Diagnostic Medical Sonography

Course Learning Outcomes are measurable statements that are used to identify the specific knowledge and skills that a student should have at the end of a course.

DMS 4400
L1- Identify key events in the development of ultrasound.
L2- Define empathy, compassion, communication, and discuss what role they play in the patient care experience.
L3- List important communication skills.
L4- Discuss how patient consent, privacy, and chaperones are important for the sonographer.
L5- Discuss and compare special considerations of patient care when performing an invasive ultrasound as well as ultrasounds of sensitive areas of the body.
L6- Discuss prevalence, causes, and risks of musculoskeletal injuries in the field of sonography.
L7- Identify causes and risk factors of work-related MSK disorders and injuries associated with scanning.
L8- Describe the biologic tissue response to improper posture and scanning techniques.
L9- Discuss ergonomic methods of prevention of MSK injuries.
L10- Name 3 strategies for combating unhealthy stress in the workplace.
L11- Understand obligations of the sonographer to patients, employer, and self.
L12- Discuss safety considerations associated with patient care.
L13- Identify good health and hygiene practices as well as discuss the sonographer's role in infection control.
L14- List the major specialty sonographic examinations.
L15- Describe and demonstrate the patient positions commonly used in sonography.
L16-Discuss patient preparations for abdominal, vascular, OB/GYN and cardiac sonography.
L17- Describe the basic components of the four major specialty scanning protocols.
L18- Identify the findings and normal values of Lab results related to abdominal and OB sonography.
L19- Describe professional accountability.
L20- Discuss steps sonographers should take to protect themselves against malpractice suits.
L21- Describe the sonographer's role in relation to medical ethics.
L22- Discuss the importance of professional confidentiality.
L23- Describe the functional skills expected of a diagnostic medical sonographer.
L24- Discuss the need for continuing education.

DMS 4401
L1- Identify the body cavities and how they relate to each other.
L2- Identify the visceral organs within the abdominal cavity and the major vessel surrounding them.
L3- Identify the nine abdominal regions and the four major quadrants, and be able to identify specific abdominal structures or refer to an area of pain within these regions.
L4 -Know the function of the circulatory system and the layers of the vessels in both arterial and venous systems.
L5- Explain the five sections of the aorta and normal diameters of the proximal, mid, and distal portions.
L6- Identify the three vessels that come off of the celiac trunk, and list the order of the arteries that come off of the aorta from the proximal portion to the distal portion.
L7- Know the types of aneurysms (true aneurysm, pseudoaneurysm, saccular aneurysm, fusiform aneurysm, Grey Turner's sign and how to identify these).
L8- Demonstrate how to classify aortic dissections.
L9- Know the veins that supply and drain the liver and which parts of the liver each vessel feeds.
L10- Identify the portal triad.
L11- Explain the direction of flow of the normal portal vein (hepatopetal) vs hypertensive portal venous flow (hepatofugal).
L12-Describe the waveforms of hepatic venous flow, portal venous flow, and pre and post prandial superior mesenteric arterial flow.
L13- Identify the four lobes of the liver and the ligaments/fissures that course throughout it.
L14- Know the Couinaud system and explain it.
L15- Know how to distinguish the hepatic vessels sonographically.
L16- List functions of the liver.
L17- Identify liver function tests.
L18- Know how to evaluate the liver parenchyma sonographically, including: the assessment of its size, configuration, homogeneity, and contour.
L19- Discover the subcategories of diffuse liver parenchyma disease, including: fatty infiltration, acute and chronic hepatitis, early alcoholic liver disease, and acute and chronic cirrhosis.
L20-Explain von Gierke's disease and hemochromatosis.
L21- Discuss portal hypertension and its relationship with cirrhosis, hepatic vein thrombosis, portal vein thrombosis, and thrombosis of the IVC.
L22- Explain the process of portal venous hypertension and the development of shunting.
L23- Compare and contrast intrahepatic and extrahepatic masses.
L24- List the three types of hepatic abscesses.
L25-Identify and explain the sonographic appearance of cavernous hemangiomas, focal nodular hyperplasia, and adenomas.
L26- Discuss the patterns of metastatic disease and the primary sites of metastasis.
L27- Explain the biliary apparatus.
L28- Identify the ampulla of Vater.
L29- Know the primary functions of the extrahepatic biliary tract.
L30 -Compare and contrast sludge, stones, wall thickening, and pericholecystic fluid.
L31- Know the types of cholecystitis and identify the WES sign.
L32- Explain the Murphy's sign.
L33- Know the different pathologies of the biliary system including: cholelithiasis, cholesterolosis, polyps, adenomyomatosis, choledochal cysts, cholangitis, cholangiocarcinoma, Klatskin's tumor, Rokitansky Aschoff sinuses.
L34- Explain and discuss the functions of the spleen, and the variations of the spleen.
L35- Identify tumors of the spleen.
L36- Know the normal sonographic appearance of splenic texture and size.

DMS 4402
L1- Describe the normal anatomy and relational landmarks of the pancreas.
L2- Name the exocrine and endocrine functions of the pancreas.
L3- Describe the laboratory tests used to detect pancreatic disease.
L4- Describe the sonographic technique and patterns of the normal pancreas.
L5- Define the clinical signs and symptoms of pancreatic disease.
L6- Name the congenital anomalies of the pancreas.
L7- List the sonographic findings and differential diagnoses of the following diseases: pancreatitis, pancreatic cyst, and pancreatic tumor.
L8- Describe the anatomy and relational landmarks of the gastrointestinal system.
L9- Discuss the size of wall thickness and diameters of the gastrointestinal tract.

L10- Describe the sonographic technique used to image the gastrointestinal tract and appendix.
L11- Differentiate the sonographic appearances of the pathologies covered in the gastrointestinal chapter Describe the normal anatomy of the abdominal wall.
L12- List the peritoneal and retroperitoneal organs.
L13- Compare and contrast the different locations of fluid and their sonographic appearances.
L14- Discuss the pathology and sonographic findings of the peritoneal cavity, mesentery, omentum, peritoneum, and abdominal wall.
L15- Discuss normal anatomic location, function, and sonographic appearance of urinary system organs.
L16- Discus normal physiology of the urinary system.
L17- Describe the sonographic scanning technique to image the urinary system.
L18- Describe the sonographic scanning technique to image the urinary system.
L19- List the adrenal gland hormones and describe the syndromes associated with hypersecretion and hyposecretion.
L20 - Describe the sonographic appearance and clinical findings of adrenal tumors, retroperitoneal fibrosis, and retroperitoneal fluid collections.
L21- List the current limitations of ultrasound imaging that may be overcome by the use of ultrasound contrast agents.
L22- Describe how contrast harmonic imaging improves the clinical capabilities of ultrasound contrast agents.
L23- Discuss the advantages and disadvantages of free-hand and needle-guided techniques.
L24- List potential complications of ultrasound-guided interventional techniques.

L25- Discuss techniques for finding the needle tip in ultrasound-guided procedures.
L26- Define the goal of sonography in the assessment of blunt trauma
L27- Describe the sonographic findings for aortic dissection, right upper quadrant pain, free fluid in the abdominopelvic region, acute pelvic pain, and scrotal trauma and torsion.
L28- Identify the necessary imaging protocol needed for imaging the transplanted organ.
L29- Recognize and define normal sonographic features of the transplant patient.

L30- Identify and describe immediate complications after transplantation, and those that occur within the months and years to follow.

DMS 4404
L1- Identify sonographically significant muscles of the pelvic cavity.
L2-Describe the major ligaments of the uterus and ovaries.
L3- Discuss the physiology of the menstrual cycle and describe hormonal changes that occur during the various ovulatory and endometrial phases.
L4- Describe the development of the ovum and its passage from the ovary into the uterus.
L5- Define the function of the corpus luteum.
L6- Discuss the indications and contraindications for transabdominal and transvaginal scanning.
L7- Describe both the sonographic technique for evaluating the uterus and adnexal area and their sonographic appearances.
L8- Define uterine pathologies and describe their causes, clinical signs, and sonographic findings.
L9- Describe how to measure endometrial thickness and the normal measurements for the various menstrual phases.
L10- Explain sonohysterography and the indications for performing this procedure.
L11- Identify the role of Doppler in evaluating pathology in the pelvis.
L12- Differentiate between the types of intrauterine contraceptive devices and describe the sonographic appearances of each.
L13- Describe the effects of hormones on the ovarian cycle.
L14- Discuss the sonographic findings of the common cystic and complex ovarian masses, common solid masses, and ovarian neoplasms.
L15- Discuss the benign pelvic masses found in neonates and adolescent girls.
L16- Differentiate between mucinous and serous types of tumors.
L17- Explain the Doppler parameters used in ovarian torsion.
L18- List the causes and risk factors for pelvic inflammatory disease.
L19- Describe the sonographic findings of salpingitis, pyosalpinx, tubo-ovarian abscess, endometrioma, and adenomyosis.
L20- Define infertility and list its treatment options.
L21- State anatomic variations or pathologies that need to be defined when imaging an infertility patient.
L22- Discuss indications for obstetric sonography.
L23- Analyze the differences among standard, specialized, and limited obstetric sonography examinations.
L24- Describe the biologic effects of diagnostic medical ultrasound energy and related patient safety.
L25- Describe the steps of the first, second, and third trimester sonography protocols.
L26- Identify ethical issues in competence and referral in sonography exams.
L27- Identify ethical issues in disclosure of results in sonographic examinations and the confidentiality of findings.

DMS 4405
L1- Describe the early development of the embryo and its sonographic appearance at different gestational ages.
L2- Explain the clinical roles of first-trimester serum biochemistry.
L3- Define the sonographic characteristics of the yolk sac, embryo, amnion and chorion, and gestational sac.
L4- Describe sonographic measurements performed in the first trimester and the goals of first-trimester sonography.
L5- Discuss the use of a first-trimester fetal anatomy survey.
L6- Identify the methods of aneuploidy risk assessment used in the first trimester.
L7- Describe viable and nonviable pregnancy with appropriate terminology.
L8- Describe sonographic features of failed pregnancy.
L8- Define sonographic appearances of retained products of conception.
L9- Explain the clinical and sonographic findings in ectopic pregnancy.
L10- Discuss the normal range for fetal cardiac rhythm.
L11- Describe the cranial abnormalities seen in the first trimester.
L12- Distinguish among normal bowel herniation, gastroschisis and omphalocele.
L13-Explain the sonographic findings with cystic hygroma in the first trimester.
L14- Name the types of umbilical cord masses that may be seen with ultrasound.
L15- Differentiate between hemorrhagic corpus luteum cyst and other ovarian masses.
L16- Discuss the difference between a fibroid and a uterine contraction on sonography.
L17- List the components of a standard obstetric examination in the second and third trimesters and describe the fetal anatomy recommended for review.
L18- Define terminology specific to fetal presentation.
L19- Specify equipment and policies required for facilities performing obstetric sonography.
L20- Describe sonographic techniques used to image specific fetal structures.
L21- Describe normal fetal anatomy visualized in an obstetric sonography examination and variations that may be significant.
L22- Discuss gestational sac growth, take measurements, and assess gestational age.
L23- Describe how to perform a crown rump length measurement and evaluate growth.
L24- Calculate the biparietal diameter, head circumference, abdominal circumference, three-dimensional cranium, and extremity measurements.
L25- Assess fetal parameter measurements, proportions, and fetal growth.

L26- Describe when other measurements should be used to provide additional clinical information.
L27- Evaluate the fetal growth time-series for intrauterine growth restriction and growth disturbances
L28- Define high-risk pregnancy.
L29- Describe the maternal and fetal factors for a pregnancy that is considered high risk.
L30- Discuss the role of sonography in the high-risk pregnancy.
L31- Describe the methods of genetic testing, including maternal serum markers, chorionic villus sampling, and amniocentesis.
L32- Discuss how anomalies are transmitted genetically.
L33- Detail the prevalence and prognosis of the most common chromosomal anomalies.
L34- Describe the sonographic features of chromosomal anomalies.
L35- Describe the embryogenesis of the placenta.
L36- List the functions of the placenta.
L37- List and describe imaging techniques and sonographic findings of the placenta.
L38- Identify placental position and describe its importance.
L39- Describe the sonographic findings and clinical significance of placental pathologies.
L40- Recognize placental abruption with diagnostic ultrasound.
L41- Describe the development and normal anatomy of the umbilical cord.
L42- Predict obstetric problems that may be associated with abnormal umbilical cord dimensions.
L43- Discuss the umbilical cord disorders presented including causes and clinical significance.
L44- Differentiate how the sonographer may distinguish tumors and cysts from a true knot in the umbilical cord.
L45- Describe how amniotic fluid is derived.
L46- Describe the production of amniotic fluid.
L47- List the functions of amniotic fluid.
L48- Describe methods for assess amniotic fluid volume.
L49- Determine abnormal volumes of amniotic fluid.
L50- Understand the significance of ruptured membranes.
L51- Describe the significance of amniotic band syndrome.
L52- Differentiate amniotic band syndrome from amniotic sheets with sonography.
L53- Distinguish between immune and nonimmune hydrops.
L54- Identify causes of hydrops and recognize the sonographic features of it.

DMS 4406
L1- List the three factors that contribute to congenital heart disease.
L2- Describe why the four-chamber view cannot rule out all forms of congenital heart disease.
L3- Discuss the echocardiographic findings for septal defects, ventricular inflow and outflow tract disturbances, great vessel abnormalities, cardiac tumors, and complex cardiac abnormalities.
L4- Discuss the basic embryology of the face.
L5- Describe how to evaluate the fetal face and neck for normal features.
L6- Describe the sonographic findings of abnormalities of the fetal face and neck .
L7- Describe the embryology of the neural tube fetal brain development.
L8- Discuss the anomalies that can occur in the fetal head and spine.
L9- Recognize the sonographic appearance of fetal head and spine anomalies.
L10- Describe the development of the thoracic cavity.
L11- List the normal sonographic features of the thorax and diaphragm.
L12- Describe the development and consequences of pulmonary hypoplasia.
L13- Differentiate between solid and cystic lesions of the lung.
L14- Discuss the sonographic findings in a diaphragmatic hernia.
L15- Describe the embryology of the abdominal wall.
L16- Define and describe the anterior abdominal wall abnormalities discussed in this chapter.
L17- List the sonographic findings for an omphalocele and for a gastroschisis.
L18- Identify the fetal anomalies in pentalogy of Cantrell .
L19- Explain the sonographic findings in a fetus with amniotic band syndrome.
L20- Describe the development of the digestive system and list the unique features of the fetal abdomen.
L21- Describe normal development of the stomach and the importance of its visualization.
L22- Define abnormalities of the fetal gastrointestinal tract and hepatobiliary system and describe their sonographic findings.
L23- Discuss the development of the urogenital and genital system.
L24- Describe the sonographic appearance of the fetal kidneys and bladder.
L25- Detail the complications of renal agenesis.
L26- Describe the sonographic findings associated with abnormalities of the kidney.
L27- Differentiate renal cystic disease.
L28- Distinguish between different types of urinary obstruction.
L29- Identify congenital malformations of the genital system.
L30- Describe in detail the embryology of the fetal skeleton.
L31- Describe the variety of musculoskeletal anomalies that can occur in the fetus.
L32- Differentiate sonographically among the most common skeletal dysplasias.
L33- List limb abnormalities and the anomalies that are associated with specific defects

DMS 4407
L1- Identify units used in the metric system.
L2- Explain the definition of sound.
L3- Understand the three acoustic variables (Pressure, Density, Distance).
L4- Compare and contrast transverse waves vs. Longitudinal waves.
L5- Describe sound waves using the seven parameters.
L6- List the 3 bigness parameters.
L7- Explain the relationship between power and amplitude.
L8- Describe the wave length equation.
L9- List the order of average speeds of sound in biologic tissues.
L10- Explain the “rule of thumbs”.
L11- Define Constructive and Destructive interference.
L12-Define pulsed sound.
L13- List the five additional parameters that describe pulsed sound.
L14- Explain duty factor.
L15- Understand parameters that describe both pulsed and continuous waves.
L16 -Define intensity and the types of intensities.
L17- List the five key words relating to intensities.
L18- Explain the commandments of Intensity.
L19- Compare and contrast positive and negative decibels.
L20- Discuss attenuation in different media.
L21- Explain the types of scattering (Diffusion reflection/backscatter, Rayleigh scattering)
L22- Define the attenuation coefficient.
L23- Discuss the differences between the Intensity Reflection Coefficient and that Intensity Transmission Coefficient.
L24- Compare and contrast reflection and transmission with normal incidence and oblique incidence.
L25- Define refraction.
L26- Explain the 13 Microsecond rule.
L27- Discuss basic transducers—the piezoelectric effect, basic transducer architecture, and frequencies.
L28- Identify bandwidth and quality factor.
L29- Explain the anatomy of a sound beam.
L30- Define Huygens’ Principle.
L31- Compare and contrast Axial and Lateral Resolution.

L32- Discuss why axial resolution is preferred to lateral resolution in ultrasound imaging.
L33- Explain focusing and the 3 ways it can alter the sound beam.
L34- List the differences between A-mode, B-mode, and M-mode.

DMS 4409
L1-Define Quality Assurance and list the requirements, goals, devices and methods for it.
L2 -Discuss tissue equivalent, slice thickness, and Doppler phantoms.
L3- Explain the principles of bioethics.
L4- Define informed consent.
L5- Discuss proper patient-sonographer interaction, and sonographer-work environment interaction.
L6- List facility responsibilities on ergonomics and the agency that regulates it.
L7- Define a hydrophone and explain the uses for it.
L8- Discuss biologic effects and safety of ultrasound.
L9- Compare and contrast the mechanistic and empirical approaches.
L10 -Compare and contrast thermal mechanism and cavitation mechanism.
L11- List limitations of epidemiologic studies.

DMS 4410
L1- Identify the major organs within the abdominal cavity and the major vessel surrounding them.
L2- Demonstrate competency in scanning the abdominal aorta, IVC, and common iliac arteries and veins.
L3- Demonstrate competency in scanning the gallbladder in multiple scan planes.
L4- Identify the main veins of the liver and the parts of the liver each vessel feeds.
L5- Demonstrate normal waveforms for abdominal vascularity.
L6- Demonstrate competency in holding the transducer and proper selection.
L7- Discuss the differences in transducers and which ones are appropriate for differing examinations.
L8- Identify the three vessels that come off the celiac trunk, and list the order of the arteries that come off of the aorta from the proximal portion to the distal portion.
L9- Demonstrate competency in scanning the portal triad.
L10 -Compare and contrast the different hepatic vessel appearance sonographically.
L11- Demonstrate accurate measurement acquisition of the aorta, common iliac arteries, liver, gallbladder wall, common bile duct, and spleen.
L12- Identify liver pathologies and differing parenchymas sonographically.
L13- Identify sonographic appearances of portal hypertension.
L14- Demonstrate scanning competency of the biliary tree.
L15- Identify sludge, stones, wall thickening, and pericholecystic fluid sonographically.
L16- Know sonographic appearance of splenic texture and size.
L17- Demonstrate the pelvic structures sonographically.
L18- Show competency in measuring the uterus, endometrium, and bilateral ovaries sonographically.
L19- Discuss protocols for pelvic imaging, as well as the indications and contraindications for transabdominal and transvaginal scanning.
L20 -Identify uterine pathologies sonographically.
L21- Demonstrate doppler imaging in the pelvis, aorta, IVC, and liver.
L22-Discuss sonographic findings of the common cystic and complex ovarian masses, common solid masses, and ovarian neoplasms.
L23- Describe sonographic findings of salpingitis, pyosalpinx, tubo-ovarian abscess, endometrioma, and adenomyosis.

DMS 4411
L1- Identify the major organs within the abdominal cavity and the major vessels surrounding them.
L2- Demonstrate competency in scanning the pancreas, kidneys, bladder, upper and lower extremity venous and arterial systems, carotid arteries, and abdominal wall.
L3- Demonstrate competency in full abdominal exams.
L4- Demonstrate normal waveforms for abdominal vascularity.
L5- Demonstrate competency in holding the transducer and proper selection.
L6- Discuss the differences in transducers and which ones are appropriate for differing examinations.
L7- Identify the anatomic structures in venous insufficiency studies.
L8- Demonstrate competency in scanning perforators.
L9- Demonstrate competency in scanning AV fistulae.
L10- Demonstrate accurate measurement acquisition of the kidneys, and pre and post void bladders.
L11- Identify pancreatic pathologies and differing parenchymas sonographically.

L12- Identify sonographic appearances of pancreatitis.
L13- Discuss findings of hydronephrosis and the stages.
L14- Identify ureteral jets sonographically.
L15- Show competency in Vertebral artery evaluation.
L16- Discuss protocols for vascular imaging, as well as the indications and contraindications for it.
L17- Demonstrate doppler imaging in the abdomen.
L18- Discuss sonographic findings of polycystic kidney disease.

DMS 4412
L1- Demonstrate continued competency in scanning the abdomen, pelvis, and extremity vasculature.
L2- Demonstrate normal waveforms for abdominal vascularity.
L3- Demonstrate competency in holding the transducer and proper selection.
L4- Discuss the differences in transducers and which ones are appropriate for differing examinations.
L5- Demonstrate accurate measurement acquisition of the kidneys, and pre and post void bladders.
L6- Discuss protocols for breast, scrotal, and prostate sonographic imaging, as well as the indications and contraindications for it.
L7- Demonstrate competency in basic musculoskeletal examinations.

DMS 4413
L1-Demonstrate understanding of abdominal aortic aneurysms, their cause, risks, sonographic appearance, and clinical presentation.
L2- Discuss findings in online webinars relating to abdominal vasculature abnormalities.
L3- Identify multiple liver pathologies and explain them in depth.
L4- Discuss different techniques for accurate hemodynamic analysis.
L5- Define multiple female pelvic pathologies and identify them sonographically.
L6- Identify gallbladder pathologies and compare and contrast them.
L7- Explain biliary ductal abnormalities.
L8- Discuss female infertility and the protocols for scanning patients receiving care for this.
L9- Identify splenic abnormalities and discuss them.
L10- Discuss inclusion and diversity in Healthcare.
L11- Define the importance of ergonomics and the possibilities for MSK injuries in the field of sonography.

DMS 4414
L1-Identify different rare obstetric cases.
L2- Describe fetal chromosomal anomalies and the sonographic characteristics of them.
L3- Compare and contrast renal pathologies and the sonographic characteristics of them.
L4- Discuss placental abnormalities and the role of the sonographer in diagnosing these.

L5- Explain Cerebrovascular abnormalities and protocols for evaluating them.
L6- Discuss rare cases in sonography in abdomen, OB/GYN, and Vascular exams.

DMS 4415
L1- Identify different rare obstetric cases.
L2- Describe fetal skeletal dysplasias and the sonographic characteristics of them.
L3- Explain neonatal spine abnormalities and protocols for evaluating them.
L4- Discuss rare cases in sonography in neuro, breast, Obstetrics, and pediatric sonography.

DMS 4416
L1- Describe physiologic factors governing blood flow and its characteristics.
L2- Explain pulsatile pressure and flow changes in the arterial system.
L3- List the pulsatile wave patterns and define each.
L4- Discuss the effects of arterial obstruction.
L5- Describe venous hemodynamics.
L6- Explain Doppler spectrum analysis and identify normal vs abnormal waveforms.
L7- Identify veins and arteries sonographically and discuss the differences of each.
L8- Explain sonographic characteristics and techniques involved in imaging and assessing for deep venous thrombosis in the upper and lower extremities.
L9- Describe indications for arterial duplex studies of the lower extremities.
L10- List the differences of clinical symptoms between arterial stenoses/ occlusions vs venous insufficiency.
L11- Know the anatomy and physiology of the carotid arterial system, the upper extremity vascular system, and the lower extremity vascular system.
L12- Discuss the protocols for upper extremity venous and arterial exams.
L13- Explain the protocols for lower extremity venous and arterial exams.
L14- List the indications for Ankle Brachial Index studies.
L15- Explain the role of the sonographer in vascular imaging.
L16- Describe pathologic findings of the Carotid Arterial system.
L17- Define atherosclerosis and identify the sonographic findings of it.
L18- Discuss the protocols used for scanning arteriovenous fistulas for hemodialysis access.
L19- Identify native vessels vs stents vs grafts sonographically.
L20- Describe the sonographic techniques of renal vessel exams and be able to identify normal vs pathologic findings.
L21- Identify normal doppler signatures of abdominal vessels.
L22- Know how to evaluate vertebral arteries and describe subclavian steal.

DMS 4417
L1- Discuss the embryology of the thyroid and parathyroid glands.
L2- Describe the normal anatomy and physiology of the thyroid and parathyroid glands.
L3- Define the relational anatomy of the thyroid and parathyroid glands.
L4- Discuss the laboratory values and clinical findings of the thyroid and parathyroid glands.
L5- Describe the sonographic examination of the thyroid and parathyroid glands.

L6- Differentiate the sonographic features of the pathologic conditions found in the thyroid and parathyroid glands.
L7- Identify normal anatomy of the scrotum.
L8- Explain the vascular supply to the scrotal contents.
L9- Describe patient positioning, scanning protocol, and technical considerations for an ultrasound examination of the scrotum.
L10- Discuss the role of color and spectral Doppler in scrotal imaging.
L11-Describe the ultrasound characteristics of scrotal pathology.
L12- Identify normal anatomic location and function of the tendon, ligament, muscle, nerve and bursa.
L13- Know the advantages and disadvantages of sonographic artifacts in musculoskeletal imaging.
L14- Summarize the basic sonographic examinations of the shoulder, wrist, knee, ankle, and foot.
L15- Distinguish normal anatomy from common pathologic conditions.

DMS 4418
L1- Choose the proper transducer for each examination.
L2- Understand and explain image optimization for breast sonography.
L3- Compare and contrast different artifacts seen in breast imaging.
L4- Discuss the clinical role of breast sonography as well as list the advantages and disadvantages of breast sonography.
L5- Compare and contrast targeted vs. whole breast examination.
L6- Explain patient preparation and position, ergonomics, set-up and examination technique of breast sonography.
L7- List the different scan planes of the breast and their annotation methods.
L8- Discuss breast development and associated anomalies.
L9- Explain in detail the breast anatomy as well as the anatomy of surrounding muscles, vasculature, and lymphatics.
L10- Correlate mammograms with sonographic scanning.
L11- Compare and contrast mammographic and sonographic tissue densities.
L12- Define the different mammographic and sonographic features suspicious for malignancy.
L13- List the BIRADS classification system.
L14- Explain benign breast changes and discuss the different benign pathologies.

L15- Define fibroadenomas and know their clinical, mammographic, and sonographic features.
L16- List general breast cancer facts and risk factors.
L17- Compare and contrast the major histologic types of breast cancer.
L18- Understand and explain cancer staging of the breast.
L19- Discuss normal male anatomy of the breast, as well as gynecomastia and cancer of the male breast.
L20- Compare and contrast the other diagnostic examinations related to breast imaging, and list the advantages and disadvantages of each.
L21- Explain the different types of breast implants and the sonographic appearance of each.
L22- Identify implant rupture sonographically.
L23- List and explain the different ultrasound-guided interventional procedures and the clinical indication of each.

DMS 4419
L1- Understand the different pediatric stages/ages and how to increase patient cooperation.
L2- List the more common hepatobiliary, pancreatic, and splenic reasons for acute abdominal pain in the pediatric population.
L3- List the more common acquired and hereditary diseases and how pediatric sonography can monitor the associated chronic or malignant processes.
L4- List the causes of jaundice in the neonate and pediatric patient.
L5- Distinguish obstructive from nonobstructive jaundice.
L6- List the common primary hepatic tumors in children.
L7- List the most common gastrointestinal surgical conditions in the pediatric population.
L8- Discuss sonographic approaches to imaging neonatal/pediatric kidneys and adrenal glands.
L9- Distinguish normal anatomy and sonographic findings from abnormal findings.
L10- List and discuss abdominal pediatric pathologic conditions.
L11- Recognize normal neuroanatomy as it pertains to the ultrasound examination of the preterm and term neonate.
L12- Describe the coronal, sagittal, and mastoid view studies.
L13- Discuss the sonographic findings in neonatal brain pathology.

L14-Discuss anatomy of neonatal hip.
L15- Describe normal movements of the hip,
L16- Describe sonographic evaluation of the neonatal hip, including technique and protocol.
L17- Describe the normal sonographic appearance of the neonatal hip.
L18 -Describe the sonographic evaluation of the neonatal hip for developmental displacement of the hip.
L19- Differentiate subluxation of the hip and dislocation of the hip."
L20- Describe the sonographic technique to image the neonatal and infant spinal column.
L21- Describe the sonographic appearance of normal anatomy of the spinal cord, the dura, the nerve roots, and the cauda equina.
L22- Describe how to determine the level of the lumbar vertebrae in the sonographic examination.
L23- List the common pathologic conditions of the spinal cord and their sonographic appearances.
L24 -Discuss echocardiography, perinatology, and pediatric sonography career opportunities.
L25 -Explain the role of the sonographer with musculoskeletal imaging.

DMS 4451
L1- Become acquainted with the research resources available to ISU students in the Eli M. Oboler Library and online.
L2- Develop expertise in AMA style of writing.
L3- Write several annotated bibliographies from peer reviewed journals on a topic of research that involves the imaging modalities presented by guest lecturers.
L4- Write a 10-15 page literature review on a topic relating to Sonography that has been approved by the instructor.

DMS 4476
L1- Understand the requirements for sitting for the national registry examinations.
L2- Discuss sonographic physics principles and instrumentation.
L3- Complete multiple mock registry examinations in SPI, Abdomen and OB/GYN specialties.
L4- Have a strong understanding of abdomen and superficial structures material tested on the ARDMS Abdomen board examination.
L5- Have a firm grasp on required OB/GYN sonographic material for the ARDMS OB/GYN examination.

DMS 4491
L1- Demonstrate in a clinical setting what has been taught in a laboratory experience at the college.
L2- Evaluate a sonographic requisition.
L3- Prepare the exam room and assess the patient by using patient management skills which have been taught didactically.
L4- Adapt standard sonographic practices to varying clinical situations.
L5- Demonstrate professional behavior.
L6- Select transducer and set knobology to produce quality diagnostic images.
L7- Critique sonographic images performed in a clinical setting.

DMS 4492
L1- Demonstrate in a clinical setting what has been taught in a laboratory experience at the college.
L2- Evaluate a sonographic requisition.
L3- Prepare the exam room and assess the patient by using patient management skills which have been taught didactically.
L4- Adapt standard sonographic practices to varying clinical situations.
L5- Demonstrate professional behavior.
L6- Select transducer and set knobology to produce quality diagnostic images.

DMS 4493
L1- Demonstrate in a clinical setting what has been taught in a laboratory experience at the college.
L2- Evaluate a sonographic requisition.
L3- Prepare the exam room and assess the patient by using patient management skills which have been taught didactically.
L4- Adapt standard sonographic practices to varying clinical situations.
L5- Demonstrate professional behavior.
L6- Select transducer and set knobology to produce quality diagnostic images.
L7- Critique sonographic images performed in a clinical setting.

DMS 4494
L1- Demonstrate in a clinical setting what has been taught in a laboratory experience at the college.
L2- Evaluate a sonographic requisition.
L3- Prepare the exam room and assess the patient by using patient management skills which have been taught didactically.
L4- Adapt standard sonographic practices to varying clinical situations.
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