Department of Education | College, Career and Technical Education

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Cardiovascular Services

Primary Career Cluster:	Health Science
Course Contact:	CTE.Standards@tn.gov
Course Code(s):	C14H18
Prerequisite(s):	*Diagnostic Medicine* (C14H12)
Credit:	1
Grade Level:	11-12
Focus Elective Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
POS Concentrator:	This course satisfies one out of two required courses to meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is the fourth course in the *Diagnostic Services* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Promoted Tennessee Student Industry Credentials :	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/career-and-technical-education/student-industry-certification.html
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html Best for All Central: https://bestforall.tnedu.gov/

Approved April 10, 2015; Amended Feb 2012 Nov. 2021

Course-at-a-Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career & technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals, and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course, note this is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management
- Participate in contests that highlight job skill demonstration; interviewing skills; community service activities, extemporaneous speaking, and job interview
- Participate in leadership activities such as Organizational Leadership, Prepared Speaking, HOSA Service Project, Creative Problem Solving, and HOSA Service Project.

For more ideas and information, visit Tennessee HOSA at http://www.tennesseehosa.org/

Using Work-based Learning in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standards 1.1-1.2**| Job shadow a cardiovascular or EKG technician
- **Standards 2.1-2.2**|Interview medical office business/accounts manager to determine if preventive procedures would increase or decrease health care costs related to heart health.
- **Standards 5.1-5.6|** Visit an electrophysiology lab
- **Standards 5.9**| Observe an echocardiogram
- **Standards 6.1-6.2**|Partner with a cardiovascular office nurse to create a plan of action for assessment, diagnosis, and treatment of a patient experiencing cardiovascular or pulmonary complication.
- **Standards 7.1|** Work with the local health department to develop a marketing campaign to inform citizens about heart health related to the goals and objectives of the Healthy People Initiative.

For more ideas and information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.

Course Description

Cardiovascular Services is an applied course in the *Diagnostic Services* program of study intended to prepare students with an understanding of the roles and responsibilities of those seeking employment in the cardiovascular field of healthcare. Upon completion of this course, proficient students will have a thorough understanding of the anatomy and physiology of the heart and be knowledgeable about both invasive and non-invasive cardiovascular procedures. Students will incorporate communication, goal setting, and information collection skills to be successful in the workplace. Students who complete a *Clinical Internship* in addition to this course will be eligible upon graduation to sit for the Certified EKG Technician (CET) Exam. Relevant standards are indicated below with (CET).

Program of Study Application

This is the fourth course in the *Diagnostic Services* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html.

Course Standards

1. Career Planning

1.1. Cardiopulmonary careers: Research **careers** within **cardiovascular and pulmonary sciences** and explain the **educational/credentialing requirements, scope of practice**, as well as state and national **compliance guidelines** required of cardiovascular health care professionals. Using real-time and projected labor market data, identify local and national employment opportunities and determine areas of growth.

1.2. Professional competencies and skills: Analyze the range of **skills, competencies**, and **professional traits** (such as leadership, time management, and ethical responsibility) required for careers in cardiovascular or pulmonary sciences.

2. Legalities and Ethical Issues

2.1 HIPAA, consent, legal concepts, and patient rights: Summarize the **Health Insurance Portability and Accountability Act (HIPAA)** and explain procedure and guidelines concerning **receiving and verifying physician orders, identifying the patient/client, and obtaining patient's consent** to perform procedures. Identify the procedures that require **written permission** and those that require only **verbal consent.** Explain, using domain-specific language and accurate definitions of **legal concepts**, how the content of these legal documents impacts **patients' rights** for all aspects of care.

2.2 Diagnostic versus preventive medical procedures: Compare and contrast the **costs of preventive medical procedures versus diagnostic medical procedures** related to the cardiovascular and pulmonary system. Research and determine if preventive procedures would increase or decrease health care cost as it relates to heart health.

3. Anatomy and Physiology

3.1 Structure and function of cardiovascular and autonomic nervous systems: Relate the **gross and cellular structure and function of the cardiovascular and autonomic systems** to the following areas.

a. Electrophysiology of the heart, including definitions of waveforms
b. Control mechanisms and cardiac cycle with normal values (CET)
c. Size, location, layers, chambers, valves, pressures, and blood flow of heart (CET)
d. Relationship of cardiac output to heart rate and stroke volume (CET)

3.2 Pathophysiology of heart and breath sounds: Interpret the **pathophysiology** related to **normal and abnormal heart sounds and breath sounds**. Evaluate simulated heart sounds to identify **normal heart sounds, normal lung sounds, murmurs, rubs, extra heart sounds, wheezes, or other abnormal breath sounds** via a mannequin or digital substitute.

3.3 Diseases, disorders, and emergency situations: Evaluate **diseases, disorders, or emergency situations related to the cardiac, circulatory, or pulmonary systems**. Interpret the scope of the disease/disorder/emergency, basic pathophysiology, affected populations, pharmacological interventions, signs and symptoms, risk factors, existing practices that target the disease/disorder, and interventions available.

3.4 Health education project: Formulate a health education project to inform an adult and/or geriatric audience about the **negative effects of co-morbidities** such as obesity, hypertension, diabetes, or renal impairment on the heart, circulatory, and pulmonary systems.

4. Cardiopulmonary Terminology

4.1 Cardiopulmonary terminology: Analyze and interpret **medical terminology and abbreviations related to anatomy and physiology, pathology, diagnostic and therapeutic procedures, and pharmacology of the cardiopulmonary and autonomic systems**. Demonstrate mastery of medical terminology use and accurate spelling in each area through verbal and written explanation. Demonstrate the skills involved when **communicating with a patient or family member** by explaining the terminology, abbreviations, and symbols in **layman's terms**.

5. Diagnostics and Procedures

5.1 Pre-procedural tasks: Perform the following duties and tasks related to **pre-procedural activity**: (CET)

a. Perform universal precautions (e.g., hand washing, Personal Protective Equipment)
b. Transport the patient
c. Prepare the patient (shaving, cleaning skin, etc., should be simulated on mannequin)
d. Collect patient information
e. Enter information into Electrocardiogram (ECG) machine

f. Identify proper landmarks on mannequin
g. Maintain patient safety throughout the pre-procedural process
h. Vital sign assessment
i. Pulse oximeter

5.2 ECG leads: Differentiate between **bipolar, unipolar, and precordial leads**. Relate their importance in performing an ECG test correctly. Include the concept of **Einthoven's Triangle** in the explanation.

5.3 ECG machines: Compare and contrast the **single- and three-channel ECG machines**. Define the **purpose of the equipment,** and explain **indications for use, expected outcomes, advantages, disadvantages, and limitations** of each.

5.4 Perform an ECG: Understand principles of and successfully perform **skills related to performing a resting ECG** (12 lead, 15 lead, etc.), incorporating rubrics from textbooks or clinical standards of practice for the following: (CET)
a. Gather supplies and equipment
b. Educate patient on procedure expectations
c. Apply electrodes and leads to patient
d. Confirm equipment
e. Perform standard ECG

5.5 Rhythm analysis: Obtain ECG tracing strips and perform **rhythm analysis**, including the following: (CET)
a. Analyze ECG tracing for presence of P, Q, R, S, and T waves, and heart rate calculation.
b. Identify ECG tracings indicative of sinus, junctional, atrial, ventricular, atrioventricular, hypertrophy, chamber enlargement, and pacemaker rhythms. Include intraventricular conduction and myocardial perfusion tracings.
c. Identify electrical interference and somatic tremor on an ECG tracing, as well as the steps to take to alleviate or prevent such artifacts.
d. Correlate ECG finding (wavelengths, segments, intervals, etc.) with cardiac function.
e. Correlate ECG morphology with anatomy and physiology.

5.6 Patient teaching: Demonstrate the ability to explain the **purpose of the ECG,** the **associated risks**, and **patient expectations before, during, and after testing.**

5.7 Radiographic and nuclear cardiovascular and pulmonary imaging: Compare and contrast various types of **nuclear imaging and radiographic cardiovascular and pulmonary tests**. Provide an overview or explanation of each test and explain the **mechanics of the procedure**, the **associated risks**, and **patient expectations** before, during and after testing.

5.8 Invasive diagnostic procedures: Research the types of **invasive diagnostic cardiovascular and pulmonary procedures**. Examples might include cardiac catheterization, carotid

angiography, electrophysiological studies, intravascular ultrasound, or myocardial biopsy. Provide an overview or **explanation of the procedure** and explain the **associated risks**, **patient expectations** before, during, and after the test, and next steps for abnormal results.

5.9 Cardiovascular ultrasound: Differentiate between the **various types of cardiovascular ultrasound procedures**. Discuss what an ultrasound can identify that other procedures might not, in addition to the **risk considerations, reliability of results, and proper interpretation of an ultrasound image**.

6. Invasive Treatment Procedures

6.1 Treatments for cardiovascular and pulmonary diseases and disorders: Research **treatments** involving cardiac, vascular, and thoracic surgery for **cardiovascular and pulmonary diseases and/or disorders**. Explain implications for each treatment, identifying trends and/or advances in available treatments over the past fifty years.

6.2 Cardiopulmonary emergencies in the physician office: Identify characteristics and/or signs and symptoms of patients experiencing **cardiac and/or pulmonary complications** in physician offices or emergency rooms. Create a plan of action for **assessment, diagnosis, and treatment** of the patient.

7. Health Statistics

7.1 Heart disease in the community: In 2020, the National Center for Health Statistics identified the leading cause of death in the United States as **heart disease. In the local community**, identify the:

a. incidence of heart disease and disorders,
b. number of associated deaths,
c. preventive measures currently being taken, and
d. available educational programs and initiatives.

Document findings in an oral, digital, or visual presentation. Information can be found from organizations such as the CDC, state and county health department websites, and interviews with public health and emergency professionals.

The following artifacts will reside in the student's portfolio:

- safety test
- artifacts that demonstrate student proficiency

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.