

UNIT TERMINAL OBJECTIVE

- 5-2 At the completion of this unit, the EMT-Intermediate student will be able to utilize the assessment findings to formulate a field impression, implement and evaluate the management plan for the patient experiencing a cardiac emergency.

COGNITIVE OBJECTIVES

At the completion to this unit, the EMT-Intermediate student will be able to:

- 5-2.1 Describe the incidence, morbidity, and mortality of cardiovascular disease. (C-1)
 - 5-2.2 Review cardiovascular anatomy and physiology. (C-1)
 - 5-2.3 Discuss prevention strategies that may reduce morbidity and mortality of cardiovascular disease. (C-1)
 - 5-2.4 Identify the risk factors most predisposing to coronary artery disease. (C-1)
 - 5-2.5 Identify and describe the components of assessment as it relates to the patient with cardiovascular compromise. (C-1)
 - 5-2.6 Describe how ECG wave forms are produced. (C-1)
 - 5-2.7 Correlate the electrophysiological and hemodynamic events occurring throughout the entire cardiac cycle with the various ECG wave forms, segments and intervals. (C-2)
 - 5-2.8 Identify how heart rates may be determined from ECG recordings. (C-1)
 - 5-2.9 List the limitations to the ECG. (C-1)
 - 5-2.10 Describe a systematic approach to the analysis and interpretation of cardiac arrhythmias. (C-2)
 - 5-2.11 Explain how to confirm asystole using more than one lead. (C-1)
 - 5-2.12 List the clinical indications for defibrillation. (C-1)
 - 5-2.13 Identify the specific mechanical, pharmacological and electrical therapeutic interventions for patients with arrhythmias causing compromise. (C-1)
 - 5-2.14 List the clinical indications for an implanted defibrillation device. (C-1)
 - 5-2.15 Define angina pectoris and myocardial infarction (MI). (C-1)
 - 5-2.16 List other clinical conditions that may mimic signs and symptoms of angina pectoris and myocardial infarction. (C-1)
 - 5-2.17 List the mechanisms by which an MI may be produced by traumatic and non-traumatic events. (C-2)
 - 5-2.18 List and describe the assessment parameters to be evaluated in a patient with chest pain. (C-1)
 - 5-2.19 Identify what is meant by the OPQRST of chest pain assessment. (C-1)
 - 5-2.20 List and describe the initial assessment parameters to be evaluated in a patient with chest pain that may be myocardial in origin. (C-1)
 - 5-2.21 Identify the anticipated clinical presentation of a patient with chest pain that may be angina pectoris or myocardial infarction. (C-3)
 - 5-2.22 Describe the pharmacological agents available to the EMT-Intermediate for use in the management of arrhythmias and cardiovascular emergencies. (C-2)
 - 5-2.23 Develop, execute, and evaluate a treatment plan based on the field impression for the patient with chest pain that may be indicative of angina or myocardial infarction. (C-3)
 - 5-2.24 Define the terms "congestive heart failure" and "pulmonary edema." (C-1)
 - 5-2.25 Define the cardiac and non-cardiac causes and terminology associated with pulmonary edema and pulmonary edema. (C-2)
 - 5-2.26 Describe the early and late signs and symptoms of pulmonary edema. (C-1)
 - 5-2.27 Explain the clinical significance of paroxysmal nocturnal dyspnea. (C-1)
 - 5-2.28 List and describe the pharmacological agents available to the EMT-Intermediate for use in the management of a patient with cardiac compromise. (C-1)
 - 5-2.29 Define the term "hypertensive emergency." (C-1)
 - 5-2.30 Describe the clinical features of the patient in a hypertensive emergency. (C-3)
 - 5-2.31 List the interventions prescribed for the patient with a hypertensive emergency. (C-1)
 - 5-2.32 Define the term "cardiogenic shock." (C-1)

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- 5-2.33 Identify the clinical criteria for cardiogenic shock. (C-1)
 - 5-2.34 Define the term "cardiac arrest." (C-1)
 - 5-2.35 Define the term "resuscitation." (C-1)
 - 5-2.36 Identify local protocol dictating circumstances and situations where resuscitation efforts would not be initiated. (C-1)
 - 5-2.37 Identify local protocol dictating circumstances and situations where resuscitation efforts would be discontinued. (C-1)
 - 5-2.38 Identify the critical actions necessary in caring for the patient in cardiac arrest. (C-2)
 - 5-2.39 Synthesize patient history, assessment findings to form a field impression for the patient with chest pain and cardiac arrhythmias that may be indicative of a cardiac emergency. (C-3)

AFFECTIVE OBJECTIVES

At the completion of this unit the EMT-Intermediate will be able to:

- 5-2.40 Value the sense of urgency for initial assessment and intervention as it contributes to the treatment plan for the patient experiencing a cardiac emergency. (A-3)
 - 5-2.41 Defend patient situations where ECG rhythm analysis is indicated. (A-3)
 - 5-2.42 Value and defend the sense of urgency necessary to protect the window of opportunity for reperfusion in the patient with chest pain and arrhythmias that may be indicative of angina or myocardial infarction. (A-3)
 - 5-2.43 Value and defend the urgency in rapid determination and rapid intervention of patients in cardiac arrest. (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this unit the EMT-Intermediate will be able to:

- 5-2.44 Demonstrate a working knowledge of various ECG lead systems. (P-3)
 - 5-2.45 Set up and apply a transcutaneous pacing system. (P-3)
 - 5-2.46 Given the model of a patient with signs and symptoms of pulmonary edema, position the patient to afford comfort and relief. (P-2)

DECLARATIVE

- I.

A. Introduction

A. Epidemiology

 1. Incidence
 - a. Prevalence of cardiac death outside of a hospital
 - (1) Supportive statistics
 - b. Prevalence of warning signs and symptoms for cardiac emergencies
 - (1) Supportive statistics
 - c. Increased recognition of need for early reperfusion
 2. Morbidity/ mortality
 - a. Reduced with early recognition
 - b. Reduced with early access to EMS system
 3. Risk factors
 - a. Age
 - b. Family history
 - c. Hypertension
 - d. Lipids
 - e. Male sex
 - f. Smoking
 - g. Carbohydrate intolerance
 4. Possible contributing risks
 - a. Diet
 - b. Female sex
 - c. Obesity
 - d. Oral contraceptives
 - e. Sedentary living
 - f. Personality type
 - g. Psychosocial tensions
 5. Prevention strategies
 - a. Early recognition
 - b. Education
 - c. Alteration of life style

B. Review cardiovascular anatomy and physiology

 1. Anatomy of the heart
 2. Location
 - a. Layers
 - (1) Myocardium
 - (2) Endocardium
 - (3) Pericardium
 - b. Chambers
 - (1) Atria
 - (2) Ventricles
 - c. Valves
 - (1) Atrioventricular (AV) valves
 - (a) Tricuspid (right)
 - (b) Mitral (left)
 - (2) Semilunar valves
 - (a) Pulmonary (right)
 - (b) Aortic (left)

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3.

 - d. Papillary muscles
 - e. Chordae tendineae
 - Cardiac cycle
 - a. Phases
 - (1) Systole
 - (a) Atrial
 - (b) Ventricular
 - (2) Diastole
 - (a) Atrial
 - (b) Ventricular
 - b. Cardiac output
 - (1) Stroke volume
 - (a) Heart rate
 - (b) Contractility
 - (c) Starling's law

4. Vascular system

 - a. Aorta
 - (1) Ascending
 - (2) Thoracic
 - (3) Abdominal
 - b. Arteries
 - c. Capillaries
 - d. Veins
 - e. Vena cava
 - (1) Superior
 - (2) Inferior
 - f. Venous return (preload)
 - (1) Skeletal muscle pump
 - (2) Thoracoabdominal pump
 - (3) Respiratory cycle
 - (4) Gravity
 - g. Resistance (afterload) and capacitance (preload)
 - h. Pulmonary veins

5. Coronary circulation

 - a. Arteries
 - (1) Left coronary artery
 - (a) Anterior descending branch (LAD)
 - i) Distribution to the conduction system
 - (b) Circumflex
 - i) Distribution to the conduction system
 - (2) Right coronary artery
 - (a) Distribution to the conduction system
 - b. Veins
 - (1) Coronary sinus
 - (2) Great cardiac vein

6. Electrophysiology

 - a. Conduction system overview
 - (1) Sinoatrial node or sinus node (SA node)
 - (2) Atrioventricular (AV) junction
 - (a) AV node

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- (b) Bundle of His
 - (3) His-Purkinje System
 - (a) Bundle branches
 - i) Right
 - ii) Left anterior fascicle
 - iii) Left posterior fascicle
 - (4) Characteristics of myocardial cells
 - (a) Automaticity
 - (b) Excitability
 - (c) Conductivity
 - (d) Contractility
 - b. Electrical potential
 - (1) Action potential
 - (a) Depolarization
 - (b) Repolarization
 - (c) Important electrolytes
 - i) Sodium
 - ii) Potassium
 - iii) Calcium
 - iv) Chloride
 - (2) Excitability
 - (a) Thresholds
 - (b) Depolarization
 - (c) Repolarization
 - i) Relative refractory period
 - ii) Absolute refractory period
 - c. Autonomic nervous system relationship to cardiovascular system
 - (1) Medulla
 - (2) Carotid sinus and baroreceptor
 - (a) Location
 - (b) Significance
 - (3) Parasympathetic system
 - (4) Sympathetic
 - (a) Alpha - vasoconstrictive effect on systemic blood vessels
 - (b) Beta
 - i) Inotropic
 - ii) Dromotropic
 - iii) Chronotropic
 - (5) Systemic circulation

II. Initial cardiovascular assessment

- A. Level of consciousness
 - 1. Alert and responsive
 - 2. Dizziness
 - 3. Unresponsive
 - B. Airway
 - 1. Patent
 - 2. Debris, blood
 - 3. Frothy sputum
 - C. Breathing

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- 1. Absent
 - 2. Present
 - a. Rate and depth
 - (1) Effort
 - (2) Breath sounds
 - (a) Characteristics
 - (b) Significance
 - D. Circulation
 - 1. Pulse
 - a. Absent
 - b. Present
 - (1) Rate and quality
 - (2) Pulse deficit
 - (3) Apical
 - (4) Peripheral
 - 2. Skin
 - a. Color
 - b. Temperature
 - c. Moisture
 - d. Turgor
 - e. Mobility
 - f. Edema
 - 3. Blood pressure
 - III. Focused history
 - A. SAMPLE format
 - B. Chief complaint
 - 1. Pain
 - a. OPQRST
 - (1) Onset/ origin
 - (a) Pertinent past history
 - (b) Time of onset
 - (2) Provocation
 - (a) Exertional
 - (b) Non-exertional
 - (3) Quality
 - (a) Patient's narrative description
 - i) For example - sharp, tearing, pressure, heaviness
 - (4) Region/ radiation
 - (a) For example - arms, neck, back
 - (5) Severity
 - (a) "1-10" scale
 - (6) Timing
 - (a) Duration
 - (b) Worsening or improving
 - (c) Continuous or intermittent
 - (d) At rest or with activity
 - 2. Dyspnea
 - a. Continuous or intermittent
 - b. Exertional

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- c. Non-exertional
 - d. Orthopneic
 - e. Paroxysmal Nocturnal Dyspnea (PND)
 - f. Cough
 - (1) Dry
 - (2) Productive
 - (3) Frothy
 - (4) Bloody
 - 3. Related signs and symptoms
 - a. Level of consciousness (LOC)
 - b. Diaphoresis
 - c. Restlessness, anxiety
 - d. Feeling of impending doom
 - e. Nausea/ vomiting
 - f. Fatigue
 - g. Palpitations
 - h. Edema
 - (1) Extremities
 - (2) Sacral
 - i. Headache
 - j. Syncope
 - k. Behavioral change
 - l. Anguished facial expression
 - m. Activity limitations
 - n. Trauma
 - C. Past medical history
 - 1. Coronary artery disease (CAD)
 - 2. Atherosclerotic heart disease
 - a. Angina
 - b. Previous MI
 - c. Hypertension
 - d. Congestive heart failure (CHF)
 - 3. Valvular disease
 - 4. Aneurysm
 - 5. Pulmonary disease
 - 6. Diabetes
 - 7. Renal disease
 - 8. Vascular disease
 - 9. Inflammatory cardiac disease
 - 10. Previous cardiac surgery
 - 11. Congenital anomalies
 - 12. Current/ past medications
 - a. Prescribed
 - (1) Compliance
 - (2) Non-compliance
 - b. Borrowed
 - c. Over-the-counter
 - d. Recreational
 - (1) Cocaine
 - 13. Allergies

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14. Family history
a. Stroke, heart disease, diabetes, hypertension
b. Age at death

15. Known cholesterol levels

IV. Detailed physical examination

A. Inspection

1. Tracheal position
 - a. Neck veins
 - (1) Appearance
 - (2) Pressure
 - (3) Clinical significance
 - b. Thorax
 - (1) Configuration
 - (a) A-P diameter
 - (b) Movement with respirations
 - (2) Clinical significance
 - c. Epigastrium
 - (1) Pulsation
 - (2) Distention
 - (3) Clinical significance

B. Auscultation

1. Breath sounds
 - a. Depth
 - b. Equality
 - c. Adventitious sounds
 - (1) Crackles
 - (2) Wheezes
 - (a) Gurgling
 - (b) Frothing (mouth and nose)
 - i) Blood tinged
 - ii) Foamy

C. Palpation

1. Areas of crepitus or tenderness
 2. Thorax
 3. Epigastrium
 - a. Pulsation
 - b. Distention

V. Electrocardiographic (ECG) monitoring

A. Wave forms

1. Origination
 2. Production
 3. Relationship of cardiac events to wave forms
 4. Intervals
 - a. Normal
 - b. Clinical significance

b. Clinic Segments

- ## 5. Segments Leads and electro

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- 2. Leads
 - a. Anatomic positions
 - b. Correct placement
 - 3. Surfaces of heart and lead systems
 - 4. Artifact
 - C. Standardization
 - 1. Amplitude (mV)
 - 2. Height (mm)
 - 3. Rate
 - D. Terminology
 - 1. Isoelectric
 - 2. Positive
 - 3. Negative
 - 4. Duration
 - 5. Segment
 - 6. Complex
 - 7. Interval
 - E. Calculation of ECG heart rate
 - 1. Regular rhythm
 - a. ECG strip method
 - b. "300" method
 - 2. Irregular rhythm
 - a. ECG strip method
 - b. "300" method
 - F. Lead systems and heart surfaces
 - 1. ECG rhythm analysis
 - a. Value
 - b. Limitations
 - G. Cardiac arrhythmias
 - 1. Approach to analysis
 - a. P wave
 - (1) Configuration
 - (2) Duration
 - (3) Atrial rate and rhythm
 - b. P-R (P-Q) interval
 - (1) Duration
 - (2) Clinical significance
 - c. QRS complex
 - (1) Configuration
 - (2) Duration
 - (3) Ventricular rate and rhythm
 - d. S-T segment
 - (1) Elevation
 - (2) Depression
 - (3) Clinical significance
 - e. Q-T interval
 - (1) Duration
 - (2) Implication of prolongation
 - f. Relationship of P waves to QRS complexes
 - (1) Consistent

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- (2) Progressive prolongation
(3) No relationship

g. T waves
h. U waves

2. Interpretation of the ECG

 - Origin of complex
 - Rate
 - Rhythm

3. Arrhythmias originating in the sinus node

 - Sinus bradycardia
 - Sinus tachycardia
 - Sinus arrhythmia
 - Sinus arrest

4. Arrhythmias originating in the atria

 - Premature atrial complex
 - Supraventricular tachycardia
 - Automatic atrial tachycardia
 - Multifocal atrial tachycardia
 - Atrial flutter
 - Atrial fibrillation
 - Atrial flutter or atrial fibrillation with junctional rhythm

5. Arrhythmias originating within the AV junction

 - First degree AV block
 - Second degree AV block
 - Narrow-complex QRS
 - Wide-complex QRS
 - Complete AV block (third degree block)
 - Narrow-complex QRS
 - Wide-complex QRS

6. Arrhythmias sustained or originating in the AV junction

 - AV nodal re-entrant tachycardia
 - Junctional escape rhythm
 - Accelerated junctional rhythm
 - Premature junctional complex
 - Junctional tachycardia

7. Arrhythmias sustained or originating because of an accessory pathway (by history)

 - Narrow-QRS complex tachycardia
 - Wide-QRS complex tachycardia
 - May be confused with ventricular tachycardia

8. Arrhythmias sustained or originating because of aberrant ventricular conduction

 - Wide-QRS complex tachycardia
 - May be confused with ventricular tachycardia

9. Arrhythmias originating in the ventricles

 - Idioventricular rhythm
 - Accelerated idioventricular rhythm
 - Premature ventricular complex (PVC)
 - R on T phenomenon
 - Paired/ couples
 - Multiformed
 - Frequent uniform

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- d. Ventricular tachycardia
 - (1) Monomorphic
 - (2) Polymorphic (including torsades de pointes)
 - e. Ventricular fibrillation
 - f. Ventricular standstill
 - g. Asystole
 - (1) Confirmation using at least two ECG leads

10. Abnormalities originating within the bundle branch system

11. Pulseless electrical activity (PEA)
 - a. Electrical mechanical dissociation
 - b. Mechanical impairments to pulsations/ cardiac output
 - c. Other possible causes

12. ECG changes due to electrolyte imbalances
 - a. Hyperkalemia
 - b. Hypokalemia

13. ECG changes in hypothermia

VI. Management of the patient with arrhythmias

A. Assessment

1. Symptomatic
 2. Hypotensive
 3. Hypoperfusion

B. Treatment

1. Mechanical interventions
 - a. Vagal maneuvers - if the heart rate is too fast
 - b. Stimulation - if heart rate is too slow
 - c. Precordial thump
 - d. Cough
 2. Pharmacological interventions (for example)
 - a. Aspirin
 - b. Atropine
 - c. Adenosine
 - d. Epinephrine
 - e. Furosemide
 - f. Lidocaine
 - g. Morphine
 - h. Nitroglycerin
 - i. Oxygen
 3. Electrical
 - a. Defibrillation
 - b. Transcutaneous pacing
 - (1) Implanted pacemaker functions
 - (a) Characteristics
 - (b) Pacemaker artifact
 - (c) ECG tracing of capture
 - (d) Failure to sense
 - i) ECG indications
 - ii) Clinical significance
 - (e) Failure to capture
 - i) ECG indications

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- ii) Clinical significance

(f) Failure to pace

i) ECG indications

ii) Clinical significance

4. Transport considerations

5. Psychological support/ communications strategies

a. Explanation for patient, family, significant others

b. Communication and transfer of data to the physician

VII. Chest pain that may be myocardial in origin

A. Define angina pectoris and myocardial infarction

 1. Epidemiology
 2. Precipitating causes

B. Morbidity/ mortality

 1. Not a self-limiting disease
 2. Chest pain may dissipate, but myocardial ischemia and injury can continue
 3. A single anginal episode may be a precursor to myocardial infarction
 4. May not be cardiac in origin
 5. Must be diagnosed by a physician
 6. Related terminology
 - a. Defined as a brief discomfort, has predictable characteristics, and is relieved promptly - no change in this pattern
 - b. Stable
 - (1) Occurs at a relative fixed frequency
 - (2) Usually relieved by rest and/ or medication
 - c. Unstable
 - (1) Occurs without fixed frequency
 - (2) May or may not be relieved by rest and/ or medication
 - d. Initial - first episode
 - e. Progressive - accelerating in frequency and duration
 - f. Preinfarction angina
 - (1) Pain at rest
 - (2) Sitting or lying down
 7. Other possible causes of chest pain
 - a. Cholecystitis
 - b. Aneurysm
 - c. Hiatal hernia
 - d. Pleurisy
 - e. Esophageal and gastrointestinal diseases
 - f. Pulmonary embolism
 - g. Pancreatitis
 - h. Respiratory infections
 - i. Aortic dissection
 - j. Pneumothorax
 - k. Herpes zoster (shingles)
 - l. Chest wall tumors
 - m. Blunt trauma

C. Initial assessment findings

 1. Level of consciousness
 - a. Anxiety and restlessness

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- b. Near syncopal episodes
 - c. Fatigue
 - d. Vertigo
 - 2. Airway/ breathing
 - a. Labored breathing may or may not be present
 - 3. Circulation
 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture

D. Focused history

 - 1. Chief complaint
 - a. Angina - typically sudden onset of discomfort, usually of brief duration, lasting three to five minutes, maybe five to 15 minutes; usually relieved by rest and/ or medication
 - b. Myocardial infarction - may be sudden onset, lasting more than five minutes, unrelieved by rest and/ or medications
 - c. May be referred to as chest pressure
 - d. Epigastric pain or discomfort
 - e. Atypical
 - 2. Denial
 - 3. Contributing history
 - a. Onset
 - (1) Exertional
 - (2) Non-exertional
 - b. Initial recognized event
 - c. Recurrent event
 - d. Increasing frequency and/ or duration of event
 - e. Prior use of nitroglycerin
 - f. Prior use of aspirin
 - g. Other medications
 - (1) Prescribed
 - (2) Borrowed
 - (3) Over-the-counter
 - h. Allergy to medications

E. Detailed physical exam

 - 1. Airway
 - 2. Breathing
 - a. May or may not be labored
 - (1) Sounds
 - (a) May be clear to auscultation
 - (b) May be congested in the bases
 - 3. Circulation
 - a. Alterations in heart rate and rhythm may occur
 - b. Peripheral pulses are usually not affected
 - c. Blood pressure may be elevated during the episode and normalize afterwards
 - d. ECG Devices

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- (1) Monitor
 - (2) Transmission
 - (3) Documentation
 - (4) Computerized pattern identification
 - (a) Pitfalls
 - (b) Common errors
 - (5) Findings
 - (a) ST segment changes are often not specific
 - (b) Arrhythmias and ectopy may not be present

F. Management

1. Position of comfort
 2. Pharmacological interventions(for example)
 - a. Oxygen
 - b. Aspirin
 - c. Nitroglycerin
 - d. Morphine

3. ECG

- Transport considerations

 1. Sense of urgency for reperfusion
 - a. No relief with medications
 - b. Hypotension/ hypoperfusion

H. Psychological support/ communications strategies

- Explanation for patient, family, significant others
 - Communication and transfer of data to the physician

VIII. Cardiac arrhythmias

A. Common management modalities

1. Assessment of LOC, airway, breathing, and circulation (ABCs)
 2. High flow oxygen
 3. Question medical and medication history, allergies
 4. Communicate with the physician
 5. Intravenous (IV) access
 6. Consider aspirin
 7. Pain management
 - a. Nitroglycerin
 - b. Morphine
 8. Transport considerations common to all conditions
 9. Psychological support/ communication strategies common to all conditions
 - a. Explanation for patient, family, significant others
 - b. Communication and transfer of data to the physician

B. Tachycardias, narrow-QRS complex

1. Sinus tachycardia
 - a. Management - ABCs, oxygen (as in VIII. A.)
 - b. Identify and treat the cause - e.g., fever, pain, anxiety, anger
 - c. Transport and support (as in VIII.A.8.and 9)
 2. Supraventricular tachycardia
 - a. Management - ABCs, oxygen (as in VIII. A.)
 - (1) Vagal maneuvers
 - (2) Consider adenosine
 - (a) Ventricular rate greater than 150

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- (b) Use with caution, if at all, in atrial flutter

 - i) Fear of catastrophic event resulting from acceleration of ventricular rate, that is, from 2:1 to 1:1 conduction
 - ii) Every attempt must be taken to clarify that the patient is not in atrial flutter

(c) When in doubt, do not use adenosine

 - b. Transport and support (as in VIII.A.8.and 9)
 - 3. Wide-complex (see Ventricular Tachycardia)
 - 4. Bradycardia
 - 5. Narrow complex
 - a. Sinus
 - b. Junctional
 - c. AV blocks
 - 6. Management - ABCs, oxygen (as in VIII. A.)
 - a. Consider atropine if symptomatic, hypotensive and hypoperfusing
 - (1) Transport and support (as in VIII.A.8.and 9)
 - 7. Wide complex
 - a. May have a preexisting complication (identified by history)
 - (1) Accessory pathway
 - (2) Bundle branch block
 - b. New onset
 - (1) AV blocks
 - 8. Management - ABCs, oxygen (as in VIII. A)
 - a. Atropine may be contraindicated
 - 9. Transport for pacemaker
 - 10. Support (as in VIII.A.9)

C. Ventricular arrhythmias

 - 1. Ectopics (PVCs)
 - a. Management - ABCs, oxygen (as in VIII. A)
 - b. Consider lidocaine
 - c. Transport and support (as in VIII.A.8.and 9)
 - 2. Ventricular tachycardia
 - a. Stable, LOC, blood pressure not impaired
 - (1) Management- ABCs, oxygen, (as in VIII. A)
 - (2) Consider lidocaine
 - (3) Consider adenosine
 - (4) Transport and support (as in A.VIII.A. 8. and 9)
 - b. Unstable
 - (1) LOC altered, diminished, or unresponsive
 - (2) Chest pain/ pressure
 - (3) Consider sedation
 - (4) Consider defibrillation
 - (5) Transport and support (as in A.VIII.A. 8. and 9)
 - c. Pulseless
 - (1) Defibrillation as soon as possible
 - (2) Transport and support (as in A.VIII.A. 8. and 9)
 - 3. Ventricular fibrillation
 - a. Management
 - (1) Confirm pulselessness
 - (2) Cardiopulmonary resuscitation (CPR) until defibrillation is available

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- (a) Confirm pulses with CPR
 - (b) High flow oxygen
 - i) Bag-valve-mask
 - ii) Intubate
 - (3) Defibrillation as soon as possible
 - (a) Energy dosage
 - i) In accordance with local medical protocol
 - ii) In accordance with type and model of defibrillator
 - (4) Medications (for example)
 - (a) Epinephrine
 - (b) Lidocaine
 - (5) Transport and support (as in A.VIII.A. 8. and 9)

D. Pulseless electrical activity (PEA)

1. Management

- a. Confirm pulselessness
 - b. Cardiopulmonary resuscitation (CPR)
 - c. Confirm pulses with CPR
 - d. High flow oxygen
 - (1) Bag-valve-mask
 - (2) Intubation
 - e. Monitor ECG
 - (1) Basic ECG rhythm, sinus, atrial, junctional, AV blocks
 - (2) Ventricular rate
 - f. Intravenous fluids
 - (1) Fluid challenge
 - (a) Normal saline
 - (b) Lactated ringer's
 - g. Pharmacological interventions (for example)
 - (1) Epinephrine
 - (2) Atropine if rhythm is bradycardic
 - h. Attempt to identify and treat the cause (for example)
 - (1) Hypovolemia
 - (2) Pneumothorax
 - (3) Tamponade
 - (4) Hypothermia
 - (5) Pulmonary embolus
 - (6) Drug overdose

2. Transport and support (as in A.VIII.A. 8. and 9)

E. Asystole (confirmed in a second ECG lead)

1. Management

- a. Cardiopulmonary resuscitation (CPR)
 - b. Confirm pulses with CPR
 - c. Airway management
 - (1) High flow oxygen
 - (2) Bag-valve-mask
 - (3) Intubation
 - d. Monitor ECG
 - (1) Basic ECG rhythm, sinus, atrial, junctional, AV blocks
 - (2) Ventricular rate
 - e. Intravenous fluids

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2. Transport and support (as in A.VIII.A. 8. and 9)

f. Attempt to identify and treat the cause (for example)

 - (1) Hypovolemia
 - (2) Pneumothorax
 - (3) Tamponade
 - (4) Hypothermia
 - (5) Hyperkalemia
 - (6) Hypokalemia
 - (7) Drug overdose

f. Pharmacologic (for example)

 - (1) Epinephrine
 - (2) Atropine

f. Fluid challenge

 - (a) Normal saline
 - (b) Lactated ringer's

2. Transport and support (as in A.VIII.A. 8. and 9)

IX. Complications of cardiovascular compromise

- A. Define pulmonary edema
 - B. Epidemiology
 - 1. Precipitating causes
 - a. Left-sided failure
 - b. Right-sided failure
 - c. Myocardial infarction
 - d. Pulmonary embolism
 - e. Hypertension
 - f. Cardiomegaly
 - 2. Related terminology
 - a. Preload
 - b. Afterload
 - c. Congestive heart failure
 - (1) Loss of contractile ability which results in fluid overload
 - d. Chronic versus acute
 - (1) First time event
 - (2) Multiple events

C. Morbidity/ mortality

1. Pulmonary edema
 2. Respiratory failure
 3. Death

D Initial assessment

- ## **Initial assessment**

 - 1. Airway/ breathing**

3. Circulation

2. Circulation

 - a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture

E. Focused history

A decorative horizontal border consisting of a repeating pattern of small, dark, curved shapes, possibly representing stylized leaves or petals, arranged in a continuous line across the page.

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1. Chief complaint
 - a. Progressive or acute SOB
 - b. Progressive accumulation of edema
 - c. Weight gain over short period of time
 - d. Episodes of paroxysmal nocturnal dyspnea
 - e. Medication history
 - (1) Prescribed
 - (a) Compliance
 - (b) Non-compliance
 - (2) Borrowed
 - (3) Over-the-counter
 - f. Home oxygen use
 - F. Detailed physical exam
 1. Level of consciousness
 - a. Unconscious
 - b. Altered level of consciousness
 2. Airway/ breathing
 - a. Dyspnea
 - b. Productive cough
 - c. Labored breathing
 - (1) Most common, often with activity
 - (2) Paroxysmal nocturnal dyspnea (PND)
 - (3) Tripod position
 - (4) Adventitious sounds
 - (a) Wheezing
 - (b) Rales
 - (5) Frothy sputum
 - (6) Retraction
 - (7) Cyanosis in advanced stages
 3. Circulation
 - a. Heart rate/ rhythm
 - (1) Rapid, "thready" pulse
 - (2) Any tachycardia with ectopy
 - (3) Any bradycardia with ectopy
 - (4) Atrial arrhythmias
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture
 - c. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - d. Edema
 - (1) Pitting versus non-pitting
 - (2) Extremities
 - (a) Localized in ankles
 - (b) To the midcalf
 - (c) To the knees
 - (d) Obliteration of pulses
 - (3) Ascites

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(4) Sacral

G. Management

1. Position of comfort
 2. Pharmacological interventions (for example)
 - a. Oxygen
 - b. Nitroglycerin
 - c. Lasix
 - d. Morphine

H. Transport considerations

I. Psychological support/ communications strategies

1. Explanation for patient, family, significant others
 2. Communication and transfer of data to the physician

X. Hypertensive emergencies

A. Define hypertensive emergencies

B. Epidemiology

1. Precipitating causes
 - a. History of hypertension
 - b. Non-compliance
 - c. Toxemia of pregnancy

C. Morbidity/ mortality

1. Hypertensive encephalopathy
 2. Stroke

D. Initial assessment

1. Airway/ breathing
 - a. Labored breathing may or may not be present

2. Circulation

- a. Peripheral pulses
 - (1) Quality
 - (2) Rhythm
 - b. Changes in skin
 - (1) Color
 - (2) Temperature
 - (3) Moisture

E. Focused history

1. Chief complaint
 2. As in precipitating causes above
 3. Medication history
 - a. Prescribed
 - (1) Compliance
 - (2) Non-compliance
 - b. Borrowed
 - c. Over-the-counter
 4. Home oxygen use

E 4. Home oxygen use Detailed physical examination

1. Airway
 2. Breath sounds
 3. Circulation
 - a. Pulse
 - b. Vital signs

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- (1) Blood pressure
(a) Systolic greater than 160 mmHg
(b) Diastolic greater than 94 mmHg

4. Diagnostic signs/ symptoms
a. General appearance
b. Level of consciousness
(1) Unconscious
(2) Altered level of consciousness
(3) Responsive
c. Skin color
d. Skin temperature
e. Skin hydration
f. Peripheral pulses
g. Edema
h. Paroxysmal nocturnal dyspnea
i. Labored breathing (SOB)
j. Orthopnea
k. Vertigo
l. Epistaxis
m. Tinnitus
n. Changes in visual acuity
o. Nausea/ vomiting
p. Seizures

G. Management
1. Pharmacological interventions
a. Oxygen
2. Non-pharmacological interventions
a. Position of comfort
b. Airway and ventilation
3. Transport considerations
4. Psychological support/ communications strategies
a. Explanation for patient, family, significant others
b. Communication and transfer of data to the physician

XI. Cardiogenic Shock

- A. Define cardiogenic shock
 - B. Epidemiology
 1. Differential from hypovolemic shock by one or more of the following
 - a. Chief complaint (chest pain, dyspnea, tachycardia)
 - b. Heart rate (bradycardia or excessive tachycardia)
 - c. Signs and symptoms of congestive heart failure
 - d. Arrhythmias
 - C. Morbidity/ mortality
 - D. Initial assessment
 - E. Focused History
 1. Chief complaint
 - a. As in precipitating causes above
 - b. Chest pain
 - c. Dizziness

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- d. Syncopal episodes
 - 2. Medication history
 - a. Prescribed
 - (1) Compliance
 - (2) Non-compliance
 - b. Borrowed
 - c. Over-the-counter
 - F. Detailed physical exam
 - 1. Level of consciousness
 - a. Altered level of consciousness
 - b. Unresponsive
 - 2. Airway
 - a. Dyspnea
 - b. Productive cough
 - c. Labored breathing
 - (1) Paroxysmal nocturnal dyspnea (PND)
 - (2) Tripod position
 - (3) Adventitious sounds
 - (4) Retractions
 - 3. ECG rhythm analysis
 - a. Any tachycardia
 - b. Atrial arrhythmias
 - c. Ectopics
 - 4. Skin condition
 - 5. Edema
 - a. Pedal pulses may be obliterated
 - b. Pretibial
 - c. Sacral
 - d. Other anatomical locations
 - 6. Circulation
 - a. Peripheral pulses
 - (1) Bradycardia
 - (2) Tachycardia
 - (3) Weak/ “thready”
 - G. Management
 - 1. Position of comfort
 - a. May prefer sitting upright with legs in dependent position
 - 2. Pharmacological interventions (for example)
 - a. Oxygen
 - b. Nitroglycerin
 - c. Lasix
 - d. Antiarrhythmic as indicated
 - e. Fluid therapy
 - 3. Transport considerations
 - 4. Psychological support/ communications strategies
 - a. Explanation for patient, family, significant others
 - b. Communication and transfer of data to the physician

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XII. Cardiac arrest

A. Precipitating causes

1. Trauma
 2. Medical conditions (for example)
 - a. End stage renal disease
 - b. Hyperkalemia with renal disease
 - c. Hypothermia
 3. Pediatric/ neonatal
 4. Other

4. Geriatric

B. Morbidity and mortality

- Initial assessment**

 1. Critical findings
 - a. Unresponsive
 - b. Apneic
 - c. Pulseless
 - d. Heart rate/ rhythm
 - (1) Ventricular fibrillation
 - (2) Ventricular tachycardia
 - (3) Asystole
 - (4) PEA

D. Focused history

1. Witnessed event
 2. Witnessed by EMS personnel
 3. Bystander cardiopulmonary resuscitation (CPR)
 4. Time from discovery to activation of CPR
 5. Time from discovery to activation of EMS
 6. Past medical history

E. Management

1. Related terminology
 - a. Resuscitation - to provide efforts to return spontaneous pulse and breathing to the patient in full cardiac arrest
 - b. Survival - patient is resuscitated and survives to hospital discharge
 - c. Return of spontaneous circulation (ROSC) - patient is resuscitated to the point of having pulse without CPR; may or may not have return of spontaneous respirations; patient may or may not go on to survive
 2. Indications for NOT initiating resuscitative techniques
 - a. Signs of obvious death
 - (1) Rigor, fixed lividity, decapitation
 - b. Local protocol
 - (1) Out-of-hospital advance directives
 3. Airway and ventilatory support
 - a. High flow oxygen
 - (1) Bag-valve system
 - (2) Intubation
 4. Circulatory support
 - a. CPR in conjunction with defibrillation
 - b. IV therapy
 5. Pharmacological interventions (for example)
 - a. Oxygen

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- F.

 - 6. Transport considerations
 - 7. Psychological support/ communications strategies
 - a. Explanation for patient, family, significant others
 - b. Communication and transfer of data to the physician
 - F. Termination of resuscitation
 - 1. Identify local protocols
 - 2. Criteria for inclusion (for example)
 - a. 18 years old or older
 - b. Arrest is presumed cardiac in origin and not associated with a condition potentially responsive to hospital treatment (e.g., hypothermia, drug overdose, toxicologic exposure)
 - c. Endotracheal intubation has been successfully accomplished and maintained
 - d. Standard advanced cardiac life support measures have been applied throughout the resuscitative effort
 - e. On-scene ALS resuscitation efforts have been sustained for 25 minutes or the patient remains in asystole through four rounds of appropriate ALS drugs
 - f. Patient has a cardiac rhythm of asystole or agonal rhythm at the time the decision to terminate is made and this rhythm persists until the arrest is actually terminated
 - g. Victims of blunt trauma in arrest whose presenting rhythm is asystole or who develop asystole while on scene
 - 3. Exclusion criteria - for example
 - a. Under the age of 18
 - b. Etiology for which specific in-hospital treatment may be beneficial
 - c. Persistent or recurrent ventricular tachycardia or fibrillation
 - d. Transient return of pulse
 - e. Signs of neurological viability
 - f. Arrest was witnessed by EMS personnel
 - g. Family or responsible party opposed to termination
 - 4. Criteria NOT to be considered as inclusionary or exclusionary
 - a. Patient age (e.g., geriatric)
 - b. Time of collapse prior to EMS arrival
 - c. Presence of a non-official do-not-resuscitate (DNR) order
 - d. Quality of life valuations
 - 5. Procedures (according to local protocol)
 - a. Direct communication with on-line medical direction
 - (1) Medical condition of the patient
 - (2) Known etiologic factors
 - (3) Therapy rendered
 - (4) Family present and apprised of the situation
 - (5) Communicate any resistance or uncertainty on the part of the family
 - (6) Maintain continuous documentation to include the ECG
 - (7) Mandatory review after the event
 - (a) Grief support (according to local protocol)
 - i) EMS assigned personnel
 - ii) Community agency referral
 - (b) Law enforcement (according to local protocol)
 - i) On-scene determination if the event/ patient requires

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- ii) assignment of the patient to the medical examiner
On-scene law enforcement communicates with attending physician for the death certificate
 - iii) If there is any suspicion about the nature of the death or if the physician refuses or hesitates to sign the death certificate
 - iv) No attending physician is identified (the patient will be assigned to the medical examiner)

XIII. Integration

- A. Apply pathophysiological principles to the assessment of a patient with cardiovascular disease
 - B. Formulation of field impression; decisions based on
 1. Initial assessment
 2. Focused history
 3. Detailed physical examination
 - C. Develop and execute a patient management plan based on field impression
 1. Initial management
 - a. Airway support
 - b. Ventilation support
 - c. Circulation support
 - d. Non-pharmacologic
 - e. Pharmacologic
 - f. Electrical
 2. On-going assessment
 3. Transport Decisions
 - a. Appropriate mode
 - b. Appropriate facility
 4. Non-transport criteria
 5. Advocacy
 6. Communications
 7. Prevention
 8. Documentation
 9. Quality assurance

Medical: 5

Cardiovascular Emergencies: 2

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