POCUS Objectives by Organ System.
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1. Basic principles.
Recognize fundamental ultrasound physics so that the highest possible image quality and cine clips can be used for image-acquisition by being able to:

A. Recognize appropriate probe selection for a given application.
B. Recognize machine controls and transducer manipulation.
C. Recognize ultrasound properties that lead to optimization of image acquisition including selecting appropriate depth, sector width, frequency, focus, gain, harmonics, dynamic range, acoustic power.
D. Recognize features of spatial and temporal resolution.
E. Understand patient positioning and its effects on image quality. This goal is partially explored in basic principles and further explored in the specific organ system.
F. Identify normal and abnormal ultrasound anatomy and pathophysiologic consequences of the imaged abnormalities. This goal is explored in the specific organ system.
G. Identify commonly encountered artifacts and strategies that can be used to eliminate them depending on the specific POCUS application.
H. Recognize when the examination is beyond the technical or interpretative capability of the POCUS exam on a particular application as seen below. This goal is explored in the specific organ system.
I. Recognize the biological effects of POCUS.

Technology explored includes 2D, M-mode and Color Flow Doppler (CFD). CFD is out of the scope of most POCUS exams. It is explored here and part of the OSCEs. Spectral doppler is out of the scope of the POCUS exam.

2. Lung
Review artifact formation with the use of 2D and M-mode modalities and the implications of these for the Lung Ultrasound (LU) exam.
Identify the appropriate ultrasound settings, probe selection and method of the LU examination..
Identify physical structures: ribs, aerated lung, pleural line and diaphragm.
Identify normal lung semiology suggestive of an aerated lung.
Identify pathologic lung semiology: alveolar interstitial syndrome, subpleural consolidations, lung point, spine sign, thickened and irregular pleural line.
Identify pathologic structures: pleural effusions, consolidations, atelectasis.
Determine the amount of pleural fluid semiquantitatively.
Make a functional assessment of the diaphragm.
Integrate LU findings in order to rule in or rule out a pneumothorax.
Integrate LU findings in order to make an assessment of the differential diagnosis of respiratory failure or shock.
Recognize the limitations of LU for technical or anatomic constraints. Recognize when the examination is beyond the interpretative capability of the POCUS exam.

3. Heart.

Understand the definition of the Focused Cardiac Exam (FoCUS): Scope, Goals and Method of assessment.

Identify the indications for a FoCUS exam.

Identify the appropriate ultrasound settings, probe selection and method of the FoCUS examination. Ultrasound technology used for the FoCUS exam includes 2D and M-mode. Color flow doppler is addressed but not part of the FoCUS exam.

Identify relevant anatomic structures that assist in the appropriate location of the cardiac views needed for the focused cardiac exam.

Identify the following diagnostic targets with the use of pattern recognition:

1. Left ventricle (LV) size and function.
2. Right ventricle (RV) size and function.
3. Gross regional wall abnormalities by evaluating myocardial thickness.
4. Pericardial effusion and tamponade physiology.
5. Detect morphologic clues towards gross valvular disease including leaflet or cusp massive disruption or naked thickening and flail .
6. Detect gross intracardiac masses: large vegetations or visible intracardiac or inferior vena cava thrombus.
7. Detect gross signs of chronic cardiac disease including major LV, RV, left atrial and right atrial dilatation or severe hypertrophy of the LV or RV.
8. Hypovolemia and fluid responsiveness assessment.
9. Detection of an ascending aortic dissection.

Integrate FoCUS findings in order to make an assessment of the differential diagnosis of respiratory failure, shock and cardiac arrest.

Recognize the limitations of the FoCUS for technical or anatomic constraints. Recognize when the examination is beyond the interpretative capability of the POCUS exam.

4. Abdomen.

A. Gastric Ultrasound.

Identify the appropriate ultrasound settings, probe selection and method of the Gastric Ultrasound examination.

Identify relevant anatomic structures that assist in the appropriate location of the gastric antrum: abdominal aorta, superior mesenteric artery, pancreas, and liver under ultrasound.

Identify the expected layers of the GU based on ultrasonographic examination.

Determine the contents by the different ultrasonographic appearance of the gastric antrum: no content, clear secretions, clear fluid and solid food.

Determine if the amount of fluid seen on GU examination represents expected secretions vs clear fluid via a quantitative approach.

Make an aspiration risk assessment based on the GU exam performed. Both quantitative and qualitative assessment methods are described.

Recognize the limitations of LU for technical or anatomic constraints.

B. Focused Assessment with Sonography for Trauma (FAST)

Identify the appropriate ultrasound settings, probe selection and method of the FAST examination.

Identify the typical appearance of intra abdominal structures and boundaries including the diaphragm, liver, spleen, kidneys and bladder under ultrasound.

Identify intra abdominal free fluid.

Make a qualitative assessment of fluid volume.

Recognize the accuracy and utility of FAST in clinical decision making.

Integrate FAST exam findings in order to make an assessment of the differential diagnosis in shock.

Recognize the limitations of the FAST exam for technical or anatomic constraints.

5. Vascular Ultrasonography.

Identify the appropriate ultrasound settings, probe selection and method of the diagnostic vascular examination. Ultrasound technology used for the vascular exam includes 2D. Color Flow Doppler will be limited to the use of procedural vascular ultrasonography.

Identify the typical appearance of relevant veins and associated arteries under ultrasound with and without compression. These vessels include the internal jugular, subclavian, axillary, common femoral, proximal saphenous, superficial femoral, popliteal vein and artery.

A. Diagnostic vascular ultrasonography

Identify the typical appearance of deep vein thrombosis in relevant veins by direct visualization or by a compressions assessment.

Integrate the diagnostic vascular ultrasonography exam into appropriate clinical context in the differential diagnosis of respiratory distress and shock states.

Recognize the limitations of vascular ultrasonography exam for technical or anatomic constraints.

B. Procedural vascular ultrasonography.

Identify the long and short axis planes of the target vessel so that orthogonal assessments can be made during the procedure.

Identify the typical appearance of deep vein thrombosis in relevant veins by direct visualization or by a compressions assessment.

Recognize the advantages and limitations of the in plane needle approach for venous or arterial access.

Recognize the advantages and limitations of the out of plane needle approach for venous or arterial access.

Identify the intraluminal wire with ultrasound to confirm appropriate placement. Both long axis and short axis approaches are addressed.

Identify signs that confirm intravascular placement of a short catheter by the use of 2D and the use of Color Flow Doppler for central or peripheral vein access.

Recognize the limitations of vascular ultrasonography access for technical or anatomic constraints.

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