



# CAAHEP's Cardiac Learning Concentration Curriculum Standards & The SonoSim® Ultrasound Training Solution

In 2011, a multidisciplinary review board led by the Commission on Accreditation of Allied Health Education Programs (CAAHEP) came together to revise the [Standards and Guidelines for the Accreditation of Educational Programs in Diagnostic Medical Sonography](#). According to CAAHEP, "These accreditation Standards and Guidelines are the minimum standards of quality used in accrediting programs that prepare individuals to enter the Diagnostic Medical Sonography profession." The award-winning, patented SonoSim Ultrasound Training Solution assists DMS programs in fulfilling these curriculum requirements through an ecosystem of **cloud-based courses, knowledge assessments, interactive SonoSimulator® scanning cases, performance tracking, and access to real-patient pathology.**

Cardiac Learning Concentration Curriculum Requirements Adult Echocardiography (Including Adult Congenital)		
Curriculum Requirements	SonoSim Courses & Lessons	Relevant SonoSimulator Cases
Demonstrate knowledge of normal and abnormal cardiac anatomy:		
Embryology and fetal cardiac development	<i>First-Trimester Pregnancy: First-Trimester Pregnancy Ultrasound, Detecting Pregnancy Failure</i> <i>Second- &amp; Third-Trimester Pregnancy – Part I: Basic Fetal Anatomy</i>	<i>First-Trimester Pregnancy Cases</i> <i>Second- &amp; Third-Trimester Pregnancy – Part I Cases</i> <i>Second- &amp; Third-Trimester Pregnancy – Part II Cases</i>
Cardiac chambers and septation	<i>Heart Anatomy &amp; Physiology: All Lessons</i> <i>Cardiology Core Clinical: All Lessons</i>	<i>All Cardiac Cases</i>
Valve anatomy and dynamics	<i>Heart Anatomy &amp; Physiology: Anatomy, Heart Physiology</i> <i>FoCUS – Part II: Anatomy &amp; Physiology, Valvular Regurgitation, Aortic Regurgitation, Mitral Regurgitation, Tricuspid Regurgitation, Pulmonic Regurgitation, Valvular Stenosis, Aortic Stenosis, Mitral Stenosis, Tricuspid Stenosis, Pulmonic Stenosis</i>	<i>All Cardiac Cases</i>
Coronary artery anatomy	<i>Heart Anatomy &amp; Physiology: Anatomy</i> <i>Cardiology Core Clinical: Parasternal Short-Axis View: Mid-Ventricle</i>	<i>All Cardiac Cases</i>
Relationships of cardiac chambers and great vessels	<i>FAST &amp; eFAST: Cardiac Views</i> <i>Cardiology Core Clinical: Parasternal Long-Axis View, Parasternal Short-Axis View: Mid-Ventricle, Parasternal Short-Axis View: Base, Apical Four-Chamber View, Subcostal Four-Chamber View, IVC Evaluation &amp; RAP, Case Studies</i>	<i>All Cardiac Cases</i>
Demonstrate knowledge of normal cardiovascular physiology:		
Hemodynamics	<i>Heart Anatomy &amp; Physiology: Heart Physiology</i> <i>Arm-Arterial: Arterial Physiology</i> <i>Leg-Arterial: Physiology</i>	<i>All Cardiac Cases</i>
Ventricular function, including influence of loading conditions and measurement of cardiac output	<i>FoCUS – Part I: Imaging Windows, Doppler Ultrasound, Cardiac Output Measurements</i>	<i>All Cardiac Cases</i>

Curriculum Requirements	SonoSim Courses & Lessons	Relevant SonoSimulator Cases
Electrophysiology and conduction system	<i>Heart Anatomy &amp; Physiology: Heart Physiology</i>	<i>All Cardiac Cases</i>
Pulmonary vascular disease	<i>FoCUS – Part I: Pulmonary Artery Pressure Measurements, Case Studies II</i>	<i>FoCUS – Part I Cases</i>
Demonstrate knowledge and understanding of cardiac pathology, pathophysiology, and hemodynamics in different types of cardiac disease:		
Valvular heart disease	<i>FoCUS – Part II: Valvular Regurgitation, Aortic Regurgitation, Mitral Regurgitation, Tricuspid Regurgitation, Pulmonic Regurgitation, Valvular Stenosis, Aortic Stenosis, Mitral Stenosis, Tricuspid Stenosis, Pulmonic Stenosis</i>	<i>Cardiology Core Clinical Cases FoCUS – Part I Cases FoCUS – Part II Cases</i>
Ischemic cardiac disease	<i>FoCUS – Part III [In Development]</i>	<i>FoCUS – Part I Cases</i>
Cardiomyopathy	<i>FoCUS – Part I: Case Studies I FoCUS – Part II: Aortic Stenosis</i>	<i>Cardiology Core Clinical Cases FoCUS – Part I Cases RUSH Cases SonoSim LiveScan® Cardiac Resuscitation, Critical Care, &amp; Late Stage Pregnancy Cases</i>
Pericardial disease	<i>Cardiology Core Clinical: Case Studies FAST &amp; eFAST: Case Studies RUSH: The Pump - Global LV Function, Case Studies</i>	<i>Cardiology Core Clinical Cases FoCUS – Part I Cases eFAST Cases RUSH Cases SonoSim LiveScan® Cardiac Resuscitation, Critical Care, Early Stage Pregnancy, Late Stage Pregnancy, &amp; Trauma Care Cases</i>
Congenital heart disease	<i>Pediatric Series [In Development]</i>	<i>Pediatric Series [In Development]</i>
Cardiac neoplasms and masses	<i>FoCUS – Part III Course [In Development]</i>	<i>FoCUS – Part III Cases [In Development]</i>
Cardiac trauma	<i>FAST &amp; eFAST: Case Studies</i>	<i>FAST &amp; eFAST Cases SonoSim LiveScan® Cardiac Resuscitation Cases</i>
Pulmonary vascular disease	<i>FoCUS – Part I: Pulmonary Artery Pressure Measurements, Case Studies II</i>	<i>FoCUS – Part I Cases</i>
Diseases of the aorta and great vessels	<i>Aorta/IVC Core Clinical: All Lessons Cardiology Core Clinical: IVC Evaluation &amp; RAP FoCUS – Part II: Aortic Regurgitation, Pulmonic Regurgitation, Aortic Stenosis, Pulmonic Stenosis</i>	<i>Cardiology Core Clinical Cases FoCUS – Part I Cases FoCUS – Part II Cases</i>
Demonstrate knowledge and understanding of clinical cardiology:		
Relationship of echocardiography to history and physical examination (including indications for echocardiography)	<i>Cardiology Core Clinical: Case Studies FoCUS – Part I: Case Studies I, Case Studies II FoCUS – Part II: Case Studies</i>	<i>Cardiology Core Clinical Cases FoCUS – Part I Cases FoCUS – Part II Cases</i>
Differential diagnosis as it relates to the echocardiographic examination	<i>Cardiology Core Clinical: Case Studies FoCUS – Part I: Case Studies I, Case Studies II FoCUS – Part II: Case Studies</i>	<i>Cardiology Core Clinical Cases FoCUS – Part I Cases FoCUS – Part II Cases</i>

Curriculum Requirements	SonoSim Courses & Lessons	Relevant SonoSimulator Cases
Cardiovascular surgery and interventional cardiology	<i>Pericardiocentesis Course [In Development]</i>	<i>Pericardiocentesis Cases [In Development]</i>
Effect of systemic diseases on cardiovascular anatomy and physiology	<i>Aorta/IVC Core Clinical: IVC Evaluation, IVC Case Studies</i> <i>Cardiology Core Clinical: Case Studies</i> <i>FoCUS – Part I: Cardiac Output Measurements, Case Studies I, Pulmonary Artery Pressure Measurements, Case Studies II</i>	<i>Aorta/IVC Cases</i> <i>Cardiology Core Clinical Cases</i> <i>FoCUS – Part I Cases</i> <i>RUSH Cases</i>
Demonstrate proficiency in the performance of the following echocardiographic studies:		
M-mode	--	<i>FoCUS – Part I &amp; II Cases</i> <i>Second- &amp; Third-Trimester Pregnancy – Part II Cases</i>
Two-dimensional	<i>All Cardiac Courses</i>	<i>All Cardiac Cases</i>
Doppler (pulsed wave, continuous wave, color flow and power)	<i>FoCUS – Part I: Doppler Ultrasound</i>	<i>FoCUS – Part I &amp; II Cases</i> <i>SonoSim LiveScan® Critical Care</i>
Demonstrate knowledge and understanding of the indications, utility, limitations, and technical procedures for related echocardiographic studies:		
Echo-guided procedures	<i>Pericardiocentesis Course [In Development]</i>	<i>Pericardiocentesis Cases [In Development]</i>
Demonstrate knowledge, understanding, and proficiency in the use of quantitation principles applied to echocardiographic images and flow data:		
Standard M-mode, two-dimensional, and Doppler measurements and calculations	<i>FoCUS – Part I: Doppler Ultrasound, Cardiac Output Measurements, Case Studies I, Pulmonary Artery Pressure Measurements, Case Studies II</i>	<i>FoCUS – Part I &amp; II Cases</i>
Knowledge and understanding of normal and abnormal values for M-mode, two-dimensional and Doppler echocardiography	<i>FoCUS – Part I: Doppler Ultrasound, Cardiac Output Measurements, Case Studies I, Pulmonary Artery Pressure Measurements, Case Studies II</i>	<i>FoCUS – Part I &amp; II Cases</i>
Evaluation of normal and abnormal ventricular function	<i>Cardiology Core Clinical: Case Studies</i> <i>Heart Anatomy &amp; Physiology: Sonographic Technique</i>	<i>All Cardiac Cases</i>
Evaluation of the severity of valve stenosis and regurgitation	<i>FoCUS – Part II: Valvular Regurgitation, Aortic Regurgitation, Mitral Regurgitation, Tricuspid Regurgitation, Pulmonic Regurgitation, Valvular Stenosis, Aortic Stenosis, Mitral Stenosis, Tricuspid Stenosis, Pulmonic Stenosis</i>	<i>FoCUS – Part I &amp; II Cases</i>
Knowledge of normal and abnormal cardiovascular hemodynamics and flow patterns	<i>Cardiology Core Clinical: IVC Evaluation &amp; RAP</i> <i>DVT: All Lessons</i> <i>Heart Anatomy &amp; Physiology: Heart Physiology, Sonographic Technique</i> <i>FoCUS – Part I: Doppler Ultrasound</i>	<i>All Cardiac Cases</i>

*Curriculum Requirements Not Covered:*

*Demonstrate knowledge of normal cardiovascular physiology: exercise physiology*

*Demonstrate knowledge of other cardiac procedures emphasizing indications, utility, and limitations of these procedures: angiography and cardiac catheterization; electrocardiography, electrophysiologic studies, Holter monitoring; stress testing; radionuclide studies; other tomographic imaging procedures; & phonocardiography and external pulse recording*

*Demonstrate knowledge and understanding of the indications, utility, limitations, and technical procedures for related echocardiographic studies: stress echocardiography, transesophageal echocardiography, intraoperative echocardiography, contrast echocardiography, & three-dimensional echocardiography*

*Demonstrate knowledge and understanding of clinical pharmacology as it relates to echocardiography and provocative maneuvers: cardiovascular pharmacology, theory and use of provocative stress agents, non-pharmacologic stress, & potential effects of cardiac medications on echocardiographic findings*

SonoSim also covers several sections of the **Learning Competencies Common to Each Concentration**, including ultrasound physics, medical terminology, normal anatomy and pathologic conditions, and basic patient care, such as patient positioning and infection control.

Learning Competencies Common to Each Concentration		
Curriculum Requirements	SonoSim Courses & Lessons	Relevant SonoSimulator Cases
Utilize oral and written communication:		
Recognize significant clinical information and historical facts from the patient and the medical records, which may impact the diagnostic examination	<i>All SonoSim Core &amp; Advanced Clinical Courses</i>	<i>All SonoSim Core &amp; Advanced Clinical Cases</i>
Comprehend and employ appropriate medical terminology, abbreviations, symbols, terms, and phrases	<i>All SonoSim Courses</i>	<i>All SonoSim Cases</i>
Educate other health care providers and the public in the appropriate applications of ultrasound and other diagnostic vascular evaluation, including the following:		
Medical terminology, sonographic/other vascular terminology, pertinent clinical signs, symptoms, laboratory tests, & pertinent legal principles	<i>All SonoSim Courses</i>	<i>All SonoSim Cases</i>
Provide basic patient care and comfort:		
Maintain infection control and utilize standard precautions	<i>All SonoSim Core Clinical, Advanced Clinical, &amp; Procedures Courses</i>	--
Proper patient positioning	<i>All SonoSim Courses</i>	<i>All SonoSim Cases</i>
Anticipate and be able to respond to the needs of the patient:		
Demonstrate age related competency (i.e., neonates, pediatric patients, adolescents, adults, and obstetric patients)	<i>All Advanced GYN Courses</i> <i>All Advanced OB Courses</i>	--
Respond appropriately to parental needs	<i>Pediatric Series [In Development]</i>	--
Recognize when sedation may be appropriate	<i>Pediatric Series [In Development]</i>	--
Demonstrate appropriate care in nursery and intensive care environments (ancillary equipment, thermal, central venous lines, ET tubes, respiratory needs)	<i>eFAST, FAST, &amp; RUSH Courses</i> <i>Pediatric Series [In Development]</i>	--
Demonstrate knowledge and understanding of human gross anatomy and sectional anatomy:		
Evaluate anatomic structures in the region of interest	<i>All SonoSim Courses</i>	<i>All SonoSim Cases</i>
Recognize the sonographic appearance of normal tissue structures, including the following: sectional anatomy, embryology, normal sonographic patterns	<i>All SonoSim Anatomy &amp; Physiology Courses</i>	<i>All SonoSim Anatomy &amp; Physiology Cases</i>

Curriculum Requirements	SonoSim Courses & Lessons	Relevant SonoSimulator Cases
Demonstrate knowledge and understanding of physiology, pathology, and pathophysiology:		
Obtain and evaluate pertinent patient history and physical findings	<i>All SonoSim Core &amp; Advanced Clinical Courses</i>	<i>All SonoSim Core &amp; Advanced Clinical Cases</i>
Extend standard diagnostic testing protocol as required by patient history or initial findings	<i>All SonoSim Core &amp; Advanced Clinical Courses</i>	<i>All SonoSim Core &amp; Advanced Clinical Cases</i>
Recognize examination findings that require immediate clinical response and notify the interpreting physician of such findings, including the following:		
Patient interview & examination techniques, physiology including blood flow dynamics, and pertinent pathology & pathophysiology	<i>All SonoSim Core &amp; Advanced Clinical Courses</i>	<i>All SonoSim Core &amp; Advanced Clinical Cases</i>
Demonstrate knowledge and understanding of acoustic physics, Doppler ultrasound principles, and ultrasound instrumentation:		
Select the appropriate technique(s) for examination(s) being performed	<i>All SonoSim Courses</i>	<i>All SonoSim Cases</i>
Adjust instrument controls to optimize image quality	<i>Fundamentals of Ultrasound: Ultrasound System Operation</i>	<i>All SonoSim Cases</i>
Perform linear, area, circumference, and other related measurements from sonographic images or data	<i>All Advanced OB Courses</i>	<i>All SonoSim Cases</i>
Recognize and compensate for acoustical artifacts	<i>Fundamentals of Ultrasound: Imaging Artifacts</i>	<i>All SonoSim Cases</i>
Minimize patient exposure to acoustic energy	<i>Fundamentals of Ultrasound: Infection Control &amp; Biosafety</i>	--
Apply basic concepts of acoustic physics which include the following:		
Sound production and propagation & interaction of sound and matter	<i>Fundamentals of Ultrasound: Basic Ultrasound Physics</i>	<i>All SonoSim Cases</i>
Instrument options, transducer selection, principles of ultrasound instruments, & modes of operation	<i>Fundamentals of Ultrasound: Transducer Basics, Imaging Conventions, Imaging Modes</i>	<i>All SonoSim Cases</i>
Operator control options	<i>Fundamentals of Ultrasound: Ultrasound System Operation</i>	<i>All SonoSim Cases</i>
Physics of Doppler, principles of Doppler techniques, & methods of Doppler flow analysis	<i>Fundamentals of Ultrasound: Doppler Mode Imaging</i>	<i>Aorta/IVC, Lungs, and Upper Airway Anatomy &amp; Physiology Cases</i> <i>Aorta/IVC, DVT, &amp; RUSH Core Clinical Cases</i> <i>All Advanced GYN, Advanced Cardiac, &amp; Procedures Cases</i> <i>SonoSim LiveScan® Critical Care &amp; Genitourinary Cases</i>
Acoustic artifacts	<i>Fundamentals of Ultrasound: Imaging Artifacts</i>	<i>All SonoSim Cases</i>

Curriculum Requirements	SonoSim Courses & Lessons	Relevant SonoSimulator Cases
Demonstrate knowledge and understanding of the interaction between ultrasound and tissue and the probability of biological effects in clinical examinations, including the following:		
Biologic effects	<i>Fundamentals of Ultrasound: Infection Control &amp; Biosafety</i>	--
Generally accepted maximum safe exposure levels	<i>Fundamentals of Ultrasound: Infection Control &amp; Biosafety</i> <i>First-Trimester Pregnancy: General Considerations</i>	--
ALARA principle	<i>Fundamentals of Ultrasound: Infection Control &amp; Biosafety</i> <i>First-Trimester Pregnancy: General Considerations</i>	--
Recognize the importance of, and employ, ergonomically correct scanning techniques:		
Equipment adjustments	<i>All Procedures Courses</i>	--
Patient positioning	<i>All SonoSim Courses</i>	--

*Curriculum Requirements Not Covered:*

*Maintain clinical records; Interact with the interpreting physician or other designated physicians with oral or written summary of findings as permitted by employer policy and procedure; Identify life-threatening situations and implement emergency care as permitted by employer procedure, including the following: pertinent patient care procedures, principles of psychological support, emergency conditions and procedures, & first aid and resuscitation techniques; Review data from current and previous examinations to produce a written/oral summary of technical findings, including relevant interval changes, for the interpreting physician's reference; Recognize examination findings that require immediate clinical response and notify the interpreting physician of such findings, including the following: chart & referral evaluation, diagnostic testing protocols related to specific disease conditions, & pertinent legal issues; Utilize appropriate devices to obtain pertinent documentation; Emerging technologies; Recording techniques; Pertinent in-vitro and in-vivo studies; Exposure display indices; Employ professional judgment and discretion: protect the patient's right to privacy based on current federal standards and regulations, maintain confidentiality, and adhere to the professional codes of conduct/ethics through the following: medical ethics, pertinent legal principles, professional interaction skills, and professional scopes of practice; understand the fundamental elements for implementing a quality assurance and improvement program, and the policies, protocols, and procedures for the general function of the ultrasound laboratory, including the following: administrative procedures, quality control procedures, elements of quality assurance program, records maintenance, personnel and fiscal management, and trends in health care systems; recognize the importance of continuing education, through the following: professional journals, conferences, lectures, in-house educational offerings, professional organizations and resources, recent developments in sonography, and research statistics and design; Personal fitness, supports, tools, and devices*