NWCA | NATIONAL WORKFORCE CAREER ASSOCIATION

Certified EKG Technician

Professional Credential

EXAM STUDY GUIDE

Credential Title

Certified EKG Technician (CET)

Purpose of Credential

The purpose of this credential is to document the proficiency of selected healthcare workers, such as EKG technicians, medical assistants, and nurses in the knowledge, skills, and techniques involved in EKG technology under the supervision of appropriate physicians and other professionals.

Audience for Credential

This credential is designed for individuals who have completed appropriate EKG training from appropriate organizations and who have mastered the many knowledge and skill sets involved with successful performing of the EKG technician job. It is also designed for those who work in the healthcare field, who desire to enhance skill sets to include EKG technology, and who have completed appropriate training.

Job/Career Requirements

EKG Technicians and other qualified health workers operate machines that record the electrical activity of a patient's heart, which provide data for the diagnosis of heart conditions. Tasks include setting up and administering EKGs and stress tests, preparing patients for Holter monitoring, editing and delivering final test results to the physician, scheduling appointments, and transcribing physicians' interpretations. Successful EKG Technicians understand basic human anatomy, physiology, and medical terminology as related to the cardiovascular system as well as know how to set up an EKG machine and Holter monitor, prepare the patient for a variety of EKG tests, run the test under the physician's supervision, recognize normal EKG tracings compared to abnormal tracings, identify abnormal tracings, and make appropriate reports to the physicians.

EKG Technician Tasks

- Communicate with others in the healthcare setting using appropriate terminology related to the cardiovascular system
- Correctly and efficiently use the EKG machine and related supplies and equipment
- Accurately identify the difference between a normal sinus rhythm and abnormal rhythms
- Correctly measure the heart rate using the EKG machine
- Properly prepare a patient for an EKG test using a 12-lead EKG
- Practice all safety procedures related to an EKG test
- Interpret basic EKG rhythm strips using a basic interpretation approach
- Identify common EKG arrhythmias
- Assist the provider in diagnostic EKG tests, ambulatory tests, and rehabilitative modalities related to the EKG

Exam Structure Overview

Number of Questions in Exam: 100

Time Limit for Exam Parts:

Cardiovascular Anatomy and Physiology - 25 items

Basic Electrophysiology - 51 items

Interpretation of Arrhythmias - 24 items

Total Time: 120 minutes

Overall Passing Score: 70% (All sections require an individual passing score of 70%)

Study Outline

Cardiovascular Anatomy and Physiology

The EKG Technician must first fully understand the anatomy and physiology of the heart, blood vessels, and cardiac cells responsible for the electrical conduction through the heart recorded by the EKG machine. This foundation allows for thorough understanding what is happening to the patient's heart by interpreting the EKG rhythm strips.

Cardiovascular Anatomy and Physiology

Objective:

- *Describe the anatomy of the heart, blood vessels, and cardiac cells*

1. Anatomy and Physiology of the Heart
    a. Layers of the Heart
    b. Chambers of the Heart
    c. Valves of the Heart
    d. Major Heart Vessels
    e. Coronary Arteries
    f. Blood Flow through the Heart
    g. Blood Flow through the Coronary Arteries and Veins
    h. The Cardiac Cycle
        i. Diastole and Systole
        ii. Systemic Circulation
    i. Cardiac Cells
    j. Cardiac Nervous Conduction System

Basic Electrophysiology

In addition to cardiovascular anatomy and physiology, the EKG technician must also thoroughly understand how to use the EKG equipment including understanding control of the EKG machine, the EKG paper, the normal EKG tracings on the rhythm strip, and the procedures involved in conducting an EKG test. Patient preparation, patient safety, and troubleshooting the various artifacts common in an EKG test are also essential skills.
The EKG Technician must be able to follow the established step-by-step approaches a basic EKG test and a 12-lead EKG as well as be able to measure the patient's heart rate using a variety of methods. The technician must also be able to document the procedure accurately and assist the physician as requested.

Use of EKG Equipment

Objectives:

- *Describe the rhythm strip, normal sinus rhythm, and EKG machine used in conducting an EKG test*
- *Explain the lead placement for a 12-lead EKG*
- *Explain safety, trouble shooting, and various artifacts of an EKG*

1. Electrophysiology
    a. Depolarization and Repolarization
    b. Action Potential
    c. Refractory Periods
    d. EKG Waves and Complexes
    e. The Cardiac Conduction System
        i. Inherent (Escape) Rates of the Pacemaker Cells
        ii. Conduction Variations
    f. EKG Paper
    g. Measuring PR, QURS, and QT Intervals
2. Lead Placement
    a. Electrodes
    b. Leads
    c. Lead Placement
        i. Bipolar Leads
        ii. Augmented Leads
        iii. Precordial (Chest) Leads
    d. Continuous Monitoring and Telemetry
    e. Electrocardiography Fundamentals
    f. Normal QRS Deflections in Different Leads
    g. Lead Morphology
3. Technical Aspects of the EKG
    a. EKG Control Features
        i. Controlling Chart Speed
        ii. Controlling Sensitivity
        iii. Standardizing the EKG Machine
        iv. Controlling Position
        v. Controlling Frequency Response
        vi. Controlling Stylus Heat
    b. Electrical Safety and the EKG Machine
    c. Artifacts
        i. Reversed Leads and Misplaced Electrodes
        ii. Baseline Sway/Wandering Baseline
        iii. 60-Cycle Interference/AC Interference
        iv. Muscle Noise/ Somatic Tremors
        v. Muscle/Skin Movement Related Artifacts
        vi. CPR Artifact
        vii. Broken Recording
        viii. Artifact Masquerading as Asystole
        ix. Artifact Masquerading as Rhythms
        x. “Toothbrush Tachycardia”
        xi. Artifact in Three Leads Monitored Simultaneously
        xii. Artifacts Caused by a Pacemaker
    d. Artifacts Related to Telemetry Monitoring
    e. Troubleshooting and Reducing Artifacts

EKG Interpretation

Objectives:

- *Use the basic approach to EKG interpretation to interpret of an EKG strip*
- *Use the six step approach to interpretation of a 12-lead EKG*

1. Calculating Heart Rate
    a. Definition of Heart Rate
    b. Methods for Calculating Heart Rate
        i. Memory Method
        ii. Using a Calculator
        iii. 6-Second Strip Method
        iv. The Little-Block or Square-Counting Method
    c. Regularity-Based Heart Rate Calculation
        i. Regular
        ii. Regular But Interrupted
        iii. Irregular
        iv. Calculating HR for Different Types of Regularity
2. Basic Interpretation of a Rhythm Strip
    a. Identifying a Normal EKG
    b. Five Steps to Rhythm Interpretation
3. Interpretation of a 12-Lead EKG
    a. Rhythm
    b. Heart Rate
    c. Intervals
    d. Determine the Axis Quadrant
    e. Check for Bundle Branch Blocks
    f. Check for Ventricular Hypertrophy
    g. Determine the Presence of Miscellaneous Effects
    h. Check for Myocardial Infarction/Ischemia

Interpretation of EKG Arrhythmias

Though the physician actually interprets the EKG test and makes a diagnosis, the EKG Technician must understand and be able to identify common arrhythmias and disease states from the EKG rhythm strip including arrhythmias associated with pacemakers, various medications, and specific diseases or heart problems. The EKG Technician must also be able to prepare patients for a variety of diagnostic and therapeutic uses of EKG equipment.

Common Arrhythmias

Objectives:

- *Identify common arrhythmias and disease states, including for patients with pacemakers*

1. Rhythms Originating in the Sinus Node
    a. Definition of Sinus Rhythms
    b. Sinus Bradycardia
    c. Sinus Arrhythmia
    d. Normal Sinus Rhythm
    e. Sinus Tachycardia
    f. Sinus Arrest
    g. Sinus Block
2. Rhythms Originating in the Atria
    a. Definition of Atrial Rhythms
    b. Wandering Atrial Pacemaker
    c. Premature Atrial Complexes (PACs)
    d. Atrial Escape Beats
    e. Atrial Couplets
    f. Atrial Bigeminy, Trigeminy, and Quadrigeminy
    g. Paroxysmal Atrial Tachycardia (PAT)
    h. Paroxysmal Atrial Runs (<100 bpm)
    i. Multifocal Atrial Tachycardia
    j. Atrial Flutter
    k. Atrial Fibrillation
    l. Supraventricular Tachycardia (SVT)
3. Rhythms Originating in the Ventricles
    a. Definition of Ventricular Rhythms
    b. Premature Ventricular Complexes (PVCs)
    c. Ventricular Escape Beats
    d. Ventricular Couplets
    e. Ventricular Bigeminy, Trigeminy, Quadrigeminy
    f. Unifocal vs. Multifocal
    g. Agonal Rhythm (Dying Heart)
    h. Idioventricular Rhythm (IVR)
    i. Accelerated Idioventricular Rhythm (AIVR)
    j. Ventricular Tachycardia (V-Tach)
    k. Torsades de Pointes

l. Ventricular Flutter
m. Ventricular Fibrillation (V-Fib)
n. Asystole
o. Pacemakers

4. Rhythms Originating in the AV Junction
    a. Definition of Junctional Rhythms
    b. Premature Junctional Complexes (PJCs)
    c. Junctional Escape Beats
    d. Junctional Couplets
    e. Junctional Bigeminy, Trigeminy, Quadrigeminy
    f. Junctional Bradycardia
    g. Junctional Rhythm
    h. Accelerated Junctional Rhythm
    i. Junctional Tachycardia
5. AV Blocks
    a. Definition of an AV Block
    b. Degrees of AV Blocks
        i. First-Degree AV Block
        ii. Type I Second-Degree AV Block (Wenckebach)
        iii. Type II Second-Degree AV Block
        iv. 2:1 AV Block
        v. Third-Degree AV Block (Complete Heart Block)
6. Artificial Pacemakers
    a. Indications for a Pacemakers
    b. Permanent and Temporary Pacemakers
    c. Pacemaker Terminology
        i. Three-Letter Pacemaker Codes
        ii. VVI Pacemakers
        iii. DDD Pacemakers
        iv. Pacemaker Malfunctions
            1. Failure to Fire
            2. Loss of Capture
            3. Undersensing

EKG in Diagnosis and Rehabilitation

Objectives:

- *Identify common cardiac medications used in treatment of cardiac problems*
- *Explain common techniques used in diagnostic electrocardiography*

1. Cardiac Medications
    a. Antiarrhythmics
        i. Class I: Sodium Channel Blockers
        ii. Class II: Beta-Blockers
        iii. Class III: Potassium Channel Blockers
        iv. Class IV: Calcium Channel Blockers

b. Emergency Cardiac Medications
    i. Atropine
    ii. Epinephrine
    iii. Amiodarone
    iv. Adenosine
    v. Sodium Bicarbonate
    vi. Isoproterenol
    vii. Oxygen

2. Electrical Therapy Uses of the EKG
    a. Cardioversion
    b. Defibrillation
3. Diagnostic Electrocardiography
    a. Stress Testing
        i. Indications and Goals for Stress Testing
        ii. Absolute and Relative Contraindications
        iii. Preparing the Patient for a Stress Test
        iv. Stress Test Procedures and Protocols
            1. Stress Test Procedures
            2. Exercise Protocols
                a. Definition and Types of Variations in Protocols
                b. Balke Protocol
                c. Bruce and Modified Bruce Protocol
                d. Cornell Protocol
                e. Ellestad Protocol
                f. Naughton
        v. Reasons for Termination of a Stress Test
        vi. Normal Signs and Symptoms During a Stress Test
        vii. Interpretation and Reliability of Stress Test Findings
        viii. Meaning of a Positive Stress Test
        ix. Categories of Stress Tests
            1. True Positive
            2. False Positive
            3. True Negative
            4. False Negative
            5. Bayes's Theorem
        x. Patient Procedures and Follow-Up After a Stress Test
    b. Holter Monitoring
        i. Indications and Contraindications for Holter Monitoring
        ii. Preparation of the Patient
        iii. Artifacts Associated with Holter Monitoring
        iv. Positive Holter
        v. Event Monitoring Using a Holter Monitor