CARDIOVASCULAR TECHNOLOGY

This is a 24-month certificate program in which students spend 30 to 40 hours each week at clinical affiliates 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 Hospital 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:

- **Invasive electrophysiology** prepares graduates to become a credentialed Registered Cardiac Electrophysiology Specialist (RCES) through Cardiovascular Credentialing International (CCI).
- **Invasive and interventional disease** prepares graduates to become a Registered Cardiovascular Invasive Specialist (RCIS) through CCI.
- **Adult echocardiography and vascular technology** prepares graduates to become a credentialed Registered Diagnostic Cardiac Sonographer (RDCS) and Registered Vascular Technologist (RVT) through American Registry for Diagnostic Medical Sonography (ARDMS).
- **Adult and pediatric echocardiography** prepares graduates to become a credentialed Registered Diagnostic Cardiac Sonographer with specialty in pediatric echocardiography (PE) through ARDMS.

Courses

**CVT 20. Cardiovascular Anatomy. 2 Hours.**
This course will provide the student with basic cardiovascular terminology, knowledge of congenital heart defects, veins, arteries, coronary vessels and the conduction system. The students will learn cardiac and vascular anatomy in relationship to various cardiovascular procedures. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

**CVT 21. EKG I. 2 Hours.**
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 pattern and common abnormality recognition. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

**CVT 22. Cardiovascular Physiology. 2 Hours.**
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. LEC.

**CVT 23. Patient Care I. 2 Hours.**
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, HIPAA, patient transfers, proper ergonomics of scanning, hand hygiene, sterile technique, radiation safety and infection control. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

**CVT 24. Introduction to Doppler and Instrumentation. 3 Hours.**
This course is designed to introduce the student to the fundamental physical principles of Doppler echocardiography. The course will introduce the student to the basic physics of Doppler ultrasound. The student will also be introduced to the fundamental principles of pulsed wave, continuous wave and color flow Doppler. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

**CVT 25. Clinical Practicum I. 8 Hours.**
This course will provide meaningful, well-balanced experiences for the student in the electrophysiology lab, cath lab, vascular lab, echocardiography and pediatric echocardiography labs. Clinical Practicum I will focus on the development of image recognition, anatomy identification and patient care. Prerequisite: Admission to the advanced cardiovascular technology program. PRA.

**CVT 26. Adult Cardiovascular Technician I. 2 Hours.**
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. LEC.

**CVT 27. Adult Echocardiography I. 4 Hours.**
This course is designed to enable the student to understand the pathophysiology of acquired valvular heart disease. The etiology, physiology, cardiac auscultation, physical examination, symptoms and electrocardiographic findings associated with the various disease states will be covered. Two-dimensional, spectral and color flow Doppler findings associated with each valvular disease state will be evaluated. The student will learn to obtain and effectively apply accurate two-dimensional and Doppler measurements as they relate to evaluation and quantification of valvular disease. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

**CVT 28. Advanced Doppler & Instrumentation. 2 Hours.**
This course is designed to enable the student to apply Doppler physics and instrumentation principles to the echocardiography exam. The student will learn how to derive hemodynamic data from the pulsed-wave, continuous wave and color-flow Doppler examinations. The student will learn to effectively acquire accurate Doppler measurements and apply those measurements to the appropriate parameters and equations that are routinely used in the echo lab. Special emphasis will be given to understanding the physical principles governing the ultrasound machine and applying those principles to practice. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

**CVT 29. Pharmacology. 1 Hour.**
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. LEC.

**CVT 30. EKG II. 2 Hours.**
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. LEC.
CVT 35. Patient Care II. 2 Hours.
The 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. LEC.

CVT 36. Clinical Practicum II. 10-11 Hours.
The student will have hands-on experience working in their chosen field; catheterization lab, electrophysiology lab, vascular lab or the echocardiography lab. Here they will be given the opportunity to improve their technical skills working one-on-one with their preceptor and patients in a clinical setting. Prerequisite: Admission to the advanced cardiovascular technology program. LEC.

CVT 39. Adult Echocardiography II. 2 Hours.
This course is designed to enable the student to understand the pathophysiology and echocardiographic findings associated with cardiomyopathies. The etiology, physiology, cardiac auscultation, physical examination, symptoms and EKG findings associated with the various disease states will be covered. The role of two-dimensional, M-mode, color flow and spectral Doppler in the evaluation of the various disease states will be evaluated. The student will learn to obtain and effectively apply accurate two-dimensional and Doppler measurements as they relate to evaluation and quantification of systolic function, diastolic function and the echocardiographic role in evaluation of diseases of the myocardium. Prerequisite: Admission to the program. LEC.

CVT 40. Vascular Ultrasound I. 3 Hours.
Upon completion of this course the student will have the necessary knowledge to perform basic vascular assessments using the appropriate 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 program. LEC.

CVT 41. Pediatric Echocardiography I. 3 Hours.
At the completion of this course the student will demonstrate an understanding of how to utilize a sequential developmental approach to obtain pediatric echocardiographic images. The image display and orientation that is specific to pediatric echocardiography will be defined. This course will review congenital heart diseases and their associated clinical signs and symptoms. Prerequisite: Admission to the program. LEC.

CVT 42. Physics I. 3 Hours.
This is the first of two ultrasound physics courses designed to prepare the student for the Sonography Principles and Instrumentation exam. The content of this course will cover mathematics, sound waves, attenuation, pulsed-wave operation, transducers, systems operations, Doppler, artifacts, bio-effects, contrast, harmonics and quality assurance. The focus of the course will be to help the student understand the physical principles that the ultrasound machine utilizes to create the ultrasound image and help the student appreciate both the capabilities and limitations of imaging with ultrasound. Prerequisite: Admission to the program. LEC.

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

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

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

CVT 49. Clinical Practicum III. 7 Hours.
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 working one-on-one with their preceptor and patients in a clinical setting. Prerequisite: Admission to the program. LEC.

CVT 55. Cardiovascular Assessment and Special Procedures. 1 Hour.
This course is designed to acquaint the student with special procedures utilized in the echocardiography laboratory. The student will be familiarized with transesophageal echocardiography, as well as, the benefits of using contrast agents during an echocardiography examination. The student will also be introduced to strain and strain rate imaging along with 3D echocardiography. Prerequisite: Admission to the program. LEC.

CVT 56. Adult Echocardiography III. 2 Hours.
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. LEC.

CVT 57. Vascular Ultrasound II. 2 Hours.
Upon completion of this course the student will have the necessary knowledge to perform basic vascular assessments using the appropriate two-dimensional, spectral and color flow Doppler information in the areas of upper and lower extremity arterial and venous duplex imaging. Prerequisite: Admission to the program. LEC.

CVT 58. Pediatric Echocardiography II. 2 Hours.
At the completion of this course the student will demonstrate an understanding of aortic arch abnormalities, aortic stenosis and associated obstructive lesions, pulmonary stenosis and associated obstructive lesions, pulmonary atresia with and without VSD, Tetralogy of Fallot, transposition of the great arteries D and L type and truncus arteriosus. Prerequisite: Admission to the program. LEC.

CVT 59. Physics II. 2 Hours.
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. LEC.

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

CVT 62. Adult Electrophysiology Technician II. 2 Hours.
The student will have continued progressive didactic exposure to the technology, procedure, techniques, and concepts of electrophysiology. Prerequisite: Admission to the program. LEC.
CVT 63. Patient Care III. 2 Hours.
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. LEC.

CVT 64. Complex Arrhythmia Assessment. 1 Hour.
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. LEC.

CVT 65. Complex Hemodynamic Assessment. 2 Hours.
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. LEC.

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

CVT 67. Clinical Practicum IV. 10-12 Hours.
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. PRA.

CVT 75. Congenital Heart Disease. 2 Hours.
This course will provide students with an overview of congenital heart disease. The student will be given an introduction to the evaluation of congenital heart disease using the segmental approach. Technical considerations will be presented for echocardiographic evaluation of the patient with known or suspected congenital heart disease. Prerequisite: Admission to the program. LEC.

CVT 76. Vascular Ultrasound III. 3 Hours.
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 ultrasound, abdominal aorta and iliac imaging. Prerequisite: Admission to the program. LEC.

CVT 77. Pediatric Echocardiography III. 3 Hours.
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 cushion defect, cor triatriatum and double outlet right ventricle. Prerequisite: Admission to the program. LEC.

CVT 78. Adult Interventional Cardiology Technician III. 3 Hours.
The student will have continued progressive didactic exposure to the technology, procedure, techniques, and concepts of interventional cardiology. Prerequisite: Admission to the program. LEC.

CVT 79. Adult Electrophysiology Technician III. 2 Hours.
The student will have continued progressive didactic exposure to the technology, procedure, techniques, and concepts of electrophysiology. Prerequisite: Admission to the program. LEC.

CVT 80. Introduction to Cardiovascular Research Principles. 1 Hour.
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 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. LEC.

CVT 81. Concepts in Intravascular Imaging and Intervention I. 2 Hours.
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. LEC.

CVT 82. Concepts in Cardiac Rhythm Management I. 2 Hours.
During this course the student will learn the fundamentals of cardiac pacing, will understand the basic techniques for interrogation, programming and pacing 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. LEC.

CVT 84. Senior Project. 1 Hour.
This course requires the student to research a cardiovascular disease process, write a research paper and present the topic at 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. LEC.

CVT 86. Clinical Practicum V. 10-11 Hours.
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. LEC.

CVT 89. Vascular Ultrasound IV. 3 Hours.
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. LEC.

CVT 90. Pediatric Echocardiography IV. 3 Hours.
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. LEC.

CVT 91. Adult Echocardiography IV. 3 Hours.
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. LEC.
CVT 94. Concepts in Cardiac Rhythm Management II. 3 Hours.
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. LEC.

CVT 95. Concepts in Intravascular Imaging and Intervention II. 3 Hours.
Intravas Imaging Interv II Prerequisite: Admission to the program. LEC.

CVT 97. Clinical Practicum VI. 7 Hours.
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. PRA.