

## ULTRASOUND STUDY GUIDE

- **Technical knowledge**
  - Physics and Safety, understand the following: 1) Physics of sound interactions in the body. 2) How transducers work, how the image is created, and what physical properties are being displayed. 3) Relative strengths and weaknesses of different transducers including various aspects of resolution.
    - Sound properties and interactions
      - Reflection
      - Attenuation
      - Scattering
      - Refraction
      - Absorption
      - Acoustic impedance
      - Speed of sound
      - Wavelength
      - Other
    - Transducer fundamentals
      - Transmit frequencies
      - Transducer components
      - Transducer types
      - Transducer pros and cons
      - Other
    - Beam formation
      - Focusing
      - Steering
      - Other
    - Imaging modes and display
      - 2D
      - 3D

- 4D
- Panoramic imaging
- Compound imaging
- Harmonic imaging
- Elastography
- Contrast imaging
- Scanning modes
  - 2D
  - 3D
  - 4D
  - M-mode
  - Doppler
  - Other
- Image orientation
- Other
- Image resolution
  - Axial
  - Lateral
  - Elevational / Azimuthal
  - Temporal
  - Contrast
  - Penetration vs. resolution
  - Other
- System Controls - Know the function of the controls listed below and be able to recognize them in the list of scan parameters shown on the image monitor
  - Gain
  - Time gain compensation
  - Power output
  - Focal zone
  - Transmit frequency
  - Depth
  - Width
  - Zoom / Magnification
  - Dynamic range
  - Frame rate
  - Line density
  - Frame averaging / persistence
  - Other
- Doppler / Flow imaging – Be familiar with the terminology used to describe Doppler exams. Be able to interpret and optimize the images. Be

able to recognize artifacts, know their significance, and know what produces them.

- Doppler phenomenon
- Doppler equation
- Modes (duplex, color, etc.)
  - Pulsed Doppler
  - Duplex Doppler
  - Color Doppler
  - Power Doppler
  - Continuous wave Doppler
  - 3D/4D Doppler
  - B-flow
  - Other
- Doppler controls / Optimization- Know the function of the controls listed below and be able to recognize them in the list of scan parameters shown on the image monitor
  - Color box
  - Gain
  - Doppler angle
  - Pulse repetition frequency / Scale
  - Transmit frequency
  - Wall filter
  - Color write priority
  - Sample volume size
  - Packet size / Dwell time
  - Beam steering
  - Other
- Doppler measurements – Know how to obtain and optimize the measurements listed below and how to interpret the results.
  - Velocity
  - Resistive index
  - Pulsatility index
  - Systolic/Diastolic ratio
  - Acceleration
  - Acceleration time
  - Volume flow
  - Other
- Doppler – grey-scale trade-offs
- Other
- Artifacts - Be able to recognize artifacts, know their significance, and know what produces them.
  - Shadowing

- Through transmission
- Mirror
- Reverberation
- Ring-down
- Comet tail
- Speed propagation
- Multipath
- Refraction
- Side-lobe
- Slice thickness
- Anisotropy
- Noise
- Electrical interference
- Doppler
  - Aliasing
  - Tissue vibration
  - Spectral broadening
  - Blooming
  - Motion / Flash
  - Twinkle
  - Noise
  - Acoustic streaming
  - Other
- Other
- Safety
  - Bioeffects - Understand the potential bioeffects of ultrasound and know how to monitor and minimize them.
    - Mechanical / Cavitation
    - Thermal
    - Mechanical index
    - Thermal index
    - Other
  - Transducer safety/care – Understand the care and cleaning of transducers.
  - Equipment quality assurance – Be familiar with how the performance and quality of ultrasound machines are checked.
    - Phantoms
    - Resolution (spatial and contrast)
    - Measurement accuracy
    - Maximum depth of penetration
    - Image uniformity
    - Image geometry/caliper accuracy

- Other
  - Regulatory / Accreditation – Be familiar with the ACR accreditation process.
  - Other
- **Pathological Diagnosis** – The list below includes the material that is most likely to appear on the Ultrasound Certifying examination. For the structures and conditions listed, be able to do the following: 1) Identify normal structures. 2) Recognize and differentiate normal, normal variants, artifacts and other abnormalities. 3) Determine the most likely diagnosis, develop a reasonable differential diagnosis, and know what can be reasonably excluded when presented with images. 4) Know what the most reasonable management is. 5) Know the relative strengths and weakness and the role of ultrasound with respect to other tests. 6) Understand their anatomy, embryology, and pathophysiology relevant to imaging.
  - Gastrointestinal (nonvascular)
    - Bowel
      - Normal
      - Normal variant
      - Congenital anomalies
      - Appendicitis
      - Diverticulitis
      - Epiploic appendicitis
      - Inflammatory bowel disease
      - Colitis
      - Intussusception
      - Ischemic bowel
      - Pneumatosis
      - Small bowel obstruction
      - Cancer
        - Esophagus
        - Stomach
        - Small bowel
        - Colon
        - Rectum
      - Metastases
      - Lymphoma
      - Gastrointestinal stromal tumor (GIST)
      - Malrotation
      - Anal sphincter
        - Normal
        - Tear
        - Fistula
        - Other
      - Other

- Liver
  - Normal
  - Normal variants
  - Congenital anomalies
  - Focal masses
    - Cysts
      - Simple
      - Complicated
      - Other
    - Cavernous hemangiomas
    - Hematoma
    - Biloma
    - Abscess
      - Pyogenic abscess
      - Amoebic abscess
      - Candidiasis / fungal
      - Other
    - Granuloma
    - Echinococcus
      - Focal nodular hyperplasia
    - Other
  - Other
- Gallbladder
  - Normal
  - Normal variants
    - Phrygian cap
    - Other
  - Congenital anomalies
    - Agenesis
    - Duplication
    - Other
  - Gallstones
  - Sludge
  - Acute cholecystitis
    - Calculous
    - Acalculous
    - Gangrenous
    - Perforated
    - Emphysematous
    - Hemorrhagic
    - Other
  - Chronic cholecystitis
  - Wall thickening (nonbiliary related)

- Polyp
- Adenomyomatosis
- Porcelain
- Carcinoma
- Metastases
- Lymphoma
- Torsion
- Other
- Bile ducts
  - Normal
  - Normal variants
  - Congenital anomalies
  - Dilatation (extra- and intrahepatic)
  - Postcholecystectomy ectasia
  - Choledocholithiasis
  - Primary sclerosing cholangitis
  - Pyogenic cholangitis
  - Recurrent pyogenic cholangitis
  - AIDS cholangitis
  
  - Caroli disease
  - Choledochal cyst
  - Pneumobilia
  - Cholangiocarcinoma
  - Metastases
  - Lymphoma
  - Stents
  - Other
- Pancreas
  - Normal
  - Normal variants
  - Congenital anomalies
  - Cysts
    - Simple
    - Complicated
    - Other
  - Acute pancreatitis
  - Chronic pancreatitis
  - Pseudocyst
  - Pancreatic necrosis
  - Abscess
  - Cancer

- Islet cell neoplasm
- Cystic neoplasms
- Intraductal papillary mucinous neoplasm (IPMN)
- Metastases
- Lymphoma
- Trauma
- Transplant (nonvascular)
  - Pancreatitis
  - Pseudocyst
  - Hematoma
  - Abscess
  - Post-transplant lymphoproliferative disease
  - Other
- Other
- Spleen
  - Normal
  - Normal variants
  - Congenital anomalies
  - Cyst
    - Simple
    - Complicated
    - Other
  - Splenomegaly
  - Infarction
  - Hematoma
  - Laceration
  - Granuloma
  - Abscess
  - Hemangioma
  - Hamartoma
  - Metastases
  - Lymphoma
  - Angiosarcoma
  - Splenosis
  - Other
- Peritoneum
  - Normal
  - Normal variant
  - Congenital anomalies
  - Ascites
  - Abscess
  - Hemorrhage



- Metastasis
- Carcinomatosis
- Lymphoma
- Primary peritoneal cancer
- Mesothelioma
- Tuberculosis
- Omental infarct
- Free air
- Other
- Mesentery
  - Adenopathy
  - Fibrosis
  - Other
- Abdominal wall
  - Normal
  - Congenital anomalies
  - Hematoma
  - Abscess
  - Endometriosis
  - Hernia
    - Inguinal - not involving scrotum
    - Incisional
    - Ventral
    - Spigelian
    - Other
  - Primary neoplasm
  - Metastasis
  - Lymphoma
  - Desmoid
  - Lipoma
  - Postsurgical changes
  - Other
- Lymph nodes
  - Normal
  - Adenopathy
    - Lymphoma
    - Metastatic disease
    - Reactive/Infection/Inflammation
    - Other
- Other
- Genitourinary
  - Kidney (nonvascular)

- Normal
- Normal variants
  - Extrarenal pelvis
  - Junctional parenchymal defect
  - Column of Bertin
  - Pelvic kidney
  - Other
- Congenital anomalies
  - Duplication
  - Horseshoe kidney
  - Agenesis
  - Crossed fused ectopia
  - Other
- Hydronephrosis
- Calculi
- Nephrocalcinosis
- Cyst
  - Simple
  - Complicated
  - Other
- Parapelvic cyst
- Polycystic disease – Autosomal dominant
- Polycystic disease – Autosomal recessive
- Multicystic dysplastic
- Acquired renal cystic disease
- Masses
  - Angiomyolipoma
  - Oncocytoma
  - Multilocular cystic nephroma
  - Renal cell carcinoma
  - Metastasis
  - Lymphoma
  - Uroepithelial (transitional) cell carcinoma
  - Other
- Infections
  - Pyelonephritis
  - Pyonephrosis
  - Abscess
  - Emphysematous pyelonephritis/pyelitis
  - Xanthogranulomatous pyelonephritis
  - Fungus ball
  - Other
- Clot in collecting system

- Urinoma
- Hematoma
- Lymphocele
- Sinus Lipomatosis
- Glomerular interstitial disease
- Infarction
- Cortical necrosis
- Transplant nonvasculature
  - Hydronephrosis
  - Hematoma
  - Urinoma
  - Abscess
  - Lymphocele
  - Pyelonephritis
  - Clot/pus in the collecting system
  - Post-transplant lymphoproliferative disease
  - Other
- Other
- Ureter
  - Normal
  - Normal variants
  - Congenital anomalies
  - Hydroureters
  - Megaureter
  - Ureteral stone
  - Clot in collecting system
  - Uroepithelial (transitional) cell cancer
  - Stents
  - Other
- Bladder
  - Normal
  - Normal variants
  - Congenital anomalies
  - Calculi
  - Wall thickening
  - Ureteral jet
  - Bladder volume
  - Uroepithelial (transitional) cell cancer
  - Polyp
  - Cystitis
  - Emphysematous cystitis
  - Hemorrhage

- Bladder outlet obstruction
- Neurogenic bladder
- Diverticula
- Ureterocele
- Ectopic ureterocele
- Fungal balls
- Other
- Urethra
  - Normal
  - Normal variants
  - Congenital anomalies
  - Diverticulum
  - Cyst
  - Abscess
  - Mass
  - Stricture/stenosis
  - Other
- Scrotum
  - Testes
    - Normal
    - Normal variants
    - Congenital anomalies
      - Nondescended testis
      - Polyorchia
      - Other
    - Cystic ectasia of rete testis
    - Orchitis
    - Torsion/detorsion
    - Microlithiasis
    - Masses
      - Germ cell tumor
      - Lymphoma
      - Metastasis
      - Stromal tumor
      - Adenomatoid tumor
      - Epidermoid cyst
      - Hematoma
      - Intratesticular varicocele
      - Abscess
      - Cyst – Intratesticular
      - Cyst – Tunica albuginea
      - Other
    - Focal atrophy/fibrosis

- Sarcoidosis
- Tuberculosis
- Infarct
- Trauma/laceration/hematoma
- Adrenal rest
- Other
- Epididymis
  - Normal
  - Epididymitis
  - Abscess
  - Spermatocele
  - Cyst
  - Adenomatoid tumor
  - Sperm cell granuloma
  - Postvasectomy/Congestion
  - Other
- Miscellaneous
  - Hydrocele
  - Pyocele
  - Hematocele
  - Varicocele
  - Fournier gangrene
  - Scrotal edema
  - Scrotal abscess
  - Hernia
  - Scrotolith
  - Vas deferens
  - Appendix testis/epididymis
  - Torsed appendix
  - Spermatic cord
    - Cyst
    - Hematoma
    - Abscess
    - Lipoma/benign tumor
    - Malignant tumor
    - Other
  - Other
- Prostate
  - Normal
  - Normal variant
  - Congenital abnormalities
  - Benign prostatic hypertrophy
  - Cancer

- Prostatitis
- Abscess
- Cyst
- Seminal vesicles
  - Normal
  - Abnormal
- Other
- Penis
  - Normal
  - Peyronie disease
  - Masses
  - Doppler
    - Normal
    - Abnormal
  - Other
- Adrenal gland
  - Normal
  - Normal variant
  - Congenital anomalies
  - Cyst
  - Adenoma
  - Pheochromocytoma
  - Myelolipoma
  - Metastasis
  - Lymphoma
  - Cancer
  - Hyperplasia
  - Hemorrhage
  - Other
- Retroperitoneum
  - Normal
  - Normal variant
  - Congenital anomalies
  - Adenopathy
    - Lymphoma
    - Metastatic disease
    - Reactive/Infectious/Inflammatory
    - Other
  - Primary tumor
  - Hemorrhage
  - Abscess
  - Fibrosis

- Other
  - Other
- Gynecology –INTRODUCTORY NOTE: Beginning in 2015, the examination will include one or more questions based on the diagnostic criteria and descriptive lexicon as well as appropriate management recommendations taken from the summary tables of the following article: Levine D, et al. Management of asymptomatic ovarian and other adnexal cysts imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement. *Radiology* 2010;256(3):943-954.
  - Uterus
    - Normal
    - Normal variants
      - Congenital anomalies
        - Septate• Bicornuate
        - Unicornuate
        - Didelphys
        - Other
    - Endometrium
      - Normal
        - Measurement technique
        - Premenopausal
        - Postmenopausal
        - Other
      - Effects of hormone replacement
      - Intrauterine / Intratubal device
        - Normal location
        - Migrated/perforated
        - Tubal occlusion devices
        - Other
      - Endometrial fluid
      - Polyp
      - Hyperplasia
      - Carcinoma
      - Endometritis
      - Other
    - Myometrium
      - Fibroids
      - Lipoleiomyoma
      - Leiomyosarcoma
      - Adenomyosis
      - C-section scar

- Other
      - Vascular lesions
      - Other
  - Ovary/Adnexa
    - Normal
    - Normal variants
    - Congenital anomalies
    - Polycystic ovarian disease
    - Ovarian hyperstimulation syndrome
    - Masses/cysts
      - Simple cyst
      - Hemorrhagic/ruptured cyst
      - Endometrioma
      - Cystadenoma/carcinoma
      - Dermoid
      - Other germ cell tumor
      - Fibroma/thecoma
      - Other stromal tumors / granulosa cell tumor
      - Metastasis
      - Other
    - Ovarian torsion
    - Pelvic inflammatory disease
    - Tubo-ovarian abscess/complex
    - Peritoneal inclusion cyst
    - Posthysterectomy
    - Free fluid
    - Other
  - Cervix
    - Normal
    - Stenosis
    - Polyp
    - Cancer
    - Fibroid
    - Other
  - Fallopian tube
    - Hydrosalpinx
    - Pyosalpinx
    - Hematosalpinx
    - Torsion
    - Other
  - Vagina
  - Other
- Obstetrics



- First trimester
  - Normal
    - Gestational Sac
      - Normal appearance (double decidual sac, intradecidual, etc.)
      - Sac Size / Growth
      - Other
    - Embryo/Fetus
      - Physiologic gut herniation
      - Rhombencephalon
      - Growth / Crown rump length (CRL)
      - Other
    - Yolk sac
    - Cardiac activity/rate
    - Amnion
    - Chorion
    - $\beta$ -hCG levels / menstrual dates
    - Other
  - Multiple gestations (chorionicity and amnionicity)
  - Failed early pregnancy
  - Embryonic demise
  - Subchorionic hematoma
  - Ectopic pregnancy
    - Tubal
    - Interstitial/Cornual
    - Cervical
    - Ovarian
    - Scar (cesarean delivery)
    - Abdominal
    - Rudimentary horn
    - Heterotopic
    - Other
  - Gestational trophoblastic disease
  - Nuchal translucency / first trimester screening
  - Embryonic/fetal structural abnormalities
  - Chorionic villus sampling (CVS)/Amniocentesis
  - Other
- Second and third trimester
  - Normal findings
    - Fetus
    - Placenta
    - Biometry

- Amniotic fluid
- Multiple gestations (including chorionicity and amnionicity)
- Other
- Fetal abnormalities
  - Abnormal growth/well being
  - Hydrops
  - Fetal death
  - CNS
    - Hydrocephalus/ventriculomegaly
    - Chiari II malformation/meningocele/myelomeningoceles
    - Anencephaly/acrania
    - Holoprosencephaly
    - Hydranencephaly
    - Encephalocele
    - Agenesis corpus callosum
    - Dandy Walker / Vermian defects / Posterior fossa cystic spaces
    - Mega cisterna magna
    - Vein of Galen malformation
    - Microcephaly
    - Intracranial masses
    - Sacrococcygeal teratoma
    - Intracranial hemorrhage
    - Porencephaly
    - Schizencephaly
    - Other
  - Face and Neck
    - Cystic hygroma
    - Cervical teratoma
    - Goiter
    - Facial cleft
    - Macroglossia
    - Micrognathia
    - Hypertelorism/Hypotelorism
    - Other

- GU
  - Multicystic dysplastic kidney
  - Hydronephrosis/Pelviciectasis
  - Ureteropelvic junction (UPJ) obstruction
  - Renal agenesis
  - Autosomal recessive polycystic disease
  - Bladder outlet obstruction
  - Bladder exstrophy
  - Ureterocele/duplication
  - Pelvic kidney / Abnormal kidney location/configuration
  - Masses
    - Ovarian cystic masses
    - Other
  - Ambiguous genitalia
  - Adrenal abnormality
  - Other
- GI
  - Omphalocele
  - Gastroschisis
  - Intestinal obstruction
    - Esophageal atresia

- Duodenal atresia
    - Small bowel atresia
    - Anorectal atresia
    - Other
  - Ascites
  - Masses
  - Meconium ileus
  - Meconium peritonitis
  - Liver abnormality
  - Gallbladder abnormality
  - Other
- Chest
  - Masses
    - Congenital pulmonary airway malformation (CPAM)
    - Sequestration
    - Other
  - Congenital diaphragmatic hernia (CDH)
  - Congenital high airway obstruction (CHAOS)
  - Pulmonary hypoplasia
  - Pleural effusion
  - Pericardial effusion
  - Cardiac
    - Structural abnormalities
    - Arrhythmias and rate abnormalities
    - Masses
    - Other
  - Other
- Skeletal
  - Dysplasia
  - Hand abnormalities
  - Foot abnormalities
  - Other
- Chromosomal abnormalities
  - Down syndrome
  - Turner syndrome
  - Trisomy 18
  - Trisomy 13
  - Other
- Syndromes
  - Amniotic band
  - Meckel-Gruber
  - Beckwith-Wiedmann

- VACTERL
  - Caudal regression
  - Other
- Congenital infections
- Other
- Aneuploidy markers / Borderline findings
  - Nuchal thickening
  - Choroid plexus cyst
  - Echogenic intracardiac focus (EIF)
  - Echogenic bowel
  - Borderline hydrocephalus
  - Other
- Oligohydramnios
- Spontaneous premature rupture of membranes
- Polyhydramnios
- Multiple gestation abnormalities
  - Twin-to-twin transfusion / Stuck twin
  - Acardiac twin (twin reversed arterial perfusion [TRAP])
  - Twin demise
  - Monoamniotic twins / cord entanglement
  - Conjoined twins
  - Abnormal growth
  - Other
- Placenta
  - Placenta previa
  - Vasa previa
  - Abruptio
  - Percreta, increta, and accreta
  - Masses
  - Succenturiate placenta
  - Circumvallate
  - Subchorionic bleed
  - Thick placenta
  - Other
- Cervix
  - Shortening / Dilatation
  - Cerclage
  - Other
- Umbilical cord
  - Two-vessel umbilical cord
  - Cord masses

- Placental cord insertion site
      - Velamentous cord insertion
      - Cord prolapse
      - Umbilical cord Doppler
      - Other
    - Uterine abnormalities during pregnancy
    - Adnexal abnormalities during pregnancy
    - Other
  - Postpartum
    - Retained products of conception
    - Ovarian vein thrombosis
    - Infection
    - Other
  - Other
- Vascular

NOTE. Knowledge is recommended of the criteria of the SRU Consensus Conference on Carotid Artery Stenosis - Grant EG, et al. Carotid artery stenosis: gray scale and Doppler ultrasound diagnosis. *Radiology* 2003;229(2):340-346.

- Carotid artery
  - Normal
  - Normal variants
  - Congenital anomalies
  - Plaque / Fibrointimal thickening
  - Stenosis
  - Occlusion
  - Dissection
  - Arteriovenous fistula
  - Aneurysm
  - Pseudoaneurysm
  - Carotid endarterectomy and stent
    - Normal
    - Restenosis
    - Complications
  - Vasculitis
  - Waveform abnormalities
  - Other
- Vertebral artery
  - Normal
  - Normal variants
  - Congenital anomalies
  - Stenosis / Occlusion

- Subclavian steal syndrome
  - Other
- Extremity arterial
  - Normal
  - Normal variants
  - Congenital anomalies
  - Thrombus
  - Stenosis / Occlusion
  - Aneurysm
  - Pseudoaneurysm
  - Arteriovenous fistula
  - Dissection
  - Hematoma
  - Hemodialysis graft/fistula
    - Normal
    - Thrombus
    - Stenosis/Occlusion
    - Lack of maturation
    - Pseudoaneurysm
    - Steal
    - Fluid collections
    - Other
  - Arterial bypass graft
    - Normal
    - Thrombus
    - Stenosis/Occlusion
    - Pseudoaneurysm
    - Perforators
    - Fluid collections
    - Other
  - Other
- Extremity venous
  - Normal
  - Normal variants
  - Congenital anomalies
  - Thrombus
  - Stenosis / Occlusion
  - Tricuspid regurgitation / Right-sided heart failure
  - Venous insufficiency
  - Venous mapping
  - Other
- Liver

- Portal vein
  - Normal
  - Normal variants
  - Congenital anomalies
  - Bland thrombus
  - Tumor thrombus
  - Stenosis / Occlusion
  - Cavernous transformation
  - Aneurysm
  - Portal hypertension
  - Portosystemic collaterals
    - Paraumbilical / umbilical vein
    - Coronary vein
    - Other
  - Varices
  - Congestion / heart failure
  - Gas
  - Other
- Hepatic artery
  - Normal
  - Normal variants
  - Congenital anomalies
  - Thrombosis
  - Stenosis Occlusion
  - Aneurysm / pseudoaneurysm
  - Injury (iatrogenic and other)
  - Dissection
  - Arterioportal fistula
  - Hereditary hemorrhagic telangiectasia
  - Arteriovenous malformation
  - Other
- Hepatic vein
  - Normal
  - Normal Variants
  - Congenital anomalies
  - Bland thrombus
  - Tumor thrombus
  - Budd Chiari syndrome
  - Stenosis / Occlusion
  - Tricuspid regurgitation/congestive heart failure
  - Portohepatic vein fistula



- Other
  - TIPS
    - Normal
    - Stenosis
    - Occlusion
    - Other
  - Other
- Kidney
  - Renal artery
    - Normal
    - Normal variants
    - Congenital anomalies
    - Thrombus
    - Stenosis / Occlusion
    - Fibromuscular dysplasia
    - Bypass graft
    - Stent / Angioplasty
    - Aneurysm
    - Pseudoaneurysm
    - Arteriovenous fistula
    - Arteriovenous malformation
    - Dissection
    - Other
  - Renal vein
    - Normal
    - Normal variants
    - Congenital anomalies
    - Thrombus
    - Tumor thrombus
    - Stenosis / Occlusion
    - Varices
    - Other
  - Other
- Mesenteric/Celiac vessels and branches
  - Normal
  - Normal variants
  - Congenital anomalies
  - Aneurysm
  - Pseudoaneurysm
  - Dissection
  - Artery Thrombosis
  - Stenosis / Occlusion

- Ischemia
  - Venous thrombus
  - Tumor thrombus
  - Other
- Spleen
  - Splenic artery
    - Normal
    - Thrombus
    - Stenosis / Occlusion
    - Aneurysm
    - Pseudoaneurysm
    - Dissection
    - Other
  - Splenic vein
    - Normal
    - Normal variants
    - Congenital anomalies
    - Thrombus
    - Tumor thrombus
    - Stenosis / Occlusion
    - Other
  - Other
- Aorta
  - Normal
  - Normal variants
  - Congenital anomalies
  - Aneurysm
  - Pseudoaneurysm
  - Mycotic aneurysm
  - Dissection
  - Atherosclerosis
  - Stent grafts normal
  - Endoleak
  - Coarctation
  - Thrombus
  - Stenosis / Occlusion
  - Other
- Inferior vena cava
  - Normal
  - Normal variants
  - Congenital anomalies
  - Thrombus

- Tumor thrombus
  - Stenosis / Occlusion
  - Filter
  - Primary sarcoma
  - Masses
  - Other
- Pelvic vessels
  - Arteries
  - Veins
  - Other
- Thoracic vessels
  - Superior vena cava
  - Brachiocephalic
  - Internal mammary
  - Other
- Kidney Transplant Vasculature
  - Normal
  - Elevated resistive index
    - Rejection
    - Acute tubular necrosis
    - Page kidney
    - Hydronephrosis
    - Pyelonephritis
    - Renal vein thrombosis
    - Compartment syndrome
    - Transducer pressure
    - Other
  - Arterial stenosis / thrombosis
  - Pseudoaneurysm
  - Arteriovenous fistula
  - Venous stenosis
  - Infarction
  - Other
- Liver Transplant Vasculature
  - Normal
  - Arterial stenosis / thrombosis
  - Vasospasm
  - Resistive index abnormalities
  - Portal vein thrombosis / stenosis
  - Hepatic vein thrombosis/stenosis
  - Heart Failure / Congestion
  - Inferior vena cava stenosis / thrombosis

- Pseudoaneurysm
    - Arteriovenous fistula
    - Other
  - Pancreas Transplant Vasculature
    - Normal
    - Arterial thrombosis / stenosis
    - Venous thrombosis / stenosis
    - Pseudoaneurysm
    - Arteriovenous fistula
    - Other
  - Other
- Neck and Head (nonvascular)
  - Thyroid
    - Normal
    - Normal variants
    - Congenital anomalies
    - Hashimoto thyroiditis
    - Graves disease
    - Subacute thyroiditis
    - Benign hyperplastic nodule
    - Adenoma – follicular/Hurthle
    - Papillary cancer
    - Follicular cancer
    - Medullary cancer
    - Anaplastic cancer
    - Lymphoma
    - Metastasis
    - Multinodular goiter
    - Cyst
      - Simple
      - Complicated
      - Other
    - Guidelines for fine-needle aspiration
    - Other
  - Parathyroid
    - Normal
    - Normal variants
    - Congenital anomalies
    - Adenoma
      - Typical
      - Ectopic
      - Multifocal

- Other
  - Hyperplasia
  - Carcinoma
  - Cyst
  - Other
- Lymph nodes
  - Normal
  - Reactive / inflammatory
  - Infectious
  - Metastatic
  - Lymphoma
  - Other
- Salivary glands
  - Normal
  - Normal variants
  - Congenital anomalies
  - Infection/inflammation
  - Abscess
  - Pleomorphic adenoma
  - Warthin's neoplasm
  - Mucoepidermoid cancer
  - Adenoid cystic cancer
  - Acinic cell cancer
  - Lymphoma
  - Stones
  - Cyst
    - Simple
    - Complicated
    - Other
  - Lymphoepithelial cyst
  - Ducts
  - Other
- Neck Soft tissues
  - Branchial cleft cyst
  - Thyroglossal duct cyst
  - Lymphangioma/Hemangioma
  - Lipoma
  - Keratinous/Epidermal inclusion/Sebaceous cyst
  - Hematoma
  - Abscess
  - Carotid body tumor
  - Hypopharynx cancer
  - Other

- Other
- Musculoskeletal (nonvascular)
  - Normal
    - Tendon
    - Muscle
    - Ligament
    - Cartilage
    - Bone
    - Nerve
    - Other
  - Normal variants
  - Congenital anomalies
  - Tendons
    - Tear
      - Rotator cuff
      - Biceps
      - Hand/wrist
      - Patellar
      - Quadriceps
      - Achilles
      - Foot/ankle
      - Other
    - Tendinopathy/tendinosis
    - Tenosynovitis
    - Other
  - Muscle
    - Tear
    - Hematoma
    - Abscess
    - Neoplasm
    - Atrophy
    - Fatty infiltration
    - Myositis
    - Necrosis
    - Other
  - Nerve
    - Compression
    - Neuroma
    - Neoplasm
    - Neuritis
    - Trauma/laceration
    - Other

- Bone
  - Fracture
  - Osteomyelitis
  - Neoplasm
  - Other
- Ligaments
  - Tear
  - Plantar fasciitis
  - Plantar fibroma
  - Pulley rupture
  - Other
- Soft tissues / Joints / General extremity
  - Joint effusion
  - Cyst
    - Simple
    - Complicated
    - Other
  - Baker cyst
  - Ganglion cyst
  - Lipoma
  - Foreign body
  - Hematoma
  - Cellulitis
  - Abscess
  - Necrotizing fasciitis
  - Synovitis
  - Primary neoplasm
  - Metastasis
  - Lymphoma
  - Giant cell tumor tendon sheath
  - Other
- Other
- Thoracic (nonvascular)
  - Lung, Pleura
    - Normal
    - Normal variants
    - Congenital anomalies
    - Pleural effusion
    - Empyema
    - Hemothorax
    - Pneumothorax
    - Atelectasis
    - Pneumonia

- Lung cancer
    - Metastasis
    - Mesothelioma
    - Lymphoma
    - Other
  - Mediastinum
    - Normal
    - Normal variant
    - Adenopathy
    - Primary neoplasm
    - Hematoma
    - Abscess
    - Other
  - Chest wall
    - Normal
    - Normal variant
    - Hematoma
    - Abscess
    - Rib abnormalities
    - Primary neoplasm
    - Metastasis
    - Lymphoma
    - Lipoma
    - Other
  - Axilla
    - Adenopathy
    - Masses
    - Fluid collections
    - Other
  - Thoracic inlet
  - Other
- Cardiac
  - Heart
  - Pericardium / Pericardial space
  - Effect on peripheral vessels
  - Other
- Noninterpretive Clinical applications – Be familiar with standard protocols for ultrasound examinations, indications, and nonindications for ultrasound, necessary aspects of examination documentation and reporting, communication of critical and unsuspected findings, and quality assurance programs.
  - Protocols
  - Appropriateness
  - Documentation, reporting, communication



- Clinical quality assurance, radiologic-pathologic correlation
- Other