Cardiovascular Sonography

This is a 21-month certificate program in which students spend 30 to 40 hours each week dividing time between didactic course work and hands-on clinical applications.

Students in the program benefit from the wide variety of diagnostic examinations conducted at The University of Kansas Health System and affiliated clinical sites. The curriculum incorporates detailed, structured, and comprehensive course work and teaches the student to use independent judgment in the acquisition of diagnostic information.

The following concentration areas are available in this program:

- **Adult echocardiography and vascular technology** Become a credentialed Registered Diagnostic Cardiac Sonographer (RDCS) and Registered Vascular Technologist (RVT) through American Registry for Diagnostic Medical Sonography (ARDMS) or a Registered Cardiac Sonographer (RCS) and a Registered Vascular Specialist (RVS) through Cardiovascular Credentialing International (CCI).

- **Adult and pediatric echocardiography** Become a credentialed Registered Diagnostic Cardiac Sonographer with a specialty in pediatric echocardiography (PE) through ARDMS or a Registered Congenital Cardiac Sonographer (RCCS) through Cardiovascular Credentialing International (CCI).

**Courses**

**CVS 21. EKG I. 1 Credits.**
This course is designed to present basic principles of ECG and the fundamentals of the ECG waveform. The student will be introduced to normal basic patterns and common abnormality recognition. Prerequisite: Admission to the advanced cardiovascular program, LEC.

**CVS 22. Cardiovascular Physiology. 1 Credits.**
During this course the student will focus on cardiovascular physiology. The student will study the circulatory system, addressing the physiology of the heart and blood vessels throughout the body. Prerequisite: Admission to the advanced cardiovascular technology program.

**CVS 23. Patient Care I. 1 Credits.**
This course will provide the student with the basic care skills necessary to function in a hospital and clinical setting. The student will learn about patient rights, HIPPA, patient transfers, proper ergonomics of scanning, hand hygiene, sterile technique, radiation safety and infection control. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 25. Physics I. 2 Credits.**
This course is designed to introduce to the student the fundamental physical principles of Doppler echocardiography, the basic physics of Doppler ultrasound, and the fundamental principles of pulsed wave, continuous wave, and color flow Doppler. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 26. Clinical Practicum I. 6 Credits.**
This course will provide meaningful, well-balanced experiences for the student in the adult echocardiography lab. Clinical Practicum I will focus on the development of image recognition, anatomy identification and patient care. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 27. Adult Cardiovascular Technician I. 2 Credits.**
This course will introduce the student to the principles of diagnostic cardiac catheterization. The student will learn basic skills to assist the cardiologist during cardiac catheterization procedures. Prerequisite: Admission to the advanced cardiovascular technology program.

**CVS 30. Adult Echocardiography I. 3 Credits.**
The student will learn the pathophysiology of acquired valvular heart disease. Two-dimensional, spectral and color flow Doppler findings associated with each valvular disease state. The student will learn to obtain and effectively apply accurate two-dimensional and Doppler measurements as they relate to the evaluation and quantification of valvular disease. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 31. Physics II. 2 Credits.**
This is the second of two ultrasound physics courses designed to prepare the student for the Sonography Principles and Instrumentation exam required for registration through ARDMS. The content of this course will cover fluid dynamics, hemodynamics, vascular principles, and cardiovascular principles. The content of Physics I will be heavily reviewed in preparation for the registry exam. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 32. Pharmacology. 1 Credits.**
The student will become familiar with common medicines used in the cardiovascular setting. The student will learn pharmacological management of patients undergoing invasive and non-invasive cardiac and vascular procedures. Students will learn to correlate drug therapies with interventional procedures and disease states. Prerequisite: Admission to the advanced cardiovascular technology program.

**CVS 33. EKG II. 2 Credits.**
This course is designed to present advanced principles of ECG. The student will be exposed to advanced pattern recognition and the underlying etiology of the rhythm. Prerequisite: Admission to the advanced cardiovascular technology program.

**CVS 35. Patient Care II. 2 Credits.**
This course will provide the student with the advanced care skills necessary to function as a cardiovascular technologist within the laboratory. The student will learn about radiation safety, interpretation of lab values, patient management, high risk patient management, basic life support and advanced cardiac life support. Prerequisite: Admission to the advanced cardiovascular technology program.

**CVS 36. Clinical Practicum II. 8 Credits.**
This course will provide meaningful, well-balanced experiences for the student in the adult echocardiography lab. Clinical Practicum II will focus on the development of image recognition, anatomy identification, and patient care. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 39. Adult Echocardiography II. 3 Credits.**
The student will learn echocardiographic findings associated with cardiomyopathies, the etiology, physiology, cardiac auscultation, physical examination, and EKG findings associated with the various cardiac disease states. The student will learn to obtain and effectively apply accurate two-dimensional and Doppler measurements as they relate to the evaluation and quantification of systolic function, diastolic, and the echocardiographic role in the evaluation of disease. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 40. Vascular Ultrasound I. 4 Credits.**
The student will learn how to assess basic vascular disease using two-dimensional, spectral and color flow Doppler information in the areas of arterial Doppler segmental pressures, plethysmography, ankle brachial
indices and carotid duplex imaging. Prerequisite: Admission to the cardiovascular sonography program.

CVS 41. Pediatric Echocardiography I. 4 Credits.
The student will demonstrate an understanding of how to utilize a sequential developmental approach. This course will review congenital heart diseases and their associated clinical signs and symptoms. Prerequisite: Admission to the cardiovascular sonography program.

CVS 42. Physics Review. 1 Credit.
This course is designed to prepare students to sit for their Sonography Principles and Instrumentation examination through ARDMS. During this course students will review all that they have learned in Physics I and Physics II. Prerequisite: Admission to the program.

CVS 43. Adult Interventional Cardiology Technician I. 3 Credits.
The student will receive progressive didactic exposure to the technology, procedures, techniques and basic concepts of interventional cardiology. Prerequisite: Admission to the program.

CVS 44. Adult Electrophysiology Technician I. 3 Credits.
The student will have didactic exposure to the technology, procedures, techniques and basic concepts of electrophysiology. Prerequisite: Admission to the program.

CVS 45. Diversity in Cardiovascular Patient Care. 1 Credit.
Explore current evidence regarding the demographic based variations in the population that impact cardiovascular care. Prerequisite: Admission to the program.

CVS 49. Clinical Practicum III. 4 Credits.
The student will have hands-on experience working in the adult echocardiography lab. Here they will be given the opportunity to improve their technical skills working one-on-one with their preceptor and patients in the clinical setting. Prerequisite: Admission to the cardiovascular sonography program.

CVS 55. Cardiovascular Assessment and Special Procedures. 1 Credit.
The student will become familiarized with the special procedures utilized in the echocardiography laboratory. These special procedures will include: transesophageal echocardiography, contrast agents, strain, strain rate imaging and 3D echocardiography. Prerequisite: Admission to the cardiovascular sonography program.

CVS 56. Adult Echocardiography III. 3 Credits.
The student will continue to build upon their knowledge of echocardiography by learning cardiac diseases secondary to systemic illness, connective tissue disorders, neurological diseases, hematological disorders, pericardial disease, cardiac tumors, masses and diseases of the great vessels. Prerequisite: Admission to the program.

CVS 57. Vascular Ultrasound II. 4 Credits.
The student will learn to perform basic vascular assessments using two-dimensional, spectral and color flow Doppler information in the areas of renal duplex ultrasounds, abdominal aorta and iliac imaging. Prerequisite: Admission to the cardiovascular sonography program.

CVS 58. Pediatric Echocardiography II. 4 Credits.
The student will learn of Ebstein’s malformation of the tricuspid valve, tricuspid atresia with and without D-transposition, partial and complete endocardial cushion defect, cor triatriatum and double outlet right ventricle. Prerequisite: Admission to the cardiovascular sonography program.

CVS 59. Physics II. 2 Credits.
This is the second of two ultrasound physics courses designed to prepare the student for the Sonography Principles and Instrumentation exam required for registration through ARDMS. The content of this course will cover fluid dynamics, hemodynamics, vascular principles and cardiovascular principles. The content of Physics I will be heavily reviewed in preparation for the registry exam. Prerequisite: Admission to the program.

CVS 61. Adult Cardiovascular Cardiology Technician II. 3 Credits.
The student will have progressive didactic exposure to the technology, procedures, techniques and concepts of interventional cardiology. Prerequisite: Admission to the program.

CVS 62. Adult Electrophysiology Technician II. 2 Credits.
The student will have continued progressive didactic exposure to the technology, procedure, techniques, and concepts of electrophysiology. Prerequisite: Admission to the program.

CVS 63. Patient Care III. 2 Credits.
The continuation of advanced radiographic identification of the cardiac and vascular anatomy will be presented. In addition, the student will learn about coronary artery disease, angina, heart failure, acute coronary syndrome, shock, valvular heart disease and how this knowledge will be used while working in an invasive cardiology setting. Prerequisite: Admission to the program.

CVS 64. Complex Arrhythmia Assessment. 1 Credit.
During this course the student will assess complex electrocardiography, telemetry, and cardiac arrhythmia cases. The student will evaluate the association of significant arrhythmias with cardiac diseases and common treatment options. Prerequisite: Admission to the program.

CVS 65. Complex Hemodynamic Assessment. 2 Credits.
The purpose of this course is to provide the student with the knowledge base necessary to understand acquired and congenital cardiovascular diseases, the etiologies associated with the disease state and the presenting clinical signs and symptoms. This course will introduce the student to the principles of hemodynamic monitoring, waveform analysis and interventional cardiovascular procedures. Prerequisite: Admission to the program.

CVS 66. Adult Interventional Cardiology Technician II. 2 Credits.
The student will have continued progressive didactic exposure to the technology, procedure, techniques, and concepts of interventional cardiology. Prerequisite: Admission to the program.

CVS 67. Clinical Practicum IV. 8 Credits.
The student will have hands-on experience working in their chosen field of adult echocardiography, vascular or pediatric echocardiography. Here they will be given the opportunity to improve their technical skills by working one-on-one with their preceptor in the clinical setting. Prerequisite: Admission to the cardiovascular sonography program.

CVS 75. Congenital Heart Disease. 1 Credits.
The student will be introduced to the evaluation of congenital heart disease using the segmental approach. Prerequisite: Admission to the cardiovascular sonography program.

CVS 76. Vascular Ultrasound III. 3 Credits.
Upon completion of this course the student will have the necessary knowledge to perform basic vascular assessments using two-dimensional, spectral and color flow Doppler information in the areas of renal duplex ultrasounds, abdominal aorta and iliac imaging. Prerequisite: Admission to the program.

CVS 77. Pediatric Echocardiography III. 3 Credits.
Upon completion of this course the student will demonstrate an understanding of Ebstein's malformation of the tricuspid valve, tricuspid atresia with and without D-transposition, partial and complete endocardial
Upon the completion of this course the student will demonstrate an understanding of partial and total anomalous pulmonary venous return, persistent left superior vena cava, hypoplastic left heart syndrome and single ventricle. Prerequisite: Admission to the program.

**CVS 91. Adult Echocardiography IV. 1 Credits.**

This course is designed to enable the student to review the materials covered throughout their time spent in the program, preparing them to step into the profession of echocardiography and become registered through ARDMS by passing their RDCS registration exam. Prerequisite: Admission to the program.

**CVS 94. Concepts in Cardiac Rhythm Management II. 3 Credits.**

The student will learn the following basic device knowledge, arrhythmias, remote monitoring management and indications and limitations of biventricular pacing. The student will also learn about echo AV optimization, radiation oncology, MRI, withdrawal of therapy and other specialized inter-departmental workflows. Prerequisite: Admission to the program.

**CVS 95. Concepts in Intravascular Imaging and Intervention II. 3 Credits.**

Intravas Imaging & Interv II Prerequisite: Admission to the program.

**CVS 97. Clinical Practicum VI. 7 Credits.**

The student will have hands-on experience working in their chosen field; catheterization lab, electrophysiology lab, echocardiography lab, vascular lab or the pediatric echocardiography lab. Here they will be given the opportunity to improve their technical skills by working one-on-one with their preceptor in a clinical setting. Prerequisite: Admission to the program.

**CVS 80. Introduction to Cardiovascular Research Principles. 1 Credits.**

This course requires the student to research a cardiovascular disease process, write a research paper and present the topic at a cardiovascular conference in front of peers, nursing personnel, cardiology fellows and the medical staff. The student may include the natural history of the disease process, the historical approach to the diagnosis of the disease, an overview of other modalities used in diagnosing the disease, the imaging techniques used in its diagnosis and the scientific rationale behind the technique. Prerequisite: Admission to the program.

**CVS 81. Concepts in Intravascular Imaging and Intervention I. 2 Credits.**

The student will expand their basic knowledge of the various imaging modalities used during vascular interventional procedures and the various endovascular treatments that they will see throughout their careers. Prerequisite: Admission to the program.

**CVS 82. Concepts in Cardiac Rhythm Management I. 2 Credits.**

During this course the student will learn the fundamentals of cardiac pacing, will understand the basic techniques for interrogation, programming, surveillance and the measurement of pacing and sensing thresholds of ICDs and CRT-Ds. Upon conclusion of this course the student will be able to recognize normal and abnormal pacemaker function. Prerequisite: Admission to the program.

**CVS 84. Senior Project. 1 Credits.**

This course requires the student to research a cardiovascular disease process, write a research paper and present the topic at a cardiology conference in front of peers, nursing personnel, cardiology fellows and the medical staff. The student may include the natural history of the disease process, the historical approach to the diagnosis of the disease, an overview of the other modalities used in diagnosing the disease and the scientific rationale behind the technique. In addition, the student may include case studies in the presentation. Prerequisite: Admission to the program.

**CVS 86. Clinical Practicum V. 8 Credits.**

The student will have hands-on experience working in their chosen field of adult echocardiography, vascular or pediatric echocardiography). Here they will be given the opportunity to improve their technical skills by working one-on-one with their preceptor in the clinical setting. Prerequisite: Admission to the cardiovascular sonography program.

**CVS 89. Vascular Ultrasound IV. 3 Credits.**

This course requires the student to research a vascular disease process, write a research paper and present the topic at a cardiovascular conference in front of peers, nursing personnel, cardiology fellows and the medical staff. The student may include the history of the disease process, the approach to the diagnosis of the disease and any other modality used in the diagnosis of the disease. In addition, the student may include case studies in the presentation. Prerequisite: Admission to the program.

**CVS 90. Pediatric Echocardiography IV. 3 Credits.**