



The SonoSim Ultrasound Training Solution in Accordance with the National Ultrasound Curriculum for Medical Students

Introducing ultrasound in UME has been proven to improve anatomy knowledge, physiology understanding, and physical examination skills.^{1,2,3} Recognizing the benefits of early ultrasound education but seeing the gaps in implementation, the Society of Radiologists in Ultrasound and the Alliance of Medical School Educators in Radiology have collaborated to create a recommended “[National Ultrasound Curriculum for Medical Students](#).”⁴ The award-winning, patented SonoSim Ultrasound Training Solution matches these industry recommendations through an ecosystem of cloud-based courses, knowledge assessments, interactive SonoSimulator® scanning cases, performance tracking, and access to real-patient pathology.

National Ultrasound Curriculum for Medical Students – Preclinical Curriculum

Familiarity with the Basic Principles of the Physics of Ultrasound		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Image acquisition	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Sound transmission and reflection, scatter	Basic Ultrasound Physics	All SonoSim Cases
Acoustic window	Imaging Artifacts	
Image optimization	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Depth, focal zone, time-gain compensation, gain, field of view	Ultrasound System Operation	All SonoSim Cases
Posterior acoustic properties	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Posterior enhancement (increased sound transmission), sound attenuation, acoustical shadowing	Imaging Artifacts	All SonoSim Cases
Artifacts	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Near field, reverberation, edge refraction, mirror image	Imaging Artifacts	All SonoSim Cases
Terminology	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Echogenic, hyperechoic, hypoechoic, anechoic, isoechoic	Basic Ultrasound Physics	All SonoSim Cases
Characteristics of:	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Simple & complex fluid	GYN Normal Adnexa: Sonographic Anatomy, Sonographic Examination OB/GYN Core Clinical: Pathological Conditions	Bladder, Intestinal/Biliary, & OB/GYN Core Clinical Cases GYN Malignant Adnexal Conditions Cases GYN Nonmalignant Adnexal Conditions Cases GYN Normal Adnexa Cases Paracentesis, Pericardiocentesis, & Thoracentesis Procedures Cases SonoSim LiveScan® Genitourinary & Hepatobiliary Cases
Soft tissue/solid	Introduction to MSK: Anatomy & Physiology Soft Tissue Core Clinical: Identification of Tissue Types	Introduction to MSK Cases Soft Tissue Core Clinical Cases
Air/gas	Fundamentals of Ultrasound: Basic Ultrasound Physics, Imaging Artifacts Intestinal/Biliary: Pathologic Gas	Intestinal/Biliary Cases Renal Cases
Bone/calcium	Fundamentals of Ultrasound: Basic Ultrasound Physics Introduction to MSK: Anatomy & Physiology Soft Tissue Core Clinical: Identification of Tissue Types	All MSK Cases Soft Tissue Core Clinical Cases

Imaging modes	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
B-mode (gray scale)	Imaging Modes	<i>All SonoSim Cases</i>
Doppler (spectral, color, and power)	Imaging Modes	<i>All Advanced GYN Cases</i> <i>All US-Guided Procedures Cases</i> <i>Aorta/IVC, Bladder, Lungs, and Renal Anatomy & Physiology Cases</i> <i>Aorta/IVC, DVT, & RUSH Core Clinical Cases</i> <i>FoCUS – Part I & II Cases</i> <i>SonoSim LiveScan® Critical Care & Genitourinary Cases</i>
M-mode	Imaging Modes	<i>FoCUS – Part I Cases</i> <i>Lungs Anatomy & Physiology Cases</i> <i>Second- & Third-Trimester Pregnancy – Part II Cases</i> <i>SonoSim LiveScan® Critical Care & Trauma Care Cases</i>

Learning Objectives Not Covered: Analogy to SONAR

Knowledge of Instrumentation		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Basic probe and image orientation	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Sagittal, transverse, coronal	Imaging Conventions	<i>All SonoSim Cases</i>
Transducers	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Frequencies, types (linear, curvilinear, sector, transvaginal), near field, far field	Transducer Basics	<i>All SonoSim Cases</i>
Machine settings	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Transducer frequency, focus, time-gain compensation	Ultrasound System Operation	--
Depth, gain	Ultrasound System Operation	<i>All SonoSim Cases</i>
Control buttons	Advanced Clinical Courses	Relevant SonoSim Cases
Freeze, save images, cine loop	--	<i>All SonoSim Cases</i>
Measure with calipers	<i>First-Trimester Pregnancy: Pregnancy Dating Using Ultrasound</i> <i>FoCUS – Part I: Cardiac Output Measurements, Pulmonary Artery Pressure Measurements</i> <i>GYN Normal Adnexa: Sonographic Examination</i> <i>GYN Normal Uterus: Transvaginal Sonographic Technique</i> <i>Second- & Third-Trimester Pregnancy - Part I: Fetal Biometry & Pregnancy Dating</i>	<i>All SonoSim Cases</i>

Describe Advantages of Ultrasound		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
General	Core Clinical, Advanced Clinical, & Procedures Courses	Relevant SonoSim Cases
Real-time dynamic imaging, multiplanar imaging, portable, lack of ionizing radiation, lower cost, safe & noninvasive	<i>Various Core Clinical, Advanced Clinical, & Procedures Courses</i>	<i>All SonoSim Cases</i>

Learning Objectives Not Covered: Improved soft tissue resolution compared with noncontrast computed tomography (CT)

Describe Limitations of Ultrasound		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
General	Fundamentals of Ultrasound Course	Relevant SonoSim Cases
Obese patients (attenuation, scatter, image degradation)	Basic Ultrasound Physics, Imaging Artifacts <i>Intestinal/Biliary</i> : Introduction	<i>SonoSim LiveScan® Late Stage Pregnancy Cases</i>
Impedance to transmission of sound waves: air (lung, bowel, gas), bone, metal	Basic Ultrasound Physics, Imaging Artifacts	<i>All MSK Cases</i> <i>Intestinal/Biliary & Renal Core Clinical Cases</i>
Smaller field of view	<i>All SonoSim Courses</i>	<i>All SonoSim Cases</i>
Operator dependence	Ultrasound System Operation	

Learning Objectives Not Covered: Less interexamination reproducibility relative to CT

Correlate Patient Safety and Ultrasound		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
OB/GYN	GYN Normal Adnexa Course	Relevant SonoSim Cases
No ionizing radiation, pelvic imaging in women of reproductive age	Introduction	All SonoSim OB/GYN Core Clinical Cases
Pediatrics	Introduction to US-Guided Procedures	Relevant SonoSim Cases
No ionizing radiation	Introduction Advanced Neonatal & Infant Neurosonography: Introduction Advanced Pediatric Lung Sonography: Introduction	All SonoSim Cases
General	Core Clinical & Procedures Courses	Relevant SonoSim Cases
US and magnetic resonance imaging are methods to reduce ionizing radiation exposure	All SonoSim Courses	All SonoSim Cases
Heat deposition, cavitation: Doppler, gray-scale imaging	Fundamentals of Ultrasound: Infection Control & Biosafety	
ALARA (as low as reasonably achievable) principle		

Learning Objectives Not Covered: Pediatrics: No sedation

Identify Classic Appearances of Normal Structures on Ultrasound		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Abdomen	Anatomy & Physiology Courses	Relevant SonoSim Cases
Liver	<i>Liver</i> : All Lessons	<i>Liver Cases</i>
Gallbladder	<i>Biliary Tree</i> : All Lessons	<i>Biliary Tree Cases</i>
Pancreas	<i>Pancreas</i> : All Lessons	<i>Pancreas Cases</i>
Spleen	<i>Spleen</i> : All Lessons	<i>Spleen Cases</i>
Kidneys	<i>Renal</i> : All Lessons	<i>Renal Cases</i>
Aorta & inferior vena cava	<i>Aorta/IVC</i> : All Lessons	<i>Aorta/IVC Cases</i>

Genitourinary	Anatomy & Physiology Courses	Relevant SonoSim Cases
Urinary bladder	<i>Bladder: All Lessons</i>	<i>Bladder Cases</i>
Uterus & ovaries	<i>Female Pelvis: All Lessons</i> <i>GYN Normal Uterus & GYN Normal Adnexa Advanced Clinical: All Lessons</i>	<i>Female Pelvis Cases</i> <i>GYN Normal Uterus & GYN Normal Adnexa Cases</i>
Prostate	<i>Prostate: All Lessons</i>	<i>Prostate Cases</i>
Obstetrical scans	OB Courses	Relevant SonoSim Cases
Basic fetal anatomy (head, abdomen, heartbeat, limbs, umbilical cord, placenta, cervix)	<i>Six-Step Obstetric Examination: Sonographic Anatomy & Technique</i> <i>Second- & Third-Trimester Pregnancy – Part I: Basic Fetal Anatomy, Cervical Length</i> <i>Second- & Third-Trimester Pregnancy – Part II: Assessment of Extrafetal Anatomy, Placental Evaluation</i>	<i>Six-Step Obstetric Examination Cases</i> <i>Second- & Third-Trimester Pregnancy - Part I & II Cases</i> <i>SonoSim LiveScan® Early Stage, Late Stage Pregnancy, & Six-Step Obstetric Examination Cases</i>
Cardiac	Heart Anatomy & Physiology Course	Relevant SonoSim Cases
Subxiphoid view of heart for pericardial effusion	<i>All Lessons</i>	<i>Heart Anatomy & Physiology Course</i> <i>Cardiology Core Clinical Course</i>
Leg venous	Anatomy & Physiology and Core Clinical Courses	Relevant SonoSim Cases
Femoropopliteal venous system (with and without compression)	<i>DVT: Sonographic Anatomy, Sonographic Technique</i> <i>Leg-Venous: All Lessons</i>	<i>DVT Cases</i> <i>Leg-Venous Cases</i>
Neck	Anatomy & Physiology and Procedures Courses	Relevant SonoSim Cases
Internal jugular vein & carotid artery (relation to internal jugular vein, carotid bifurcation)	<i>Cerebrovascular: All Lessons</i> <i>US-Guided Internal Jugular Vein Cannulation: Sonographic Anatomy</i>	<i>Cerebrovascular Cases</i> <i>US-Guided Internal Jugular Vein Cannulation Cases</i>
Subclavian vein	<i>Cerebrovascular: All Lessons</i> <i>US-Guided Subclavian Vein Cannulation: Sonographic Anatomy</i>	<i>Cerebrovascular Cases</i> <i>US-Guided Subclavian Vein Cannulation Cases</i>
Thyroid	<i>Thyroid: All Lessons</i>	<i>Thyroid Cases</i>
Pulmonary	Lungs: Anatomy & Physiology Course	Relevant SonoSim Cases
Normal lung (pleural line, sliding lung sign) & diaphragm (hyperechogenicity and movement)	<i>All Lessons</i>	<i>Lungs Cases</i>
Musculoskeletal	All MSK Courses	Relevant SonoSim Cases
Tendon (principle of anisotropy), muscle, surface of bone, & joint fluid	<i>Introduction to MSK, Ankle, Elbow, Foot, Hand & Finger, Hip, Knee, Shoulder, & Wrist: All Lessons</i> <i>MSK Core Clinical: All Lessons</i>	<i>Introduction to MSK, Ankle, Elbow, Foot, Hand & Finger, Hip, Knee, Shoulder, & Wrist Anatomy & Physiology Cases</i> <i>MSK Core Clinical Cases</i>

National Ultrasound Curriculum for Medical Students – Clinical Curriculum

List Appropriate Indications for Common Ultrasound Examinations

Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Characterization of masses	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Cystic, solid, complex	<i>Bladder, OB/GYN, & Renal Core Clinical: Case Studies/ Case Pathologies</i> <i>First-Trimester Pregnancy: Pathologic Conditions</i> <i>GYN Malignant Adnexal Conditions: Sonographic Characterization of Adnexal Masses, Borderline Tumors</i> <i>GYN Nonmalignant Adnexal Conditions: Ovarian Cysts</i> <i>GYN Normal Adnexa: Sonographic Anatomy</i>	<i>First-Trimester Pregnancy & All Advanced GYN Cases</i> <i>Bladder, DVT, Intestinal/Biliary, OB/GYN, Renal, RUSH, & Soft Tissue Core Clinical Cases</i> <i>Advanced Neonatal & Infant Neurosonography Cases</i> <i>SonoSim LiveScan® Critical Care, Early Stage Pregnancy, Late Stage Pregnancy, Genitourinary, Hepatobiliary, & Neonatal & Infant Neurosonography Cases</i>
Clinically suspected fluid accumulations	Core Clinical, Advanced Clinical, & Procedures Courses	Relevant SonoSim Cases
Ascites	<i>eFAST: Case Studies</i> <i>Intestinal/Biliary: Gallbladder Evaluation</i> <i>Paracentesis Course</i>	<i>Bladder, eFAST, & Intestinal/Biliary Core Clinical Cases</i> <i>Paracentesis Cases</i> <i>SonoSim LiveScan® Genitourinary, Hepatobiliary, & Trauma Care Cases</i>
Pleural effusion	<i>eFAST: Case Studies</i> <i>Pulmonary: Pleural Effusion</i> <i>Advanced Pediatric Lung Sonography: Sonographic Anatomy, Case Studies</i>	<i>Airway, Aorta/IVC, Cardiology, eFAST, Pulmonary, & RUSH Core Clinical Cases</i> <i>FoCUS – Part I Advanced Clinical Cases</i> <i>Advanced Pediatric Lung Sonography Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation, Critical Care & Trauma Care Cases</i>
Pericardial effusion	<i>Cardiology, eFAST, & RUSH Core Clinical: Case Studies</i> <i>Pericardiocentesis Course</i>	<i>Airway, Cardiology, eFAST, & RUSH Core Clinical Cases</i> <i>FoCUS – Part I Advanced Clinical Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation, Critical Care, Early Stage Pregnancy, Late Stage Pregnancy, & Trauma Care Cases</i>
Abscess	<i>Soft Tissue Core Clinical: Cellulitis and Abscess Imaging, Advanced Abscess Evaluation</i>	<i>Soft Tissue Core Clinical Cases</i> <i>MSK Challenge Cases</i>
Hematoma	<i>Musculoskeletal Core Clinical: Muscle Evaluation</i>	<i>Soft Tissue Core Clinical Cases</i>
Abdomen	Core Clinical Courses	Relevant SonoSim Cases
Evaluation of right-upper-quadrant (RUQ) pain	<i>Intestinal/Biliary: Gallbladder Evaluation, Common Bile Duct Evaluation</i> <i>Renal: Obstructive Uropathy, Case Studies</i>	<i>Intestinal/Biliary & Renal Core Clinical Cases</i> <i>Abdomen Challenge Cases</i> <i>SonoSim LiveScan® Hepatobiliary & Genitourinary Cases</i>
Obstructive jaundice	<i>Intestinal/Biliary: Gallbladder Evaluation, Common Bile Duct Evaluation</i>	<i>Intestinal/Biliary Cases</i>
Clinically suspected appendicitis in children, young patients, or pregnant women	<i>Intestinal/Biliary: Appendicitis</i>	
Suspected splenomegaly	<i>eFAST: LUQ Views</i>	<i>eFAST, FAST, & RUSH Core Clinical Cases</i> <i>SonoSim LiveScan® Critical Care, Hepatobiliary, & Trauma Care</i>
Hematuria	--	<i>SonoSim LiveScan® Genitourinary Cases</i>
Flank pain	<i>Renal: Obstructive Uropathy, Case Studies</i>	<i>Intestinal/Biliary & Renal Core Clinical Cases</i> <i>SonoSim LiveScan® Hepatobiliary & Genitourinary Cases</i>
Screening (and following) abdominal aortic aneurysms	<i>Aorta/IVC: Aortic Case Studies</i>	<i>Aorta/IVC & RUSH Core Clinical Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation & Critical Care</i>

Gynecology	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Pelvic mass	<i>GYN Abnormal Uterus - Part I:</i> Leiomyoma <i>GYN Malignant Adnexal Conditions:</i> Sonographic Characterization of Adnexal Masses, Borderline Tumors <i>GYN Nonmalignant Adnexal Conditions:</i> Ovarian Cysts <i>OB/GYN:</i> Case Studies	<i>First-Trimester Pregnancy Cases</i> <i>GYN Abnormal Uterus – Part II Cases</i> <i>GYN Nonmalignant & Malignant Adnexal Conditions Cases</i> <i>GYN Normal Uterus Cases</i> <i>OB/GYN Core Clinical Cases</i> <i>GYN Challenge Cases</i> <i>SonoSim LiveScan® Early Stage & Late Stage Pregnancy Cases</i>
Pelvic pain	<i>GYN Abnormal Uterus - Part I:</i> Localization of Intrauterine Devices, Adenomyosis, Leiomyoma <i>GYN Abnormal Uterus - Part II:</i> Evaluating the Endometrium, Endometrial Polyps & Submucosal Leiomyomas <i>GYN Nonmalignant Adnexal Conditions:</i> Ovarian Cysts	<i>First-Trimester Pregnancy Cases</i> <i>GYN Abnormal Uterus – Part II Cases</i> <i>GYN Nonmalignant & Malignant Adnexal Conditions Cases</i> <i>OB/GYN Core Clinical Cases</i> <i>GYN Challenge Cases</i> <i>SonoSim LiveScan® Early Stage Pregnancy & Late Stage Pregnancy Cases</i>
Abnormal vaginal bleeding	<i>GYN Abnormal Uterus - Part II:</i> All Lessons	<i>GYN Abnormal Uterus – Part I & II Cases</i> <i>GYN Normal Adnexa & GYN Normal Uterus Cases</i> <i>GYN Nonmalignant Adnexal Conditions Cases</i> <i>OB/GYN Core Clinical Cases</i>
Obstetrics	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Abnormal bleeding	<i>GYN Abnormal Uterus - Part II:</i> Retained Products of Conception, Subinvolution of the Placental Site <i>OB/GYN:</i> Pathologic Conditions	<i>First-Trimester Pregnancy Cases</i> <i>SonoSim LiveScan® Early Stage Pregnancy & Late Stage Pregnancy Cases</i>
Dating	<i>Six-Step Obstetric Examination:</i> Sonographic Anatomy & Technique, Case Study <i>First Trimester Pregnancy:</i> Pregnancy Dating Using Ultrasound <i>Second- & Third-Trimester Pregnancy - Part I:</i> Fetal Biometry & Pregnancy Dating	<i>Six-Step Obstetric Examination Cases</i> <i>First-Trimester Pregnancy Cases</i> <i>OB/GYN Core Clinical Cases</i> <i>Second- & Third-Trimester Pregnancy - Part I & II Cases</i> <i>SonoSim LiveScan® Six-Step Obstetric Examination Cases</i>
Heartbeat	<i>Six-Step Obstetric Examination:</i> Sonographic Anatomy & Technique, Case Study <i>First-Trimester Pregnancy:</i> General Considerations <i>OB/GYN:</i> Embryology <i>Second- & Third-Trimester Pregnancy - Part I:</i> Basic Fetal Anatomy	<i>Six-Step Obstetric Examination Cases</i> <i>First-Trimester Pregnancy Cases</i> <i>OB/GYN Core Clinical Cases</i> <i>Second- & Third-Trimester Pregnancy - Part I & II Cases</i> <i>OB Challenge Cases</i>
Fetal anatomy	<i>Second- & Third-Trimester Pregnancy - Part I:</i> Basic Fetal Anatomy	<i>SonoSim LiveScan® Six-Step Obstetric Examination Cases</i>
Decreased fetal activity	<i>Second- & Third-Trimester Pregnancy - Part II:</i> Biophysical Profile	--
Suspected ruptured membranes	<i>Second- & Third-Trimester Pregnancy - Part II:</i> Amniotic Fluid Assessment	
Premature labor	<i>Second- & Third-Trimester Pregnancy - Part I:</i> Cervical Length	
Pediatrics	Advanced Neonatal & Infant Neurosonography Course	Relevant SonoSim Cases
Suspected neonatal brain hemorrhage	All Lessons	<i>Advanced Neonatal & Infant Neurosonography Cases</i> <i>SonoSim LiveScan® Neonatal & Infant Neurosonography Cases</i>

Echocardiography	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Pericardial effusion with or without tamponade	<i>Cardiology: Case Studies</i> <i>RUSH: The Pump - Global LV Function, Case Studies</i>	<i>Cardiology, eFAST, & RUSH Core Clinical Cases</i> <i>FoCUS – Part I Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation, Critical Care, Early Stage Pregnancy, Late Stage Pregnancy, & Trauma Care Cases</i>
Right-sided heart strain	<i>Cardiology: Case Studies</i> <i>RUSH: Case Studies</i>	<i>Cardiology Cases</i> <i>FoCUS - Part I Cases</i>
Valvular dysfunction	<i>FoCUS - Part II: Valvular Regurgitation, Valvular Stenosis</i>	<i>Cardiology Cases</i> <i>FoCUS - Part I Cases</i>
Cardiac/chamber enlargement	<i>FoCUS - Part II: Valvular Regurgitation</i>	
Calculate ejection fraction	<i>Cardiology: Case Studies</i>	
Extremities	DVT: Core Clinical Course	Relevant SonoSim Cases
Lower- or upper-extremity swelling or pain (suspected deep vein thrombosis)	All Lessons	<i>DVT & RUSH Core Clinical Cases</i>
Musculoskeletal	Musculoskeletal: Core Clinical Course	Relevant SonoSim Cases
Evaluation of musculoskeletal pain (muscle, tendon, or other superficial soft tissue origin), effusions, collections	Tendon Evaluation, Muscle Evaluation, Effusion Evaluation	<i>Musculoskeletal Core Clinical Cases</i> <i>MSK Challenge Cases</i>

Learning Objectives Not Covered: Renal failure; Evaluation of palpable neck/thyroid mass; Evaluation of scrotal pain, mass; Pediatrics: recurrent urinary tract infections, abdominal or pelvic mass, abnormal neonatal hip examination, tethered cord

Observe the Following Ultrasound Studies		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Abdominal	Anatomy & Physiology Courses	Relevant SonoSim Cases
RUQ US (liver, gallbladder, bile ducts, right kidney, head of pancreas) & upper abdominal US (RUQ plus spleen, left kidney)	<i>Biliary Tree, Liver, Pancreas, Renal, and Spleen Anatomy & Physiology: All Lessons</i> <i>Intestinal/Biliary Core Clinical: Gallbladder Evaluation, Common Bile Duct Evaluation</i> <i>Renal Core Clinical: All Lessons</i>	<i>Biliary Tree, Liver, Pancreas, Renal, and Spleen Anatomy & Physiology Cases</i> <i>Intestinal//Biliary & Renal Core Clinical Cases</i> <i>Abdomen & Genitourinary Challenge Cases</i>
Aorta, IVC	<i>Aorta/IVC Anatomy & Physiology and Core Clinical: All Lessons</i>	<i>Aorta/IVC Anatomy & Physiology and Core Clinical Cases</i>
Pelvic	Anatomy & Physiology, Core Clinical, & Advanced Clinical Courses	Relevant SonoSim Cases
Urinary bladder	<i>Bladder Anatomy & Physiology and Core Clinical: All Lessons</i>	<i>Bladder Anatomy & Physiology and Core Clinical Cases</i> <i>Genitourinary Challenge Cases</i>
Uterus, ovaries, cul de sac (transabdominal & transvaginal)	<i>Female Pelvis Anatomy & Physiology: All Lessons</i> <i>All Advanced GYN Courses: All Lessons</i> <i>OB/GYN: All Lessons</i>	<i>Female Pelvis Anatomy & Physiology Cases</i> <i>All Advanced GYN Cases</i> <i>OB/GYN Core Clinical Cases</i> <i>GYN Challenge Cases</i>
Prostate	<i>Prostate Anatomy & Physiology: All Lessons</i>	<i>Prostate Anatomy & Physiology Cases</i>
Obstetric	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
First-trimester US (gestational sac, yolk sac, embryo, M-mode heartbeat)	<i>First-Trimester Pregnancy: All Lessons</i>	<i>First-Trimester Pregnancy Cases</i> <i>OB/GYN Core Clinical Cases</i>

Second/third-trimester fetal US (fetal heartbeat, placenta, amniotic fluid, cervix)	<i>Six-Step Obstetric Examination: All Lessons</i> <i>Second- & Third-Trimester Pregnancy - Part I & II: All Lessons</i>	<i>Six-Step Obstetric Examination Cases</i> <i>Second- & Third-Trimester Pregnancy - Part I & II Cases</i> <i>OB Challenge Cases</i> <i>SonoSim LiveScan® Six-Step Obstetric Examination Cases</i>
Breast	Breast Anatomy & Physiology Course	Relevant SonoSim Cases
Breast US	All Lessons	<i>Breast Anatomy & Physiology Cases</i>
Thyroid	Thyroid Anatomy & Physiology Course	Relevant SonoSim Cases
Thyroid US	All Lessons	<i>Thyroid Anatomy & Physiology Cases</i>
Vascular	Anatomy & Physiology, Core Clinical, & Procedures Courses	Relevant SonoSim Cases
Upper- or lower-extremity deep vein thrombosis study	<i>DVT: All Lessons</i>	<i>DVT Cases</i> <i>RUSH Cases</i>
Internal jugular vein and subclavian vein (versus companion arteries)	<i>Cerebrovascular Anatomy & Physiology: All Lessons</i> <i>US-Guided Internal Jugular Vein Cannulation: All Lessons</i> <i>US-Guided Subclavian Vein Cannulation: All Lessons</i>	<i>Cerebrovascular Anatomy & Physiology</i> <i>US-Guided Internal Jugular Vein Cannulation Cases</i> <i>US-Guided Subclavian Vein Cannulation Cases</i>
Carotid US (if possible)	<i>Cerebrovascular Anatomy & Physiology: All Lessons</i>	<i>Cerebrovascular Anatomy & Physiology</i> <i>US-Guided Internal Jugular Vein Cannulation Cases</i>
Cardiac	Anatomy & Physiology and Core Clinical Courses	Relevant SonoSim Cases
Echocardiogram (basic views)	<i>Heart Anatomy & Physiology: All Lessons</i> <i>Cardiology Core Clinical: All Lessons</i>	<i>Heart Anatomy & Physiology Cases</i> <i>Cardiology Core Clinical Cases</i>
Pediatrics	Advanced Neonatal & Infant Neurosonography Course	Relevant SonoSim Cases
Neonatal brain US (if possible)	All Lessons	<i>Advanced Neonatal & Infant Neurosonography Cases</i> <i>SonoSim LiveScan® Neonatal & Neurosonography Cases</i>
Biopsy guidance/fluid aspiration or drainage	Core Clinical & Procedures Courses	Relevant SonoSim Cases
Fluid aspiration/drainage	<i>Bladder Core Clinical: Ultrasound-Guided Suprapubic Catheterization</i> <i>Soft Tissue Core Clinical: Advanced Abscess Evaluation, Peritonsillar Abscess</i> <i>Acromioclavicular Joint Injection & Aspiration: All Lessons</i> <i>Glenohumoral Joint Injection & Aspiration: All Lessons</i> <i>Metatarsophalangeal Joint Injection & Aspiration: All Lessons</i> <i>Subacromial-Subdeltoid Bursa Injection & Aspiration: All Lessons</i> <i>Tibiotalar Joint Injection & Aspiration: All Lessons</i>	<i>Acromioclavicular Joint Injection & Aspiration Cases</i> <i>Glenohumoral Joint Injection & Aspiration Cases</i> <i>Metatarsophalangeal Joint Injection & Aspiration Cases</i> <i>Subacromial-Subdeltoid Bursa Injection & Aspiration Cases</i> <i>Tibiotalar Joint Injection & Aspiration Cases</i>

Recognize or at Least See Classic Examples of Common Pathological Conditions on Ultrasound

Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Cyst versus complex cyst versus solid mass	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Cyst vs. complex cyst vs. solid mass	<i>Bladder, OB/GYN, & Renal Core Clinical: Case Studies/ Case Pathologies</i> <i>First-Trimester Pregnancy: Pathologic Conditions</i> <i>GYN Malignant Adnexal Conditions: Sonographic Characterization of Adnexal Masses, Borderline Tumors</i> <i>GYN Nonmalignant Adnexal Conditions: Ovarian Cysts</i>	<i>Bladder, Cardiology, DVT, Intestinal/Biliary, OB/GYN, Renal, RUSH, & Soft Tissue Core Clinical Cases</i> <i>First-Trimester Pregnancy & All Advanced GYN Cases</i> <i>Advanced Neonatal & Infant Neurosonography Cases</i> <i>SonoSim LiveScan® Critical Care, Early Stage Pregnancy, Late Stage Pregnancy, Genitourinary, Hepatobiliary, & Advanced Neonatal & Infant Neurosonography Cases</i>
Fluid accumulations	Core Clinical, Advanced Clinical, & Procedures Courses	Relevant SonoSim Cases
Pleural	<i>eFAST: Case Studies</i> <i>Pulmonary: Pleural Effusion</i> <i>Advanced Pediatric Lung Sonography: Sonographic Anatomy, Case Studies</i>	<i>Airway, Aorta/IVC, Cardiology, eFAST, Pulmonary, & RUSH Core Clinical Cases</i> <i>FoCUS – Part I Cases</i> <i>Advanced Pediatric Lung Sonography Cases</i> <i>Pediatric Challenge Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation, Critical Care, & Trauma Care Cases</i>
Ascites	<i>eFAST: Case Studies</i> <i>Intestinal/Biliary: Gallbladder Evaluation</i> <i>Paracentesis</i>	<i>Bladder, eFAST, & Intestinal/Biliary Core Clinical Cases</i> <i>Paracentesis Cases</i> <i>SonoSim LiveScan® Genitourinary, Hepatobiliary, & Trauma Care Cases</i>
Hemoperitoneum	<i>eFAST: RUQ Views, LUQ Views, Pelvic Views, Case Studies</i> <i>FAST: RUQ Views, LUQ Views, Pelvic Views, Case Studies</i>	<i>eFAST & FAST Cases</i> <i>SonoSim LiveScan® Trauma Care Cases</i>
Hematoma	<i>Bladder: Case Pathologies</i> <i>Musculoskeletal: Muscle Evaluation</i> <i>Soft Tissue: Advanced Abscess Evaluation</i>	<i>Ocular Cases</i> <i>Soft Tissue Cases</i>
Abscess	<i>Soft Tissue: Cellulitis and Abscess Imaging, Advanced Abscess Evaluation</i>	<i>Soft Tissue Cases</i> <i>MSK Challenge Cases</i>
Abdomen	Core Clinical Courses	Relevant SonoSim Cases
Gallstones & acute cholecystitis	<i>Intestinal/Biliary: Gallbladder Evaluation</i>	<i>Intestinal/Biliary & RUSH Core Clinical Cases</i> <i>Abdomen Challenge Cases</i> <i>SonoSim LiveScan® Early Stage Pregnancy, Late Stage Pregnancy, & Hepatobiliary Cases</i>
Biliary obstruction	<i>Intestinal/Biliary: Gallbladder Evaluation, Common Bile Duct Evaluation</i>	<i>Intestinal/Biliary Cases</i> <i>Abdomen Challenge Cases</i>
Hydronephrosis	<i>Renal: Obstructive Uropathy, Case Studies</i>	<i>Renal Core Clinical Cases</i> <i>Genitourinary Challenge Cases</i> <i>SonoSim LiveScan® Early Stage Pregnancy, Late Stage Pregnancy Cases, & Genitourinary Cases</i>
Abdominal aortic aneurysm	<i>Aorta/IVC: Aortic Case Studies</i>	<i>Aorta/IVC & RUSH Core Clinical Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation & Critical Care Cases</i>

Renal calculi	<i>Renal: Case Studies, Obstructive Uropathy</i>	<i>eFAST & Renal Core Clinical Cases Genitourinary Challenge Cases SonoSim LiveScan® Early Stage Pregnancy, Genitourinary, & Trauma Care Cases</i>
Splenomegaly	--	<i>eFAST, FAST, & RUSH Cases SonoSim LiveScan® Critical Care, Hepatobiliary, & Trauma Care</i>
Urinary	Bladder Core Clinical Course	Relevant SonoSim Cases
Overdistended urinary bladder	Case Pathologies	<i>Bladder, Intestinal/Biliary, & RUSH Core Clinical Cases Genitourinary Challenge Cases</i>
Foley catheter in urinary bladder	Foley Catheter Placement, Case Pathologies	<i>Bladder, eFAST, & RUSH Core Clinical Cases SonoSim LiveScan® Critical Care & Trauma Care</i>
Enlarged prostate	--	<i>Bladder Core Clinical Cases</i>
Gynecology	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Uterine fibroid	<i>GYN Abnormal Uterus - Part I: Leiomyoma GYN Abnormal Uterus - Part II: Endometrial Polyps & Submucosal Leiomyomas</i>	<i>GYN Abnormal Uterus - Part I & II Cases GYN Nonmalignant & Malignant Adnexal Conditions Cases GYN Normal Adnexa Cases OB/GYN Core Clinical Cases SonoSim LiveScan® Early Stage Pregnancy</i>
Thickened endometrium	<i>GYN Normal Uterus: Female Pelvis Physiology, Transvaginal Sonographic Technique GYN Abnormal Uterus - Part II: Introduction, Retained Products of Conception, Endometrial Cancer & Endometrial Hyperplasia</i>	<i>First-Trimester Pregnancy Cases GYN Malignant Adnexal Conditions Cases GYN Normal Adnexa Cases OB/GYN Core Clinical Cases</i>
Hemorrhagic ovarian cyst	<i>First-Trimester Pregnancy: Pathologic Conditions GYN Nonmalignant Adnexal Conditions: Ovarian Cysts GYN Normal Adnexa: Case Studies OB/GYN: Case Studies</i>	<i>GYN Nonmalignant & Malignant Adnexal Conditions Cases GYN Normal Uterus GYN Challenge Cases</i>
Corpus luteum	<i>First-Trimester Pregnancy: Pathologic Conditions GYN Normal Adnexa: Sonographic Anatomy OB/GYN: Case Studies</i>	<i>First-Trimester Pregnancy Cases GYN Abnormal Uterus - Part I Cases GYN Nonmalignant Adnexal Conditions Cases GYN Normal Adnexa & GYN Normal Uterus Cases</i>
Ovarian cancer	<i>GYN Malignant Adnexal Conditions: Evaluation of Adnexal Masses, Sonographic Characterization of Adnexal Masses, Borderline Tumors, Ovarian Cancer</i>	<i>GYN Malignant Adnexal Conditions Cases</i>
Obstetrics	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
First-trimester pregnancy complications (subchorionic hemorrhage, embryonic demise)	<i>First-Trimester Pregnancy: Detecting Pregnancy Failure, Pathologic Conditions</i>	<i>First-Trimester Pregnancy Cases</i>
Ectopic pregnancy	<i>First-Trimester Pregnancy: Pathologic Conditions OB/GYN: Pathologic Conditions</i>	--
Placenta previa	<i>Second- & Third-Trimester Pregnancy - Part II: Placental Evaluation</i>	
Incompetent cervix	<i>Second- & Third-Trimester Pregnancy - Part I: Cervical Length</i>	
Polyhydramnios & oligohydramnios	<i>Second- & Third-Trimester Pregnancy - Part II: Amniotic Fluid Assessment</i>	

Vascular	DVT Course	Relevant SonoSim Cases
Acute deep vein thrombosis in femoropopliteal system	All Lessons	<i>DVT Cases</i>
Thoracic conditions	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Large pericardial effusion (pericardial tamponade)	<i>Cardiology: Case Studies</i> <i>Pericardiocentesis Course</i> <i>RUSH: Case Studies</i>	<i>Cardiology, eFAST, & RUSH Core Clinical Cases</i> <i>FoCUS - Part I Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation, Critical Care, Early Stage Pregnancy, Late Stage Pregnancy, & Trauma Care Cases</i>
Pneumothorax	<i>Pulmonary: Pneumothorax Rule-Out, Pneumothorax Rule-In</i> <i>Advanced Pediatric Lung Sonography: Sonographic Anatomy, Case Studies</i>	<i>eFAST, Pulmonary, & RUSH Core Clinical Cases</i> <i>Advanced Pediatric Lung Sonography Cases</i> <i>SonoSim LiveScan® Cardiac Resuscitation, Critical Care, & Trauma Care Cases</i>
Pediatrics	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Intussusception	<i>Intestinal/Biliary: Intussusception</i>	--
Intracranial hemorrhage	<i>Advanced Neonatal & Infant Neurosonography: Sonographic Anatomy, Case Studies</i>	<i>Advanced Neonatal & Infant Neurosonography Cases</i> <i>SonoSim LiveScan® Neonatal & Infant Neurosonography Cases</i>

Learning Objectives Not Covered: Acute deep vein thrombosis in internal jugular vein, Testicular mass, Hydrocele, Torsion, Epididymitis, Varicocele, Paralyzed hemidiaphragm, Pediatric hypertrophic pyloric stenosis

Describe Clinical Situations Where Ultrasound is Used to Guide Interventional Procedures		
Learning Objectives	SonoSim Courses & Lessons	SonoSimulator Scanning Cases
Centesis procedures	Procedures Courses	Relevant SonoSim Cases
Paracentesis	<i>Paracentesis Course</i>	<i>Paracentesis Cases</i>
Thoracentesis	<i>Thoracentesis Course</i>	<i>Thoracentesis Cases</i>
Pericardiocentesis	<i>Pericardiocentesis Course</i>	<i>Pericardiocentesis Cases</i>
Vascular access	Procedures Courses	Relevant SonoSim Cases
Peripherally inserted central catheter line	<i>Peripheral Venous Access: All Lessons</i>	<i>Peripheral Venous Access Cases</i>
Venous access	<i>All Procedures Courses: All Lessons</i>	<i>All Procedures Cases</i>
Localization for aspiration and drainage	Core Clinical & Advanced Clinical Courses	Relevant SonoSim Cases
Abscess	<i>Soft Tissue: Cellulitis and Abscess Imaging, Advanced Abscess Evaluation, Peritonsillar Abscess</i>	<i>Soft Tissue Core Clinical Cases</i>
Hydronephrosis	<i>Renal: Obstructive Uropathy, Case Studies</i>	<i>Renal Core Clinical Cases</i> <i>Genitourinary Challenge Cases</i> <i>SonoSim LiveScan® Early Stage Pregnancy, Late Stage Pregnancy, & Genitourinary Cases</i>
Cysts	<i>Bladder, OB/GYN, & Renal Core Clinical: Case Studies/ Case Pathologies</i> <i>First-Trimester Pregnancy: Pathologic Conditions</i> <i>GYN Malignant Adnexal Conditions: Sonographic Characterization of Adnexal Masses, Borderline Tumors</i> <i>GYN Nonmalignant Adnexal Conditions: Ovarian Cysts</i>	<i>Bladder, DVT, Intestinal/Biliary, OB/GYN, Renal, RUSH, Soft Tissue Core Clinical Cases</i> <i>SonoSim LiveScan® Critical Care, Genitourinary, & Hepatobiliary</i>

Procedures	Core Clinical & Procedures Courses	Relevant SonoSim Cases
Injections	<i>Acromioclavicular Joint Injection & Aspiration: All Lessons</i> <i>Biceps Tendon Sheath Injection: All Lessons</i> <i>Glenohumoral Joint Injection & Aspiration: All Lessons</i> <i>Metatarsophalangeal Joint Injection & Aspiration: All Lessons</i> <i>Plantar Intrafascial & Perifascial Injections: All Lessons</i> <i>Subacromial-Subdeltoid Bursa Injection & Aspiration: All Lessons</i> <i>Tibiotalar Joint Injection & Aspiration: All Lessons</i>	<i>Acromioclavicular Joint Injection & Aspiration Cases</i> <i>Biceps Tendon Sheath Injection Cases</i> <i>Glenohumoral Joint Injection & Aspiration Cases</i> <i>Metatarsophalangeal Joint Injection & Aspiration Cases</i> <i>Plantar Intrafascial & Perifascial Injections Cases</i> <i>Subacromial-Subdeltoid Bursa Injection & Aspiration Cases</i> <i>Tibiotalar Joint Injection & Aspiration Cases</i>
Aspirations	<i>Soft Tissue: Advanced Abscess Evaluation</i> <i>Acromioclavicular Joint Injection & Aspiration: All Lessons</i> <i>Glenohumoral Joint Injection & Aspiration: All Lessons</i> <i>Metatarsophalangeal Joint Injection & Aspiration: All Lessons</i> <i>Subacromial-Subdeltoid Bursa Injection & Aspiration: All Lessons</i> <i>Tibiotalar Joint Injection & Aspiration: All Lessons</i>	<i>Acromioclavicular Joint Injection & Aspiration Cases</i> <i>Glenohumoral Joint Injection & Aspiration Cases</i> <i>Metatarsophalangeal Joint Injection & Aspiration Cases</i> <i>Subacromial-Subdeltoid Bursa Injection & Aspiration Cases</i> <i>Tibiotalar Joint Injection & Aspiration Cases</i>
Foreign body localization	Soft Tissue: Foreign Bodies, Foreign Body Removal Techniques	<i>Ocular Cases</i>
Fetal procedures	Second- & Third-Trimester Pregnancy – Part I Course	Relevant SonoSim Cases
Amniocentesis	Basic Fetal Anatomy	--
Sonohysterography	GYN Abnormal Uterus - Part II: Evaluating the Endometrium	Relevant SonoSim Cases

Learning Objectives Not Covered: Arterial access, Biopsies, Fetal therapeutic procedures

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³Hoppmann RA, Rao VV, Poston MB, et al. An integrated ultrasound curriculum (iUSC) for medical students: 4-year experience. *Crit Ultrasound J.* 2011 Apr;3(1):1-12. Epub 2011 Feb 1.

⁴Baltarowich OH, Di Salvo DN, Scoutt LM, et al. National ultrasound curriculum for medical students. *Ultrasound Q.* 2014 Mar;30(1):13-19.