

Appendix B

Each of the following sub-appendices contains a detailed chart of course description, competencies & learning outcomes revisions described within the Probe notice documentation.

- A1- DMSO 1010: Foundations of Sonography
- A2- DMSO 1020: Sectional Anatomy and Normal Sonographic Appearance
- A3- DMSO 1040: Sonographic Physics and Instrumentation
- A4- DMSO 1050: Abdominal Sonography I
- A5- DMSO 1060: Clinical Sonography I
- A6- DMSO 1070: Pelvic Sonography and First Trimester Obstetrics
- A7- DMSO 1080: Sonographic Physics and Instrumentation Registry Review
- A8- DMSO 1090: Introduction to Vascular Sonography
- A9- DMSO 1100: Clinical Sonography II
- A10- DMSO 1101: Clinical Sonography (Part A)
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- A12- DMSO 2010: OB Second and Third Trimesters
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- A15- DMSO 2031: Clinical Sonography III (Part A)
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- A17- DMSO 2040: Comprehensive ABD and OB/GYN Registry Review
- A18- DMSO 2050: Clinical Sonography IV
- A19- DMSO 2021: Breast Sonography (New Course)

A1- DMSO 1010: Foundations of Sonography

Revised Course Description

Using classroom didactic instruction and laboratory experiences, this foundations course prepares students for the role of a sonographer. The course provides a base of knowledge and experiences from which complementary and subsequent courses build on. Topics include diagnostic medical sonography history; medical ethics and law; patient privacy and confidentiality; body mechanics, lifts and transfers; patient assessment and administration of care; transducer care; response to medical emergencies; professionalism; medical and sonographic terminology; cultural competence; ergonomics: work related musculoskeletal disorders; ~~basic sonographic physical principles and system operation~~; Maslows Hierarchy of Needs, sonographic scanning techniques, communications and information technology.

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Define ergonomics, OSHA and industry standards and guidelines.	Discuss the basic fundamentals of the physical principles of sound and the basic features of medical sonographic equipment, including operator controls and image processing.	Demonstrate the ability to use key terminology related to ethics and principles of ethical decisions.
	Observe the ARDMS faculty member demonstrate how the basic physical principles apply to sonographic equipment manipulation to produce images.	Discuss compliance regulations relating to patient privacy and confidentiality.

	Perform hands on practice utilizing scanning models or volunteers using the ultrasound systems with techniques demonstrated by faculty.	Describe the healthcare coding and reimbursement system.
	Describe the importance of performance, safety, and output measurements and standards.	Analyze consequences for non-compliance to coding and reimbursement policies.
		Demonstrate proper IV insertion and injection of simulated contrast in the DMS lab.
		Discuss the role of Administration and the Sonographer in the prevention of MSI Cognitive Comprehension

A2- DMSO 1020: Sectional Anatomy and Normal Sonographic Appearance

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
		Obtain, evaluate, document, and communicate relevant information related to sonographic examinations.

A3- DMSO 1040: Sonographic Physics and Instrumentation

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
		Review emerging technology that will be used in a clinical setting.
		Describe performance measures used to evaluate a machine for operation and maintenance with a phantom.
		Recognize the importance of proper records maintenance with quality assurance programs.
		Discuss different image storage techniques.
		Perform techniques to decrease the mechanical and thermal index.

A4- DMSO 1050: Abdominal Sonography I

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
		Identify anatomy, relational anatomy, anatomic variants, and sonographic appearances of normal anatomic structures for abdominal organs vasculature and cavities.
		Evaluate Scanning protocol and modifications (s) based on the sonographic findings and the differential diagnosis including : indications and contraindications, history and physical exam, related imaging, laboratory, and functional testing procedures, clinical

		differential diagnosis, contrast-enhancing imaging , role of sonography in patient management.
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A5- DMSO 1060: Clinical Sonography I

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Recognize significant clinical information and historical facts from patient and medical records for abdominal & pelvic examinations and modify exam as needed.		
Adapt to the psychological and physical needs of the patient and respond if needed.		

A6- DMSO 1070: Pelvic Sonography and First Trimester Obstetrics

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Describe the embryology, anatomy, function and normal and abnormal sonographic appearance of the female pelvis to include the pelvic musculature, pelvic vasculature, peritoneal spaces, reproductive organs, and suspensory ligaments.		Demonstrate knowledge and identify sonographic appearance of inflammatory processes.
Identify the clinical indications and laboratory values associated with abnormalities and diseases of the female reproductive system early pregnancy.		Demonstrate knowledge and identify sonographic appearance of benign and malignant uterine and adnexal masses.
Identify normal anatomic features and sonographic appearance of the uterus, cervix, pelvic spaces, and of the developing embryo first trimester structures to include the gestational sac, embryonic pole, yolk sac, and early placenta.		Correlate clinical presentation with sonographic findings.
		Discuss the role of the sonographer in performing sonohysterography, chorionic villus sampling, amniocentesis, and infertility procedures.
		Discuss the role of the sonographer in the evaluation and measurement of the nuchal translucency.
		Discuss the role of the sonographer in patient management.
		Identify contraindications for sonographic evaluation of the obstetrical patient.
		Identify and correlate related imaging and functional testing procedures.

		Identify and evaluate fetal cardiac activity.
		Identify the normal sonographic appearance of multiple gestations in the first trimester.
		Discuss criteria to determine embryonic/fetal viability.
		Discuss modifications to scan protocol based on clinical history, physical exam and/or sonographic findings to account for differential diagnoses.

A7- DMSO 1080: Sonographic Physics and Instrumentation Registry Review

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
		Explain the ALARA principle and how adjusting certain controls reduces patient exposure.

A8- DMSO 1090: Introduction to Vascular Sonography

Revised Competencies

Competency #4: Vascular Imaging of the Abdomen to Include: Aorta and Primary Branches, Vena Cava, Portal & Hepatic Veins, **Mesenteric Vessels**, and **Renal Arteries & Veins**.

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
		Perform an Abdominal vascular Doppler assessment to include the hepatic, mesenteric, and renal vessels.

A9- DMSO 1100: Clinical Sonography II

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
		Recognize examination findings that require immediate clinical response and notify the appropriate clinical affiliate.
		Compare examination to previous study and note changes, if applicable.
		Compare examination to previous study and note changes, if applicable.
		Compare examination to previous study and note changes, if applicable.

A10- DMSO 1101: Clinical Sonography (Part A)

Revised Course Description

This course provides students with continued work experience in a hospital, clinic or other patient care setting. Students conduct sonographic examinations under direct and indirect supervision while continuing to improve their communication, professionalism and critical thinking skills. Topics include: patient care issues; **advanced** scanning techniques; normal anatomy and pathologic conditions of the abdomen; **normal and abnormal sonographic imaging**

~~of the male pelvis~~; normal and abnormal anatomy and pathology of the female pelvis; normal and abnormal uterine and fetal development through the first trimester; ~~and introduction to vascular sonography~~.

Revised Competency

Competency #2: ~~Advanced~~ Scanning Techniques

<u>Revised Learning Outcomes</u>	<u>Deleted Learning Outcomes</u>	<u>Added Learning Outcomes</u>
	Demonstrate a progression of scanning skills.	Demonstrate progression of patient care skill, acquiring and recording patient history, locating pertinent lab values, and obtaining reports from related imaging procedures, while communicating effectively with the patient, physicians, and other healthcare professionals.
	Recognize normal and abnormal sonographic appearance of the male pelvis	Establish patient confidentiality according to HIPPA guidelines
	Differentiate abnormal sonographic and doppler patterns of disease processes, pathology and pathophysiology of the male pelvis	Recognize examination findings that require immediate clinical response and notify the appropriate clinical affiliate.
	Compare Laboratory findings and clinical history.	Demonstrate a progression of scanning skills.
	Demonstrate the introductory skills of vascular sonography in imaging arterial and venous anatomy of the upper and lower extremities and cerebrovascular anatomy.	Compare examination to previous study and note changes, if applicable.
	Demonstrate normal and abnormal flow characteristics and waveforms.	Compare examination to previous study and note changes, if applicable.

A11- DMSO 1102: Clinical Sonography (Part B)

<u>Revised Learning Outcomes</u>	<u>Deleted Learning Outcomes</u>	<u>Added Learning Outcomes</u>
		Demonstrate progression of patient care skill, acquiring and recording patient history, locating pertinent lab values, and obtaining reports from related imaging procedures, while communicating effectively with the patient, physicians, and other healthcare professionals.
		Establish patient confidentiality according to HIPPA guidelines.
		Recognize examination findings that require immediate clinical response and notify the appropriate clinical affiliate.
		Relate knowledge of system controls to minimize possible bio-effects to the patient.
		Demonstrate system controls to optimize sonographic images.

		Perform examinations of the abdomen following the JRC-DMS National educational curriculum.
		Differentiate normal and pathologic conditions while performing sonographic procedures of the abdomen.
		Demonstrate a progression of scanning skills.
		Demonstrate clinical indications in laboratory values associated with abdominal pathology.
		Correlate clinical presentation with sonographic findings.
		Compare examination to previous study and note changes, if applicable.
		Recognize normal and abnormal sonographic appearance of the male pelvis.
		Differentiate abnormal sonographic and doppler patterns of disease processes, pathology and pathophysiology of the male pelvis.
		Compare Laboratory findings and clinical history.
		Compare examination to previous study and note changes, if applicable.
		Recognize Normal and abnormal sonographic appearance of the female pelvis.
		Demonstrate abnormal sonographic doppler patterns of disease process.
		Establish clinical indications and laboratory values associated with sonographic findings.
		Compare examination to previous study and note changes, if applicable.
		Name the required AIUM images required for a first trimester obstetric sonogram.
		Perform examinations of the obstetric patient following AIUM guidelines to demonstrate normal and abnormal uterine growth, presence of gestational sac, the embryo, growth during a normal embryonic period.
		Compare fetal growth with known normal HCG levels.
		Perform examinations of first trimester obstetric patients imaging

		accurate crown rump length and nuchal translucency measurements.
		Correlate clinical presentation with sonographic findings.
		Understand sonographic findings associated with ectopic pregnancies.
		Distinguish sonographic findings consistent with types of abortions.
		Demonstrate the introductory skills of vascular sonography in imaging arterial and venous anatomy of the upper and lower extremities and cerebrovascular anatomy.
		Demonstrate normal and abnormal flow characteristics and waveforms.

A12- DMSO 2010: OB Second and Third Trimesters

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Demonstrate sonographic appearance of fetal anatomical structures for a complete fetal anatomic survey.		Describe how to assess the maternal adnexa and cervix to evaluate for abnormalities.
Distinguish various fetal abnormalities and their sonographic appearances including the fetal face, neck, head and brain, spine, thorax, heart, abdomen, abdominal wall, gastrointestinal system, genitourinary system, musculoskeletal system, fetal pelvis, extremities and external genitalia.		Discuss maternal conditions that make a pregnancy high risk.
Perform measurement techniques utilized in fetal gestational age and growth assessment to include assessment of fetal cardiac activity.		Explain the role of fetal monitoring and biophysical profile when fetal abnormalities are present.
		Discuss the role of three-dimensional sonography in improving the visualization of abnormalities.
		Distinguish normal and abnormal developments of the fetal heart.
		Demonstrate fetal heart position, size, four chamber view, left ventricular outflow, right ventricular outflow, three-vessel view and three- vessel trachea view.
		Discuss the role of sonography in fetal therapy.

A13- DMSO 2020: Specialized Sonographic Procedures

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
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List clinical indications and contraindications for interventional procedures.		Discuss importance of informed consent during an interventional procedure.
Demonstrate the sonographic technique and transducer guidance for interventional procedures.		Discuss importance of procedural time out.
List indications and contraindications for organ transplant.		Discuss and demonstrate how to set up a sterile tray for an interventional procedure.
Describe the anatomy and variants of the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system		Discuss importance of pre and post procedural documentation.
Describe the function of the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system.		
Describe the clinical indications, contraindications and laboratory values associated with the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system.		
Describe the sonographic technique used to evaluate the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system.		
Describe the sonographic procedure and protocol for imaging the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system.		
Describe the pathologic conditions associated with the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system.		
Identify the sonographic characteristics of abnormal findings in the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system.		
Recognize the laboratory values associated with the breast, thyroid, parathyroid, prostate, scrotum, penis, and musculoskeletal system		
Describe the clinical indications, contraindications, and laboratory values associated with the pediatric hip and pylorus: neonatal brain and spine.		

A14- DMSO 2030: Clinical Sonography III

Revised Course Description

This course provides students with continued work experience in a hospital, clinic or other patient care setting. Students improve skills in performing **sonographic** procedures previously introduced. Topics include: normal

uterine and fetal development through the three trimesters including placental grading; equipment manipulation for optimum resolution; manipulation of equipment to minimize biological effects; normal anatomy and pathologic conditions of the abdomen and female pelvis; fetal biometry including gestational sac size, crown-rump length, bi-parietal diameter and head circumference; ectopic pregnancies; normal anatomy of the venous and arterial systems of the body; abnormal conditions of the human vasculature system; patient care issues; and demonstration of significant progression of knowledge and scanning skills.

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Perform examinations of the obstetric patient following AIUM guidelines to demonstrate the cervix, adnexa, pelvic spaces, normal uterine growth, presence of gestational sac, the embryonic pole, yolk sac, placenta, fetal cardiac activity, and growth during a normal embryonic period in the first trimester. and continued growth throughout the second and third trimesters.	Create diagnostic images of fetal anatomy, including a biophysical profile, and FHR.	Perform examinations of the obstetric patient following AIUM guidelines to demonstrate the intracranial anatomy, face, thoracic cavity, fetal heart (including position and size, four-chamber view, LVOT and RVOT views, three-vessel view, and three -vessel tracheal views), abdomen, abdominal wall, spine, extremities, amniotic fluid, placenta, umbilical cord, fetal cardiac activity, maternal cervical length and maternal adnexa in the second and third trimesters.
Use system controls to optimize images in grayscale, Doppler, and M-mode.		Perform a Biophysical Profile.
Adapt system controls to minimize possible bio-effects to the patient in keeping with the ALARA principle.		
Perform examinations of the abdomen and complete female pelvis to include the vagina, cervix, uterus, posterior and anterior cul-de-sac, and adnexa including the ovaries and fallopian tubes while following AIUM guidelines.		

A15- DMSO 2031: Clinical Sonography III (Part A)

Revised Course Description

This course provides students with continued work experience in a hospital, clinic or other patient care setting. Students improve skills in performing **sonographic** procedures previously introduced. Topics include: normal uterine and fetal development through the first ~~three trimesters including placental grading~~; equipment manipulation for optimum resolution; manipulation of equipment to minimize biological effects; normal anatomy and pathologic conditions of the abdomen **and female** pelvis; fetal biometry including gestational sac size, crown-rump length, bi-parietal diameter and head circumference; ectopic pregnancies; normal anatomy of the venous and arterial systems of the body; abnormal conditions of the human vasculature system; patient care issues; and demonstration of **significant** progression of knowledge and scanning skills.

Revised Competencies

Competency #1: Normal Uterine and Fetal Development Through the **First Trimester** ~~Three Trimesters, Including Placental Grading, Plac~~

Competency #5: Fetal Biometry, Including Gestational Sac Size, Crown-Rump Length, Bi-Parietal Diameter, Head Circum**ference**

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
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Name the required AIUM images required for a first trimester obstetric sonogram. and the second and third trimester obstetric exam.	Determine the location of the placenta and assign a placental grade by the sonographic appearance of the placenta.	
Perform examinations of the obstetric patient following AIUM guidelines to demonstrate the cervix, adnexa, pelvic spaces, normal uterine growth, presence of gestational sac, the embryonic pole, yolk sac, fetal cardiac activity, and growth during a normal embryonic period, and continued growth throughout the second and third trimesters.		
Create diagnostic images of fetal anatomy. including a biophysical profile, and FHR		
Use system controls to optimize images in grayscale, Doppler, Color and M-mode.		
Adapt system controls to minimize possible bio-effects to the patient in keeping the ALARA principle.		
Perform examinations of the abdomen and complete female pelvis to include the vagina, cervix, uterus, posterior and anterior cul-de-sac, and adnexa including the ovaries and fallopian tubes while following AIUM guidelines.		

A16- DMSO 2032: Clinical Sonography III (Part B)

Revised Course Description

This course provides students with continued work experience in a hospital, clinic or other patient care setting. Students improve skills in performing **sonographic** procedures previously introduced. Topics include: normal uterine and fetal development through the three trimesters including placental grading; equipment manipulation for optimum resolution; manipulation of equipment to minimize biological effects; normal anatomy and pathologic conditions of the abdomen and female pelvis; fetal biometry including gestational sac size, crown-rump length, bi-parietal diameter and head circumference; ectopic pregnancies; normal anatomy of the venous and arterial systems of the body; abnormal conditions of the human vasculature system; patient care issues; and demonstration of significant progression of knowledge and scanning skills.

Revised Competencies

Competency #1: Normal Uterine and Fetal Development Through the Three Trimesters, Including Placental Grading, ~~Plae~~

Competency #5: Fetal Biometry, Including Gestational Sac Size, Crown-Rump Length, Bi-Parietal Diameter, Head Circumference

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Perform examinations of the obstetric patient following AIUM guidelines to demonstrate the	Create diagnostic image of fetal anatomy, including a biophysical profile, and FHR.	Perform examinations of the obstetric patient following AIUM guidelines to demonstrate the

cervix, adnexa, pelvic spaces, normal uterine growth, presence of gestational sac, the embryonic pole, yolk sac, placenta, fetal cardiac activity, and growth during a normal embryonic period in the first trimester and continued growth throughout the second and third trimesters.		intracranial anatomy, face, thoracic cavity, fetal heart (including position and size, four-chamber view, LVOT and RVOT views, three-vessel view, and three -vessel tracheal views), abdomen, abdominal wall, spine, extremities, amniotic fluid, placenta, umbilical cord, fetal cardiac activity, maternal cervical length and maternal adnexa in the second and third trimesters.
Use system controls to optimize images in grayscale, Doppler, and M-mode.		Perform a Biophysical Profile.
Adapt system controls to minimize possible bio-effects to the patient in keeping with the ALARA principle.		
Perform examinations of the abdomen and complete female pelvis to include the vagina, cervix, uterus, posterior and anterior cul-de-sac, and adnexa including the ovaries and fallopian tubes while following AIUM guidelines.		

A17- DMSO 2040: Comprehensive ABD and OB/GYN Registry Review

Revised Course Title

Comprehensive Registry Review for ABD-extended and/or OB/GYN and/or Breast Concentration(s) ~~ABD and OB/GYN Registry Review~~

Course Description

Provides a review of knowledge from previous courses and helps the student prepare for ARDMS national certification examinations for sonography. Information concerning test taking skills is also reviewed. Topics include: **Abdomen Extended: anatomy and physiology of abdominal structures, small parts, and superficial structures; patient preparation and protocols for sonographic examination of abdominal structure; clinical indications, pertinent related diagnostic imaging procedures and laboratory tests; sonographic technique and appearance of normal anatomic abdominal structures, small parts; characteristic sonographic features and/or patterns of pathology in the abdomen, small parts; and instrumentation; OB/GYN: patient care, preparation and technique; instrumentation, normal pelvic anatomy; abnormal pelvic anatomy; extra-pelvic pathology associated with gynecology; pediatric sonography; post menopause; infertility and endocrinology; first trimester; placenta, amniotic fluid, umbilical cord; second and third trimester; congenital fetal anomalies; complications during pregnancy; fetal demise; coexisting disorders; HIPPA and patient care techniques utilizing a professional sonographer; Breast: patient care, preparation and imaging technique, instrumentation, normal and abnormal anatomy, variants, sonographic appearance, organ development, infectious processes, BI-RADS, image optimization, invasive procedures, and treatment options.**

Additional Competencies

Competency #21: Breast Anatomy

Competency #22: Physiology and pathophysiology in both normal and abnormal breast structures

Competency #23: Sonographic technique, measurements, sonographic appearances, integration of data, and Doppler patterns in both normal and abnormal breast structures

Competency #24: Interventional and intraoperative procedures

Competency #25: Scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses

Competency #26: Treatment options

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Describe sonographic examinations of the female pelvis. pertinent to the program's concentration(s).	Compare and Contrast transabdominal, translabial, and transvaginal pelvic sonography.	Anticipate and be able to respond to the needs of the patient.
Discuss scanning techniques and their applications to the various obstetric and gynecological sonographic examinations.	Review HIPPA.	Review HIPPA
Discuss the physical principles of sonography and their application towards the performance of the sonographic pelvic examinations.	Review patient care techniques utilized by a professional sonographer.	Discuss different transducer designs and applications.
Apply imaging and doppler techniques used to recognize normal and abnormal pelvic anatomy.	Discuss the basic fundamentals of ultrasound physics and instrumentation.	Identify and differentiate ultrasound-imaging artifacts and apply them to diagnostic criteria.
Discuss conditions associated with pediatric sonographic imaging gynecology	Discuss different transducer designs and applications.	Describe quality assurance programs and responsibilities.
Recognize sonographic findings associated with normal and abnormal pediatric Gynecological abnormalities.	Identify and differentiate ultrasound imaging artifacts and apply them to diagnostic criteria.	Discuss congenital and developmental variants, and sonographic appearances of normal breast structures.
Demonstrate sonographic techniques used to identify normal and abnormal pediatric pelvic findings.	Describe quality assurance programs and responsibilities.	Identification of anatomical and relational structures
Describe the anatomy and physiology of abdominal structures, small parts, and superficial structures to include: a) liver, b) gall bladder and biliary system, c) pancreas, d) spleen, e) kidneys and urinary tract, f) scrotum and testes, g) prostate, h) retroperitoneum, i) gastrointestinal tract, j) superficial structures, abdominal wall, musculoskeletal, k) neck, l) abdominal vascular, m) breast, n) invasive procedures, o) transplants, p) musculoskeletal, and q) abdominal wall. a) Abdominal wall, b) Adrenal glands, c) Aorta and branches, d) Biliary system, e) Gastrointestinal tract, f) Great vessels and branches, g) Liver, h) Lung/pleura, i) Lymphatic system, j) Pancreas, k) Peritoneal and retroperitoneal cavities, l) Spleen, m) Urinary tract, n) Extremity non-vascular, m) Infant hips, n) Neck, o) Neonatal/infant head, p) Neonatal/infant spine, q) Penis, r)		Differentiation of normal from pathological/disease process

<p>Prostate, s) Scrotum, t) Superficial soft-tissue structures</p>		
<p>Detail patient preparation (if applicable) and protocols for sonographic examination of abdominal structures, small parts, and superficial structures to include: a) liver, b) gall bladder and biliary system, c) pancreas, d) spleen, e) kidneys and urinary tract, f) scrotum and testes, g) prostate, h) retroperitoneum, i) gastrointestinal tract, j) superficial structures, abdominal wall, musculoskeletal, k) neck, l) abdominal vascular, m) breast, n) invasive procedures, o) transplants, p) musculoskeletal, and q) abdominal wall. a) Abdominal wall, b) Adrenal glands, c) Aorta and branches, d) Biliary system, e) Gastrointestinal tract, f) Great vessels and branches, g) Liver, h) Lung/pleura, i) Lymphatic system, j) Pancreas, k) Peritoneal and retroperitoneal cavities, l) Spleen, m) Urinary tract, n) Extremity non-vascular, m) Infant hips, n) Neck, o) Neonatal/infant head, p) Neonatal/infant spine, q) Penis, r) Prostate, s) Scrotum, t) Superficial soft-tissue structures</p>		<p>Discuss Image optimization techniques in grayscale and Doppler</p>

<p>List clinical indications, pertinent related imaging procedures, and laboratory tests, or other procedures associated to sonographic examinations of the abdominal structures, small parts, and superficial structures to include: a) liver, b) gall bladder and biliary system, c) pancreas, d) spleen, e) kidneys and urinary tract, f) scrotum and testes, g) prostate, h) retroscaption, i) gastrointestinal tract, j) superficial structures, abdominal wall, musculoskeletal, k) neck, l) abdominal vascular, m) breast, n) invasive procedures, o) transplants, p) musculoskeletal, and q) abdominal wall. a) Abdominal wall, b) Adrenal glands, c) Aorta and branches, d) Biliary system, e) Gastrointestinal tract, f) Great vessels and branches, g) Liver, h) Lung/pleura, i) Lymphatic system, j) Pancreas, k) Peritoneal and retroperitoneal cavities, l) Spleen, m) Urinary tract, n) Extremity non-vascular, m) Infant hips, n) Neck, o) Neonatal/infant head, p) Neonatal/infant spine, q) Penis, r) Prostate, s) Scrotum, t) Superficial soft-tissue structures.</p>		<p>Implants</p>
<p>Describe the sonographic technique and appearance of normal anatomic of abdominal structures, small parts, and superficial structures including anatomic variants and normal doppler patterns to include: a) liver, b) gall bladder and biliary system, c) pancreas, d) spleen, e) kidneys and urinary tract, f) scrotum and testes, g) prostate, h) retroscaption, i) gastrointestinal tract, j) superficial structures, abdominal wall, musculoskeletal, k) neck, l) abdominal vascular, m)</p>		<p>Discuss Embryologic development and age-related development of the breast to involution.</p>

<p>breast, n) invasive procedures, o) transplants, p) musculoskeletal, and q) abdominal wall. a) Abdominal wall, b) Adrenal glands, c) Aorta and branches, d) Biliary system, e) Gastrointestinal tract, f) Great vessels and branches, g) Liver, h) Lung/pleura, i) Lymphatic system, j) Pancreas, k) Peritoneal and retroperitoneal cavities, l) Spleen, m) Urinary tract, n) Extremity non-vascular, m) Infant hips, n) Neck, o) Neonatal/infant head, p) Neonatal/infant spine, q) Penis, r) Prostate, s) Scrotum, t) Superficial soft-tissue structures.</p>		
<p>Discuss characteristic sonographic features and/or patterns of pathology in the abdomen, small parts, and superficial structures including abnormal doppler findings that include: a) liver, b) gall bladder and biliary system, c) pancreas, d) spleen, e) kidneys and urinary tract, f) scrotum and testes, g) prostate, h) retrospetion, i) gastrointestinal tract, j) superficial structures, abdominal wall, musculoskeletal, k) neck, l) abdominal vascular, m) breast, n) invasive procedures, o) transplants, p) musculoskeletal, and q) abdominal wall. a) Abdominal wall, b) Adrenal glands, c) Aorta and branches, d) Biliary system, e) Gastrointestinal tract, f) Great vessels and branches, g) Liver, h) Lung/pleura, i) Lymphatic system, j) Pancreas, k) Peritoneal and retroperitoneal cavities, l) Spleen, m) Urinary tract, n) Extremity non-vascular, m) Infant hips, n) Neck, o) Neonatal/infant head, p) Neonatal/infant spine, q) Penis, r) Prostate, s) Scrotum, t) Superficial soft-tissue structures</p>		<p>Identify Normal blood flow patterns within the breast and its components.</p>
		<p>Identify and differentiate effects of normal and abnormal Lymphatic drainage.</p>
		<p>Discuss effects of pregnancy and lactation.</p>
		<p>Describe Infectious processes and possible treatment options.</p>
		<p>Describe Imaging techniques, Image optimization including effect and correction of artifacts.</p>

		Discuss Image labeling and measurement accuracy.
		Differentiate normal vs abnormal Lymph node assessment.
		Describe Postoperative biopsy site.
		List and discuss BI-RADS assessment categories.
		Describe the importance of correlation of other imaging modalities.
		Discuss Spectral, Color and Power Doppler of the vasculature related to a mass/lesion
		Describe the role of sonographer in ultrasound-guided procedures and sentinel lymph node biopsy.
		Discuss Pre-and post-procedural documentation, necessary clinical information and procedure guidelines.
		Identify proper sterile setup for patient, sonographer and physician.
		Describe sonography-assisted procedures.
		List Indications and contraindications for sonographic breast examinations.
		Discuss patient history collection and the breast physical examination.
		Describe related imaging, laboratory, and functional testing procedures including elastography and three dimensional imaging.
		Discuss the correlation with mammography, MRI, and Nuclear medicine.
		Discuss BIRADS
		List clinical differential diagnosis.
		Describe medical, surgical and brachytherapy treatments.

A18- DMSO 2050: Clinical Sonography IV

Revised Learning Outcomes	Deleted Learning Outcomes	Added Learning Outcomes
Apply physics and theory to produce optimum sonographic images incorporating techniques in grayscale, Doppler, and M-mode.		

A19- DMSO 2021: Breast Sonography

Course Description: This course introduces breast anatomy and pathology as related to the field of sonographic imaging. Topics include: anatomy, congenital and developmental variants, and sonographic appearances of normal and abnormal breast structures; the sonographic technique, measurements, integration of data, and Doppler patterns in both normal and abnormal breast structures; scanning protocol and modification(s) based on the sonographic

findings and the differential diagnoses; interventional and intraoperative procedures for breast; indications for examination correlative and prior imaging, pertinent lab values.

Course Requisites

Pre-requisites: Program Admission

Regstr. Co-requisites: None

True Co-requisites: None

Course Length

	Lecture Contact Time	Regular Lab Type	Reg. Lab Contact Time	Other Lab Type	Other Lab Contact Time	Total Contact Hrs
Contact Hrs/week	2hrs	N/A	0hrs	Clinical	1hr	3hrs
Contact Mins/semester	1500mins		0mins		750mins	45hrs

	Lecture Credit Hours	Lab Credit Hours	Total Credit Hours	WLU
Semester Credit Hours	2	1	3	82.5

Competencies & Outcomes

1. Normal Breast Structures

Order	Description	Learning Domain	Level of Learning
1	Identify anatomy, congenital and developmental variants, and sonographic appearances of normal breast structures. 1. Areolar complex/nipple 2. Fibrous planes a) Skin b) Subcutaneous fat c) Mammary zone d) Retromammary space e) Muscle layers f) Rib cage and intercostal muscles 3. Cooper's ligament 4. Ductal system 5. Lymph nodes 6. Vasculature a) Arterial b) Venous 7. Variants a) Amastia b) Amazia c) Athelia d) Polymastia e) Polythelia f) Nipple inversion/flattening g) Early ripening h) Age-related sonographic changes of breast tissue and its components	Cognitive	Knowledge

2. Abnormal Breast Structures

Order	Description	Learning Domain	Level of Learning
1	Demonstrate knowledge of physiology and pathophysiology in both normal and abnormal breast structures. 1. Embryologic development 2. Age-related development of the breast to involution 3. Normal blood flow patterns within the breast and its components 4. Lymphatic drainage 5. Effect of pregnancy 6. Lactation 7. Male breast 8. Infectious processes 9. Neoplasms a) Cystic b) Benign c) Malignant 10. Trauma	Cognitive	Application

3. Sonographic technique, measurements, sonographic appearances, integration of data, and Doppler patterns in both normal and abnormal breast structures

Order	Description	Learning Domain	Level of Learning
1	Demonstrate knowledge of the sonographic technique, measurements, sonographic appearances, integration of data, and Doppler patterns in both normal and abnormal breast structures. 1. Scan planes 2. Scan techniques 3. Patient position 4. Imaging techniques 5. Image labeling/distance from nipple 6. Image optimization 7. Artifacts 8. Implants 9. Lymph node assessment 10. Postoperative biopsy site 11. BI-RADS assessment categories 12. Correlation of other imaging modalities 13. Spectral Doppler of the vasculature related to a mass 14. Color Doppler of a mass/lesion 15. Power Doppler of a mass/lesion	Cognitive	Application

4. Interventional and intraoperative procedures

Order	Description	Learning Domain	Level of Learning
1	Demonstrate knowledge in interventional and intraoperative procedures. 1. Role of sonographer in ultrasound-guided procedures and sentinel lymph node biopsy 2. Clinical information 3. Informed consent 4. Procedural time out 5. Transducer guidance	Cognitive	Application

	6. Sterile setup 7. Pre-and post-procedural documentation 8. Sonography assisted procedures		
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5. Scanning protocol and modification(s)

Order	Description	Learning Domain	Level of Learning
1	Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses. 1. Indications and contraindications 2. History and physical examination 3. Related imaging, laboratory, and functional testing procedures a) Correlation with mammography b) BIRADS c) Correlation with MRI d) Correlation with Nuclear Medicine 4. Clinical differential diagnosis 5. Role of sonography in patient management 6. Elastography 7. Role of three-dimensional sonography	Cognitive	Evaluation

6. Treatment options

Order	Description	Learning Domain	Level of Learning
1	Demonstrate knowledge of treatment options. 1. Medical 2. Surgical 3. Brachytherapy	Cognitive	Application

7. Clinical Competency

Order	Description	Learning Domain	Level of Learning
1	Demonstrate achievement of clinical competency through the performance of sonographic examinations of the breast, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers. Clinical competencies must include evaluation and documentation of: 1. Identification of anatomical and relational structures 2. Differentiation of normal from pathological/disease process 3. Image optimization techniques in grayscale 4. Image optimization techniques in Doppler (where applicable) 5. Measurement techniques (where applicable) 6. Breast competencies a) Targeted exam b) Lymph node evaluation c) Cystic lesion d) Solid lesion e) Doppler evaluation of mass f) Implant	Psychomotor	Guided Response

	g) Breast interventional procedures (1) Fine needle aspiration (2) Core biopsy (3) Needle localization		
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