine Ultrasound Curriculum focuses on different aspects of emergency ultrasonography, thereby promoting progressive understanding and utilization of point-of-care ultrasound in medical decision-making during residency training. Ultrasound is an invaluable bedside tool for emergency physicians; this skill must be mastered by resident learners during residency training, and ultrasound competency is a required ACGME milestone.<sup>1</sup> The American College of Emergency Physicians (ACEP) currently recommends that 11 applications of emergency ultrasound be part of the core skills of an emergency physician.<sup>2</sup> This curriculum acknowledges the standards developed by ACEP and the ACGME.

**Objectives:** Learners will 1) know the indications for each the 11 ACEP point-of-care ultrasound (POCUS) applications; 2) perform each of the 11 ACEP POCUS applications; 3) integrate POCUS into medical decision-making.

**Methods:** The educational strategies used in this curriculum include: independent, self-directed learning (textbook and literature reading), brief didactic sessions describing indications and technique for each examination, hands-on ultrasound scanning under the direct supervision of ultrasound faculty with real-time feedback, and quality assurance review of ultrasound images. Residents are expected to perform a minimum of 150 ultrasound examinations with associated quality assurance during the course of their residency training. The time requirements, reading material, and ultrasound techniques taught vary depending on the year of training.

**Length of curriculum:** The entirety of the curriculum is three years; however, each year of residency training has specific objectives and education material.

**Topics:** Ultrasound, POCUS, medical education, curriculum.





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**Learner Audience:**

Interns, Junior Residents, Senior Residents

**Length of Curriculum:**

Three years

**Topics:**

Ultrasound, POCUS, medical education, curriculum.

**Objectives:**

At the end of this curriculum, learners will:

1. Know the indications for each the 11 ACEP POCUS applications.
2. Perform each of the 11 ACEP POCUS applications.
3. Integrate POCUS into medical decision-making.

6. Urinary tract: Identification of hydronephrosis, measurement of urinary bladder volume.
7. Deep venous thrombosis: Identification of femoral vein and popliteal veins for compressibility.
8. Soft-tissue/musculoskeletal: Identification of abscess versus cellulitis, foreign body localization.
9. Thoracic: Identification of pneumothorax, identification of pleural effusion.
10. Ocular: Identification of vitreous hemorrhage, vitreous detachment, and retinal detachment.
11. Procedural guidance: Procedural guidance for internal jugular central venous catheter placement, femoral venous catheter placement, paracentesis, thoracentesis, incision and drainage.
12. Additional skills: Identification of inferior vena cava and observation for respiratory variation, (volume status, SBO, appendicitis, and pyloric stenosis).

**Brief introduction:**

Ultrasound is a valuable bedside diagnostic tool in the repertoire of an emergency physician. It is rapid, portable, non-invasive, and provides immediate diagnoses in the critically ill patient. Ultrasound is an important and established niche within academic emergency medicine. The ACGME considers ultrasonography a core milestone within the patient care competency in emergency medicine.<sup>1</sup> The milestones do not define which (other than extended focused assessment of sonography for trauma, eFAST) ultrasound applications are necessary for graduation. The American College of Emergency Physicians defines 11 core ultrasound applications, however.

The ACEP 11 core ultrasound applications are: trauma, intrauterine pregnancy, abdominal aortic aneurysm (AAA), cardiac, biliary, urinary tract, deep venous thrombosis, soft-tissue/musculoskeletal, thoracic, ocular, and procedural guidance.

Our curriculum covers the following exams in each category:

1. Trauma: eFAST.
2. Intrauterine pregnancy: Transvaginal and transabdominal identification of intrauterine pregnancy, including gestational sac, yolk sac, fetal pole, and fetal heart rate measurement.
3. AAA: Measurement of abdominal aorta in transverse and sagittal planes.
4. Cardiac: Parasternal long and sub-xiphoid cardiac windows for pericardial effusion and global ejection fraction; apical four-chamber view for comparison of right ventricular size.
5. Biliary: Right upper quadrant ultrasound includes identification of gallbladder, gallstones, measurement of gallbladder wall, and measurement of common bile duct.

**Problem identification, general and targeted needs assessment:**

Bedside ultrasonography is a vital diagnostic tool for emergency physicians, and the ACGME considers ultrasonography a patient care milestone within the specialty of emergency medicine. Thus, emergency medicine residency training programs should have a formalized ultrasound curriculum. The efficacy of ultrasound training in residency education has been demonstrated in several studies. For example, emergency medicine trainees were able to reliably perform and interpret focused bedside cardiac ultrasound images after participating in a web-based echocardiogram module and three hours of bedside training with a cardiologist.<sup>3</sup> Residents were able to correctly identify the presence or absence of an intrauterine pregnancy after participating in a one-hour transvaginal ultrasound (TVUS) didactic lecture, competency examination, and 10 supervised TVUS scans.<sup>4</sup>

Bedside ultrasound educational interventions targeting internal medicine residents showed that interventions employing multiple modalities, including online learning, modules, and simulation, are more effective than teaching with only hands-on practice.<sup>5</sup> Despite multiple studies demonstrating the effectiveness of frequent brief ultrasound programs, studies on specific, long-term organized residency curricula are lacking, leaving a significant gap in the literature regarding best practices for teaching ultrasound to resident learners over the course of their residency training. Residents who were exposed to an organized ultrasound curriculum or who had performed a greater number of ultrasound scans performed better on an ABEM style examination of ultrasound content.<sup>6</sup>

Clearly, ultrasound is an important part of emergency medicine and a formalized curriculum is necessary, yet there is not a



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defined “best practices” curriculum. Our presented curriculum provides a comprehensive, longitudinal educational model for resident learners throughout a 36-month residency training program.

## **Objectives of the curriculum:**

Learning objectives for each year of training will vary, yet they each address specific ACGME milestones to accurately assess resident understanding and growth in ultrasound-related competencies. Objectives for the various years and components of the curriculum are listed below.

There are three components to the curriculum: didactics, hands-on sessions, and ultrasound scanning shifts. The PGY-1 through PGY-3 learning objectives below are the learning objectives achieved through the didactic and hands-on sessions described in the curriculum chart. The goals for the ultrasound scanning shifts are also described below.

### PGY-1 Learning Objectives

At the successful completion of their PGY-1 year, residents will be able to competently perform the following:

1. Describe safety and limitations of diagnostic ultrasound (PC, SBP).
2. List the 11 current focused emergency ultrasound indications (SBP, PBL).
3. Compare and contrast focused and comprehensive ultrasound exams (SBP, PC).
4. Report common emergency ultrasound indications and contraindications (MK, PC).
5. Demonstrate proper ultrasound technique for holding and moving a probe (MK, PC).
6. Complete an eFAST exam and save images (MK, PC, IC, SBP, PR).
7. Describe the appearance of a positive eFAST examination and how the interpretation of a FAST is integrated into medical decision-making (MK, PC).
8. Describe, demonstrate and articulate the components of a focused transvaginal and transabdominal exam and how to integrate these findings into medical decision-making (MK, PC).
9. Perform a focused cardiac exam evaluating entrance (IVC), effusion, ejection (globally), equality of chambers, and exit (LVOT) (MK, PC).
10. Describe the interpretation of cardiac ultrasound findings and how to integrate these findings into medical decision-making (MK, PC).
11. Be able to guide a needle successfully to a target using ultrasound (CVC, paracentesis, thoracentesis, abscess, joint) (MK, PC, PBL).

12. Analyze and assess an ultrasound exam and demonstrate a knowledge of optimal settings and clarity of visualized anatomy (SBP, MK, PC, IC).
13. Demonstrate the ability to critically and objectively review an ultrasound exam and recognize the components of a quality exam (SBP, MK, PC).
14. Demonstrate the ability to teach basic ultrasound techniques and anatomy to other learners (MK, PC, IC, SBP).

### PGY-2 Learning Objectives

At the successful completion of their PGY-2 year, residents will be able to competently perform the following:

1. Demonstrate ability to identify and measure aorta in short and long axis and describe normal and pathologic measurements of the aorta (MK, PC).
2. Demonstrate ability to measure bladder volumes, identify kidneys, and describe the sonographic appearance of hydronephrosis (MK, PC).
3. Differentiate between normal soft tissue, cellulitis, and abscess using ultrasound (MK, PC).
4. Demonstrate the ability to acquire soft tissue images (MK, PC).

### PGY-3 Learning Objectives

At the successful completion of their PGY-3 year, residents will be able to competently perform the following:

1. Demonstrate normal lung windows and describe the sonographic signatures of pleural effusion and pneumothorax (MK, PC).
2. Demonstrate technique of scanning for DVT and describe the sonographic signatures of DVT (MK, PC).
3. Demonstrate ability to identify gallbladder and describe the sonographic signatures of cholecystitis (MK, PC).
4. Demonstrate ability to scan orbit and describe the ultrasound findings of retinal and vitreous detachment (MK, PC).
5. Describe the sonographic appearance of normal and pathologic bowel ultrasound (SBO, appendicitis, and pyloric stenosis) (MK, PC).
6. Articulate the pearls and pitfalls of documenting ultrasound findings (MK, PC).
7. Demonstrate the ability to critically analyze an ultrasound by completion of required QAs (MK, PC, SBP).
8. Demonstrate the ability to teach the ACEP-defined 11 indications for bedside ultrasound to other learners.

Goals of longitudinal ultrasound scanning shifts, which are incorporated into emergency medicine curricular blocks, are provided below.



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## Ultrasound Scanning Shift Goals

1. Residents will participate in 30 scanning shifts over the course of residency training.
2. Residents will be present from 0900-1700 on their assigned shift.
  - a. 80% of this time will be spent on bedside ultrasound in the emergency department and 20% will be spent on QA and didactics.
  - b. Times may vary slightly and a calendar will be maintained.
3. Residents will work with faculty to identify patients appropriate for billable or educational scans.
4. Resident will perform scans with the ultrasound team.
5. Resident will demonstrate proficiency in the 11 POCUS competencies.
6. Once proficiency is demonstrated in the core ultrasounds, resident will meet with an ultrasound faculty member to identify areas of deficiency and transition to personal goals/curriculum.
7. Complete personalized curricular goals prior to clinical shift.
8. Complete five QAs per shift – preferably cases completed by resident who is performing QA.
9. Resident will complete a self-assessment identifying skills needing further development with US faculty member and will review goals and update as appropriate.

## **Educational Strategies:**

**(See attached curriculum chart)** Please refer to the curriculum chart of linked objectives and educational strategies.

## **Associated Content:**

A complete list of curricular resource material is provided below; however, additional videos utilizing Google Slides™ videos can be accessed via our departmental ultrasound website [www.osuultrasound.com](http://www.osuultrasound.com). These videos and corresponding slides provide educational content pertaining to the topics and objectives covered in each residency academic year. These content slides and associated videos are securely embedded within the website and are readily accessible upon visiting the website.

## **Evaluation and Feedback:**

This formalized ultrasound curriculum was specifically designed to address and incorporate feedback, compiled over the past several years, from both resident learners and faculty members. Our curricular model will remain dynamic through the utilization of evaluations and feedback obtained; however, this specific ultrasound curriculum is our most robust and comprehensive model, which has been the result of dynamic changes over the past several years. The curriculum will be

critically evaluated and updated by education and ultrasound faculty members in order to ensure educational material remains current and consistent with ultrasound best practices.

## **References/Further Readings:**

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## **Additional Resources:**

Resources are readily available on our departmental ultrasound website [www.osuultrasound.com](http://www.osuultrasound.com); however, a complete list of resources and educational materials are listed below.

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# DIDACTICS AND HANDS-ON CURRICULUM

Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Aorta	<ol style="list-style-type: none"> <li>Brief lecture describing the technique in measuring the abdominal aorta.  <a href="http://www.osuultrasound.com/tutorials/aorta">http://www.osuultrasound.com/tutorials/aorta</a>  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></li> <li>Hands-on session immediately following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-How to measure the abdominal aorta</p> <p>-Size of normal and abnormal abdominal aorta</p> <p>-Pearls and pitfalls (how to minimize bowel gas, comprehensive scan to avoid missing infrarenal AAA)</p>	<p>The learner will demonstrate the ability to identify and measure aorta in short and long axis and describe normal and pathologic measurements of the aorta.</p>	PGY-2	<p>10 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist and/or Likert scale of skill mastery</p>
Trauma	<ol style="list-style-type: none"> <li>Brief lecture describing eFAST scan technique.  <a href="http://www.osuultrasound.com/tutorials/fast">http://www.osuultrasound.com/tutorials/fast</a>  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></li> <li>Hands-on session immediately following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Recognizing normal and abnormal findings</p> <p>-Pearls and pitfalls (eg, technically difficult parts of exam, performing comprehensive scan)</p>	<p>The learner will complete a FAST exam and save images using naming system.</p> <p>The learner will describe the appearance of a positive FAST examination and how the interpretation of a FAST is integrated into medical decision making.</p>	PGY-1	<p>15 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>30 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Obstetrics	<ol style="list-style-type: none"> <li>Lecture describing pelvic anatomy, intrauterine pregnancy, and ectopic pregnancy.   <a href="http://www.osuultrasound.com/tutorials/pelvic-1">http://www.osuultrasound.com/tutorials/pelvic-1</a>  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a> </li> <li>Hands-on session following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Identification of gestational sac and yolk sac</p> <p>-How to measure gestational sac or embryo to estimate gestational age</p> <p>-Assessing cardiac activity, measurement of heart rate</p> <p>-Recognizing sonographic signs of ectopic pregnancy</p> <p>-Pearls and pitfalls (patient comfort, heterotopic pregnancy, etc.)</p>	<p>The learner will describe, demonstrate, and articulate the components of a focused transvaginal exam and how to integrate these findings into medical decision making.</p>	PGY-1	<p>15 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>30 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and simulation model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>
Cardiac	<ol style="list-style-type: none"> <li>Lecture describing technique for obtaining each cardiac view and measuring the inferior vena cava (IVC).   <a href="http://www.osuultrasound.com/tutorials/cardiac">http://www.osuultrasound.com/tutorials/cardiac</a>  <a href="http://www.osuultrasound.com/tutorials/ivc">http://www.osuultrasound.com/tutorials/ivc</a>  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a> </li> <li>Hands-on session immediately following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-How to measure the IVC diameter and assess collapsibility</p> <p>-How to assess qualitative global LV function, ventricular equality, ventricular outflow tracts, and the presence or absence of effusion</p> <p>-Pearls and pitfalls</p>	<p>The learner will perform a focused cardiac exam evaluating entrance (IVC), effusion, ejection (globally), equality of chambers, and exit (RVOT).</p> <p>The learner will describe the interpretation of cardiac ultrasound findings and how to integrate these findings into medical decision making.</p>	PGY-1	<p>20 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>30 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Procedural	<p>1. Lecture describing the technique for guiding a needle to a target.</p> <p><a href="http://www.osuultrasound.com/tutorials/vascular">http://www.osuultrasound.com/tutorials/vascular</a></p> <p><a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></p> <p>2. Hands-on session at simulation center following lecture.</p>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Maintaining needle visualization</p> <p>-Sterile technique</p> <p>-Differentiating veins from arteries</p> <p>-Pearls and pitfalls (transverse vs. longitudinal view in vascular access, static vs dynamic views, patient positioning)</p>	<p>The learner will be able to guide a needle successfully to a target using ultrasound (i.e. CVC, paracentesis, thoracentesis, abscess, joint).</p>	PGY-1	<p>10 minutes (lecture)</p> <p>Instructors: 1</p> <p>Equipment: PowerPoint (and projector/screen)</p> <p>30 minutes (hands-on session)</p> <p>Instructors: 1 per 3 learners</p> <p>Equipment: 1 ultrasound machine and appropriate simulation model (e.g. vascular access, paracentesis, thoracentesis, arthrocentesis) per 3 learners</p>	<p>Milestone: PC12, PC14</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>
Renal	<p>1. Brief lecture describing sonographic evaluation of renal abnormalities and the presence of hydronephrosis and bladder volume measurement.</p> <p><a href="http://www.osuultrasound.com/tutorials/genitourinary">http://www.osuultrasound.com/tutorials/genitourinary</a></p> <p><a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></p> <p>2. Hands-on session after lecture.</p>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Recognizing features of a benign renal cyst</p> <p>-How to use Doppler to evaluate kidney vasculature</p> <p>-How to measure cysts, masses, and bladder volume</p> <p>-Pearls and pitfalls</p>	<p>Demonstrate the ability to identify kidneys and describe the sonographic appearance of hydronephrosis.</p> <p>The learner will measure bladder volume.</p>	PGY-2	<p>10 minutes (lecture)</p> <p>Instructors: 1</p> <p>Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session)</p> <p>Instructors: 1 per 3 learners</p> <p>Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>



# DIDACTICS AND HANDS-ON CURRICULUM

Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Skin, soft tissue, and musculo-skeletal	<p>1. Brief lecture describing sonographic features of normal skin and muscle, as well as features that distinguish cellulitis from an abscess.</p> <p><a href="http://www.osuultrasound.com/tutorials/soft-tissue">http://www.osuultrasound.com/tutorials/soft-tissue</a></p> <p><a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></p> <p>2. Hands-on session following lecture.</p>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Sonographic features of cellulitis vs abscess</p> <p>-How to measure fluid collection</p> <p>-Using Doppler to identify nearby vascular structures</p> <p>-Pearls and pitfalls</p>	<p>The learner will differentiate between normal soft tissue, cellulitis and abscess using ultrasound.</p> <p>Demonstrate the ability to acquire soft tissue and musculoskeletal images.</p>	PGY-2	<p>10 minutes (lecture)</p> <p>Instructors: 1</p> <p>Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session)</p> <p>Instructors: 1 per 3 learners</p> <p>Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12, PC13</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>
Pulmonary/Thoracic	<p>1. Lecture describing the technique for evaluating lungs using ultrasound and identifying normal and abnormal physiology based on sonographic findings.</p> <p><a href="http://www.osuultrasound.com/tutorials/ThoracicLung">http://www.osuultrasound.com/tutorials/ThoracicLung</a></p> <p><a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></p> <p>2. Hands-on session immediately following lecture.</p>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Recognizing pleural line, the sliding sign, A-lines, and B-lines</p> <p>-Recognizing pneumothorax, pleural effusion, and interstitial infiltrates</p> <p>-Pearls and pitfalls (optimizing settings on the ultrasound machine)</p>	<p>The learner will demonstrate normal lung windows and describe the sonographic signatures of pleural effusion and pneumothorax.</p>	PGY-3	<p>10 minutes (lecture)</p> <p>Instructors: 1</p> <p>Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session)</p> <p>Instructors: 1 per 3 learners</p> <p>Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>



# DIDACTICS AND HANDS-ON CURRICULUM

Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
DVT	<ol style="list-style-type: none"> <li>Brief lecture describing the technique in assessing vasculature for thrombosis using ultrasound.  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></li> <li>Hands-on session immediately following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-How to evaluate veins for thrombosis using compression</p> <p>-Pearls and pitfalls (using Doppler to confirm anatomy, recognizing anatomic variation such as duplicated veins)</p>	The learner will demonstrate technique of scanning for DVT and describe the sonographic signatures of DVT.	PGY-3	<p>10 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>
Hepato-biliary	<ol style="list-style-type: none"> <li>Brief lecture describing the technique in visualizing the gallbladder.  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></li> <li>Hands-on session immediately following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Sonographic features of gallstones and cholecystitis</p> <p>-How to measure gallbladder wall thickness</p> <p>-Sonographic Murphy's sign</p> <p>-Pearls and pitfalls (avoid misidentifying gallbladder, minimizing bowel gas)</p>	The learner will demonstrate the ability to identify gallbladder and describe the sonographic signatures of cholecystitis.	PGY-3	<p>10 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>
Ocular	<ol style="list-style-type: none"> <li>Brief lecture describing the technique in assessing ocular structures using ultrasound.  <a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></li> <li>Hands-on session immediately following lecture.</li> </ol>	<p>-Proper technique and probe choice for image acquisition</p> <p>-Identifying normal and abnormal ocular structures</p> <p>-Using Doppler to evaluate ocular blood supply</p> <p>-Pearls and pitfalls ("floating" the transducer on gel to minimize pressure on the globe)</p>	The learner will demonstrate ability to scan the orbit and describe the ultrasound findings of retinal detachment, vitreous detachment, and vitreous hemorrhage.	PGY-3	<p>10 minutes (lecture) Instructors: 1 Equipment: PowerPoint (and projector/screen)</p> <p>20 minutes (hands-on session) Instructors: 1 per 3 learners Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>



# DIDACTICS AND HANDS-ON CURRICULUM

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GI	<p>1. Brief lecture describing the technique for evaluating the small and large bowel using ultrasound.</p> <p><a href="http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources">http://www.osuultrasound.com/residents-and-faculty/osu-specific-resources</a></p> <p>2. Hands-on session immediately following lecture.</p>	<p>-Proper technique and probe choice for image acquisition</p> <p>-How to measure the diameter of bowel lumen</p> <p>-Size of normal and abnormal bowel lumen diameter</p> <p>-Measuring bowel wall thickness</p> <p>-Normal and abnormal bowel wall thickness</p> <p>-Locating and evaluating the appendix</p> <p>-Sonographic features of appendicitis</p> <p>-Pearls and pitfalls (minimizing bowel gas, avoiding missing collapsed bowel loops)</p>	<p>The learner will describe the sonographic appearance of normal and pathologic bowel ultrasound (i.e. SBO, appendicitis, and pyloric stenosis).</p>	PGY-3	<p>10 minutes (lecture)</p> <p>Instructors: 1</p> <p>Equipment: PowerPoint (and projector/screen)</p> <p>30 minutes (hands-on session)</p> <p>Instructors: 1 per 3 learners</p> <p>Equipment: 1 ultrasound machine and model per 3 learners</p>	<p>Milestone: PC12</p> <p>Assessment: -Lecture: quiz -Hands-on: checklist</p>
Ultra-sound scanning shifts	<p>1. The resident should participate in 30 scanning shifts over the course of three years.</p> <p>2. The resident will participate in QA review following scanning shifts.</p>	All categories described above.	Residents will perform clinical scans in the above categories.	PGY-1 through PGY-3	30 shifts varying from 4-8 hour blocks of time	Observation with immediate feedback



# POINT OF CARE ULTRASOUND ASSESSMENT

Resident:

Year:   PGY-1           PGY-2           PGY-3           PGY-4

Exam Performed:

Date:

	Unable to perform	Performs with assistance	Performs independ-ently
Describes the indications for the ultrasound examination (Level 1, PC12)			
Optimizes images using appropriate gain and depth (Level 2, PC12)			
Selects the appropriate probe (Level 2, PC12)			
Places probe in correct position			
Acquires complete images			
Measures accurately (if applicable)			

Comments:

Supervised by: