BASICS OF ULTRASOUND

1. Describe the advantages and disadvantages of ultrasound
2. Identify and discuss the function of basic controls on an ultrasound machine console, including
    a. Transducer selection
    b. Presets
    c. Depth
    d. Focal zone/focal region
    e. Gain
    f. Time gain compensation/depth gain compensation
3. Discuss the basic physics principles of ultrasound, including
    a. How an ultrasound image is generated
    b. Inter-relationship of machine controls (eg, frequency, resolution, and depth)
    c. Doppler imaging (difference between power Doppler and color Doppler)
4. Discuss terminology of ultrasound
    a. Reflection
    b. Refraction
    c. Angle of incidence
    d. Echogenicity (hypoechoic, hyperechoic, anechoic, and isoechoic)
    e. Attenuation
    f. Near field/far field
    g. Anisotropy
5. Demonstrate how to optimize an ultrasound image
    a. Superficial structures
    b. Deep structures
6. Describe the normal ultrasonographic appearance of adipose, muscle, tendon, ligament, bone, vessels, nerve, and cartilage
7. Identify and discuss the source and/or implications of basic ultrasound artifacts, including
    a. Anisotropy
    b. Reverberation
    c. Refraction
    d. Through transmission
    e. Acoustic shadowing
8. Perform image acquisition of vascular structures using color and power Doppler

MUSCULOSKELETAL ULTRASOUND

1) Obtain an acceptable set of MusculoSkeletal US images of the following regions
    a. Shoulder
    b. Elbow
    c. Wrist-hand
    d. Hip
    e. Knee
    f. Ankle-foot
2) Demonstrate apporpirate labeling of MusculoSkeletal US images
    a. Use of text insertion
    b. Use of arrows and measurement calipers
3) Demonstrate how to capture, store, and transfer MusculoSkeletal US images
4) Perform an appropriate MusculoSkeleteal US evaluation to identify the following conditions:
    a. <u>Shoulder</u>
        i. Rotator cuff tear/tendinopahty
        ii. Bicipital tear/tendinopathy and subluxation
        iii. Subacromial–subdeltoid bursopathy
        iv. Acromioclavicular joint osteoarthritis and laxity
    b. <u>Elbow</u>
        i. Biceps insertion tendinopathy and tear

ii. Common extensor tendinopathy
iii. Dynamic examination of the ulnar nerve at the elbow
iv. Common flexor tendinopathy
v. ulnar collateral ligament injury

c. Wrist–hand
i. Demonstrate six extensor compartments
ii. DeQuervain's tenosynovitis
iii. Intersection syndrome
iv. Scapho-lunate ligament stability
v. Triangular Fibrocartilage Complex
vi. Carpal tunnel syndrome

d. Hip
i. Gluteus medius/minimus tendinopathy
ii. Ileopsoas tendinopathy
iii. Hip joint and femoral neck

e. Knee
i. Patellar tendinopathy
ii. Suprapatellar recess and effusion
iii. Quadriceps tendinopathy
iv. MCL and anterior horn of medial meniscus
v. LCL and popliteal tendon
vi. Baker's cyst

f. Ankle–foot
i. Peroneal tendinopathy (including dynamic evaluation for instability)
ii. ATL, Anterior Tib Fib ligament, Calcaneo-fibular ligaments and injuries
iii. Achilles tendinopathy and Calcaneal bursopathy
iv. Plantar fasciopathy
v. Tendinopathy of Tibialis Anterior and Extensor Hallucis Longus

US GUIDED INJECTION

1. Describe the advantages and disadvantages of needle tracking using an in-plane versus out-of-plane approach and provide clinical examples of when each approach may be beneficial
2. Image a needle using an in-plane (longitudinal or long axis) and out-of-plane (short axis or transverse) approach using ultrasound guidance in a phantom, turkey breast, cadaveric specimen, or other imaging medium, including demonstration of the following transducer manipulations:
a. Translation (sliding/gliding)
b. Rotation
3. Describe "cross-cut" artifact when imaging/tracking a needle during an interventional procedure
c. Heel–toe
d. Tilting (toggling/wagging)
e. Compression
4. Demonstrate the ability to efficiently relocate a lost needle during both an in-plane and out-of-plane needle tracking approach
5. Demonstrate the ability to guide a needle into a target region or structure using both an in-plane and out-of plane approach in a phantom, turkey breast, cadaveric specimen, or other imaging medium
6. Obtain an acceptable set of pre-, intra-, and post-procedure images of an ultrasound-guided procedure
7. Demonstrate appropriate labeling of the ultrasound guided procedure images
8. Demonstrate how to store and transfer the ultrasound guided procedure images
9. Generate an appropriate ultrasound-guided procedure report

(OPTIONAL)
10. Perform and appropriately document (eg, capture, label, save, and transfer images; generate a report) the following ultrasound-guided procedures:
a. Shoulder

i. Subacromial–subdeltoid bursa injection
ii. Intra-articular glenohumeral joint injection
iii. Intra-articular acromioclavicular joint injection
iv. Bicipital tendon sheath injection
b. Elbow
i. Intra-articular elbow joint injection
ii. Peri- or intratendinous injection of the common extensor tendon origin
iii. Peri- or intratendinous injection of the common flexor tendon origin
c. Wrist–hand
i. Carpal tunnel injection
ii. First dorsal compartment tendon sheath injection
iii. Intra-articular wrist injection
d. Hip
i. Intra-articular hip injection
ii. Greater trochanteric bursa injection
iii. Gluteus medius or minimus peri- or intratendinous injection
e. Knee
i. Intra-articular knee injection
ii. Iliotibial band/bursa (distal) injection
f. Ankle–foot
i. Intra-articular tibiotalar joint injection
ii. Peroneal tendon sheath injection
iii. Peri- or intraplantar fascia injection
g. Miscellaneous cyst
i. Aspiration or injection of a

ULTRASOUND

1. Orientation of the ultrasound probe
2. Orientation of the patient
3. Identifying fetal head position
4. Identifying cardiac activity and recording heart rate
5. Location of the placenta
6. Measuring largest pocket of amniotic fluid in all four quadrants

FAST

Focused assessment with sonography for trauma (FAST) is a rapid bedside ultrasound examination used as a screening test for pericardial effusion or hemoperitoneum.

Residents will be taught to identify free fluid in the following:

1. Perihepatic space
2. Perisplenic space
3. Pericardium
4. Pelvis

Within this portion of the curriculum, residents may also learn venous ultrasound to exclude DVT.