Chapter 24
Cardiovascular Emergencies

Chapter Goal
- Use assessment findings to formulate field impression and implement and evaluate management plans for patient experiencing a cardiac emergency

Learning Objectives
- Describe incidence, morbidity, & mortality of CV disease
- Discuss prevention strategies to reduce morbidity & mortality of CV disease
- Identify risk factors most predisposing to coronary artery disease (CAD)
- Identify & describe components of focused history as it relates to CV patient
- Define defibrillation
Learning Objectives

- List clinical indications for defibrillation
- Identify specific mechanical, pharmacological, & electrical therapeutic interventions for patients with dysrhythmias
- Define angina pectoris, acute coronary syndrome, & myocardial infarction (MI)
- List other clinical conditions mimic signs & symptoms of angina pectoris & MI

Learning Objectives

- List mechanisms by which MI may be produced by traumatic & nontraumatic events
- List & describe assessment parameters to be evaluated in patient with chest pain
- Identify what is meant by OPQRST of chest pain assessment
- List & describe initial assessment parameters to be evaluated in patient with chest pain that is myocardial in origin

Learning Objectives

- Identify anticipated clinical presentation of patient with chest pain attributed to angina pectoris or MI
- Based on pathophysiology & clinical evaluation, list anticipated clinical problems according to their life-threatening potential in patient with chest pain
- Describe pharmacological agents available for use in management of dysrhythmias & CV emergencies
- Describe “window of opportunity” pertaining to reperfusion of myocardial injury or MI
Learning Objectives

- Develop, execute, & evaluate treatment plans based on field impression for patient with chest pain indicative of angina or MI
- Define congestive heart failure (CHF) & pulmonary edema
- Define cardiac & noncardiac causes & terminology associated with CHF & pulmonary edema
- Describe early & late signs & symptoms of CHF

Learning Objectives

- Explain clinical significance of paroxysmal nocturnal dyspnea
- List & describe pharmacological agents available for management of cardiac compromise
- Define hypertensive emergency
- Describe clinical features of patient with a hypertensive emergency

Learning Objectives

- List interventions prescribed for hypertensive emergency patient
- Define cardiogenic shock
- Identify clinical criteria for cardiogenic shock
- Define cardiac arrest
- Describe incidence, morbidity, & mortality of cardiac arrest
- Define resuscitation
Learning Objectives

- Identify local protocols dictating circumstances & situations in which resuscitation would not be initiated
- Identify local protocols dictating circumstances & situations in which resuscitation would be discontinued
- Identify critical actions necessary in caring for patient in cardiac arrest
- Synthesize patient history & assessment findings to form field impression of patient with chest pain & cardiac dysrhythmias indicative of a cardiac emergency

Introduction

- Causes of cardiovascular emergencies:
  - Angina
  - Heart attack
  - CHF
  - Pulmonary edema
  - Cardiogenic shock
  - Dysrhythmia
  - Hypertensive emergency
  - Cardiac arrest

Epidemiology

- CVD—#1 killer
- 40% of all deaths
- 70 million Americans
- 1 in 4 males & females
**Epidemiology**
- Risk factors
  - Age
  - Family history
  - Hypertension
  - Lipids
  - Sex
  - Smoking
  - Diabetes mellitus
  - Diet
  - Obesity
  - Oral contraceptive use
  - Sedentary lifestyle
  - Personality type
  - Psychosocial tension

**Initial CV Assessment**
- LOC
- Breathing
- Circulation
- Skin
- BP

**Focused History**
- SAMPLE acronym
  - Signs & symptoms
  - Allergies
  - Medications
  - Pertinent past medical history
  - Last oral intake (fluid or solid)
  - Events leading to present situation
Focused History

- OPQRST
  - Onset
  - Provocation
  - Quality
  - Radiation/relief
  - Severity
  - Time

- Atypical cardiac pain
- Past medical history
- Medications

Detailed Physical Examination

- Inspection
  - Neck veins & trachea
  - Thorax
  - Epigastrium

Detailed Physical Examination

- Auscultation
  - Abnormal sounds
  - Chest auscultated
  - Four normal patterns
  - Adventitious lung sounds

- Palpation
Detailed Physical Examination

Cardiac Emergency Treatments

- Pharmacological interventions:
  - Adenosine
  - Amiodarone
  - Aspirin
  - Atropine
  - Epinephrine
  - Lidocaine
  - Morphine sulfate
  - Naloxone
  - Nitroglycerin
  - Vasopressin

- Mechanical interventions:
  - Vagal maneuvers
  - Stimulation
  - Precordial thump
  - Cough
  - CPR

Cardiac Emergency Treatments

- Electrical therapy
  - Defibrillation
    - Synchronized cardioversion
    - Successful defibrillation
    - Early defibrillation
    - Response times >4–5 min
    - Transthoracic resistance
Cardiac Emergency Treatments

- AED
  - First responders
  - 2 types:
    - Fully automatic
    - Semi-automatic
  - Precautions

Cardiac Emergency Treatments

- Operating AED
  - Perform initial assessment
  - Activate device

Cardiac Emergency Treatments

- Attach electrodes & pads
- Deliver number of shocks indicated
Cardiac Emergency Treatments

- Manual defibrillation
  - Automatic implantable defibrillator
  - Nitroglycerin patch
  - Safety & operational considerations
  - Synchronized cardioversion

Cardiac Emergency Treatments

- Apply gel pads to patient or conductive gel to defibrillator paddles
- Select appropriate energy level, charge defibrillator
Cardiac Emergency Treatments

- Apply paddles to correct locations

- "Stand clear"

Cardiac Emergency Treatments

Cardiac pacing
  - Transcutaneous pacing
  - General uses
  - Advantages
  - Drawbacks
  - Indications & contraindications
Cardiac Emergency Treatments

Proper electrode attachment

Cardiac Emergency Treatments

Cardiac Conditions

- Chest pain
  - Angina pectoris
    - Intermittent
    - Reduction in blood flow
    - Increased cardiac oxygen demand
    - Relieved by rest or nitroglycerin
Cardiac Conditions

- Chest pain
  - Heart attack
    - AMI
    - Death of heart muscle
    - Complete blockage
    - Angina & MI similar

Cardiac Conditions

Acute MI

Cardiac Conditions

Acute MI
Cardiac Conditions

- Chest pain
  - Other causes—nonischemic
  - Initial assessment findings
  - Focused history
  - Detailed physical examination
  - Management considerations

Cardiac Conditions: Management of AMI
Cardiac Conditions:

Administration of Nitroglycerin Tabs

- Obtain order; check expiration date
- Direct patient to lift tongue; place tablet under tongue

Cardiac Conditions:

Administration of Nitroglycerin Spray

- Spray 1 dose under tongue
- Reassess BP & symptoms

Cardiac Dysrhythmias

- Patients with pulse
  - Is patient stable or unstable?
  - Clinical approach
    - Assess ABCs
  - General management
    - Monitor cardiac rhythm
    - Treat the patient, not the monitor
    - Place patient in position of comfort
    - Administer supplemental O2
    - Initiate IV of normal saline TRO
    - Transport without delay
Cardiac Dysrhythmias

- Bradycardia
  - ↓ HR
  - ↓ Cardiac output
  - Unstable
    - Sinus bradycardia
    - Junctional escape
    - Idioventricular rhythm
    - Ventricular escape
    - AV heart block (2nd & 3rd degree)
- Definitive care
  - TCP
  - Atropine

Cardiac Dysrhythmias: Bradycardia

- Tachycardia
  - Stable patient usually will not require acute treatment
    - Narrow QRS
      - Sinus tachycardia
      - VT
      - Atrial fibrillation
      - Atrial flutter
    - Wide QRS
      - Stable monomorphic VT
      - Polymorphic VT
      - Stable wide-complex tachycardia
Cardiac Dysrhythmias

- Sinus tachycardia
  - Increased sympathetic tone
  - Causes:
    - Stress
    - Fever
    - Caffeine
    - Hypovolemia
  - Management
    - Treat cause

- Atrial & junctional tachycardias
  - ↓ Stroke volume
  - ↓ Coronary artery perfusion
  - Patient stable or unstable?
    - Unstable
      - Immediate synchronized cardioversion
    - Stable
      - Consider vagal maneuvers
      - Adenosine

- Atrial fibrillation/atrial flutter
  - May be chronic
  - Is patient symptomatic?
    - May require immediate cardioversion
      - If symptomatic >48hms dist may form; can precipitate stroke
Cardiac Dysrhythmias:
Narrow-QRS Tachycardia

Cardiac Dysrhythmias
- Ventricular tachycardia/torsades de pointes
  - Wide-complex
  - Pulseless
    - Treatment same as VF
  - Pulse present
    - Initiate IV
    - Prepare for defibrillation
    - Unstable
      - Perform immediate cardioversion (torsades de pointes—defib)
    - Stable
      - Administer antidysrhythmic
      - Consider cardioversion

Cardiac Dysrhythmias
- Premature beats
  - Originate in ventricles
  - Occur during regular rhythm
  - Causes
    - Ischemic heart disease
    - AMI
    - Hypokalemia
    - Hypoxemia
    - Drug or alcohol intoxication
  - Treatment
    - Correct underlying cause
    - Consider antidysrhythmic
Patients in Cardiac Arrest

- Precipitating causes:
  - Trauma
    - Bleeding
    - CNS injury
  - Adult patient
    - Myocardial ischemia—most common
    - Electrolyte abnormalities
    - Hypothermia
    - Drug overdose
    - Large pulmonary emboli
    - CNS hemorrhage
    - Occult GI bleeding
  - Children
    - Primary respiratory event—most common
    - Congenital heart problems

Patients in Cardiac Arrest

- Initial assessment
  - Assess ABCs
  - Identify rhythm
- Focused history
  - Witnesses or unwitnessed?
  - Time from patient discovery until CPR started
  - Time from patient discovery until EMS called
  - Patient’s past medical history
  - Advanced directives, DNR orders, or living will?

Patients in Cardiac Arrest

- General management principles
  - Terms
    - Resuscitation
      - Effort to return spontaneous circulation
    - Return of spontaneous circulation
      - Patient has pulse without CPR
        - Patient may or may not survive
    - Survival
      - Discharged from hospital neurologically intact
Patients in Cardiac Arrest

- General management principles (cont’d)
  - Indications for not initiating resuscitation
    - Signs of obvious death
    - Per local protocols
  - CPR
  - Manual ventilation
  - Vasoconstrictors
  - Rhythm or no rhythm?
    - Rhythm—defibrillate
    - Antiarrhythmics

Patients in Cardiac Arrest

- General management principles (cont’d)
  - Airway and ventilatory support
  - Circulatory support & continuous cardiac monitoring
  - Pharmacological interventions
  - Safe transport to nearest appropriate facility
  - Psychological support for patient & significant others
  - Communication to receiving institution

Patients in Cardiac Arrest

- Pulseless VT/VF

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Patients in Cardiac Arrest

Termination of resuscitation
- >18 yrs old
- Arrest cardiac in origin
- Advanced airway management accomplished
- BLS & ALS measures applied; patient remains in asystole/PEA
- Blunt trauma victim in arrest with asystole

Exclusions
- <18 yrs old
- Etiology that would benefit from hospital treatment
- Persistent VT/VF
- Transient return of pulse
- Signs of neurological viability
- Family objects to termination

Factors generally not considered
- Patient’s age
- Time of collapse before EMS arrival
- Presence of nonofficial DNR order
- Quality-of-life valuations
Patients in Cardiac Arrest

- Field termination of resuscitation
  - Communicate with on-line medical direction
  - Patient’s baseline medical condition
  - Known etiological factors
  - Therapy rendered
  - Whether family present & informed of situation
  - Continuous documentation
  - Involve law enforcement/ME per local protocol

CHF & Acute Pulmonary Edema

- Circulatory congestion
- Heart muscle damage
- Inadequate pumping
- Mild to severe/chronic or acute
- Causes:
  - Cardiomyopathy
  - Hypertension
  - Thyroid disease
  - Heart valve disease

CHF & Acute Pulmonary Edema

- Left-sided CHF
  - Pumping ability of left ventricle
    - Fluid backs up into lungs
      - Pulmonary congestion
    - If lungs fill lots of fluid
      - Pulmonary edema
  - Signs
    - Dyspnea
    - Pink, frothy sputum
    - Audible rates & wheezes
CHF & Acute Pulmonary Edema

- Right-sided CHF
  - Pumping ability of right ventricle
    - ↓ Resistance to flow through lungs
  - Causes:
    - Left-sided heart failure
    - Severe pulmonary disease
  - Resulting conditions:
    - Extremity and lower back edema
    - Ascites
    - Liver and spleen edema
    - Neck vein distention

CHF & Acute Pulmonary Edema

- Assess for:
  - Diaphoresis
  - Restlessness, anxiety
  - Dypsnea (PND, orthopnea)
  - JVD
  - Peripheral edema
  - Weakness, fatigue
  - Tachycardia
  - Chest pain
  - Cyanosis
  - ↑ Systolic pressure
  - Abnormal heart sounds (S₃ gallop)

CHF & Acute Pulmonary Edema

- Emergency care
  - Right-sided heart failure
    - Position patient in sitting position with legs dangling
    - Administer high-concentration O₂
    - Initiate IV of normal saline TKO
    - Monitor ECG
    - Monitor VS (including pulse oximetry)
Acute pulmonary edema

Pathophysiology
- ↓ Pumping in left ventricle → ↑ Left-sided filling pressure
- ↓ Left ventricular contractility from ischemia
- Fluid leaks from pulmonary capillaries into interstitial tissue & alveoli → Acute pulmonary edema

CHF & Acute Pulmonary Edema

Acute pulmonary edema

Clinical assessment
- Acute onset of dyspnea
- Diaphoresis, tachycardia, or anxiety
- Pink, frothy sputum
- Extraneous lung sounds
- Cyanosis—late sign
- May be hypertensive
- May have cardiac dysrhythmias
CHF & Acute Pulmonary Edema

- Acute pulmonary edema
  - Treatment
    - Position patient in sitting position with legs dangling
    - Suction if frothy secretions present
    - Administer high-concentration O₂
    - Prepare to assist ventilations
    - Administer NTG
    - Initiate IV of normal saline TKO
    - Administer furosemide
    - Administer morphine
    - Transport promptly

Cardiogenic Shock

- Profound failure of cardiac muscle
- Causes:
  - Severe MI
  - Severe heart failure
  - Cardiac valve muscle rupture
  - Trauma

Cardiogenic Shock

- Assess for:
  - Severe respiratory distress
  - Chest pain
  - Abnormal mental status
  - Peripheral vein collapse
  - Cold, clammy skin
  - Rapid, shallow respirations
  - Rapid, thready pulse
  - ↓ O₂ saturation
  - Do not rely on BP as indicator of shock
Cardiogenic Shock

- Emergency care
  - Call for more advanced cardiac response personnel
  - Secure & maintain patent airway
    * Intubate per local protocol
  - Administer high-concentration O₂
  - Initiate IV normal saline TKO
    * Administer fluid challenge per local protocol
    * Monitor VS, including SaO₂ q 5 min
    * Transport
    * Provide psychological support
    * Notify receiving facility

Hypertensive Emergencies

- Definition
  - Sudden ↑ in systolic BP, diastolic BP, or both

- Causes:
  - Drugs (e.g., cocaine)
  - Amphetamines & thyroid medicine toxicity
  - Acute heart failure
  - Pregnancy-induced hypertension
  - Acute kidney infection or abnormal kidney function
  - Intracranial event

Hypertensive Emergencies

- Pathophysiology
  - Brain loses ability for cerebral autoregulation
  - ↑ Cerebral blood flow → ↑ ICP
    * Headache
    * Dizziness
    * Vomiting
    * Visual disturbances
  - Stress on heart
    * Angina
    * MI
  - Stress on kidney
    * Renal failure
Hypertensive Emergencies

- Assess for:
  - Markedly ↑ BP
  - Severe headache or dizziness
  - ↓ Level of responsiveness
  - Visual disturbances
  - Nausea or vomiting
  - Chest pain, dyspnea
  - Nosebleed

Hypertensive Emergencies

- Emergency care
  - Maintain patent airway
  - Administer high-concentration O₂
  - Initiate IV normal saline TKO
  - Monitor ECG rhythm
  - Monitor VS, including SaO₂, q 5 min
  - Transport
  - Provide psychological support
  - Notify receiving facility

Aortic Aneurysm

- Dissecting thoracic aortic aneurysm
  - Blood enters tear in intimal lining
    - Walls of aorta tear apart
    - Pericardial tamponade, AMI, stroke possible
  - Key symptoms: excruciating pain from anterior chest down toward back
    - Often described as tearing sensation between shoulder blades
  - Physical exam findings vary
    - Possible asymmetry of pulses
    - May mimic stroke
    - May be ↓ or absent femoral pulse on one side
    - Leg, foot, or toe may be white or cyanotic & cooler than other side
Aortic Aneurysm

Dissecting thoracic aortic aneurysm

Ruptured/leaking abdominal aortic aneurysm

Symptoms:
- Sudden onset of back and/or abdominal pain radiating to scrotum
- Nausea/vomiting
- Signs of shock
- Possible pulsating mass
- Possible ↓ femoral pulses
- Possible blue scrotum sign

Aortic Aneurysm

Management

- Priority patient; gentle but rapid transport
- Maintain patent airway
- Administer high-concentration O₂
- Initiate 102 large-bore IVs of normal saline
  - TKO if BP >90 mm Hg
- Monitor ECG rhythm
- Monitor VS, including SaO₂ & peripheral pulses, q 5 min
- Keep patient calm
Pulmonary Embolism

- Occlusion in small vessel of lung periphery
- Massive pulmonary emboli occlude branches of pulmonary arteries causing blood to pump against high pressures
  - Results in right-sided heart failure
    - Cor pulmonale

Pulmonary Embolism

- Risks
  - Sedentary lifestyle
  - Obesity
  - Thrombophlebitis
  - Use of oral contraceptives
  - Recent long bone fracture
  - Pregnancy
  - Surgery
  - Blood disease

Pulmonary Embolism

- Signs & symptoms
  - Massive emboli:
    - Syncope spell
    - Cardiac arrest
  - Smaller emboli:
    - Sudden, unexplained onset of chest pain
    - Respiratory distress
    - Wheezing or hemoptysis
    - Anxiety
    - Shock
    - Hypotension
    - May mimic pneumonia, MI, or spontaneous pneumothorax
Pulmonary Embolism

- Management
  - Maintain patent airway
  - Intubate if necessary
  - Administer high-concentration O₂
  - Monitor ECG rhythm
  - Place patient in position of comfort
  - Monitor VS q 5 min
  - Transport

Summary

- Cardiovascular disease is common cause of medical problems

- Angina is chest pain & related symptoms caused by lack of O₂ in heart muscle

- Patients with angina complain of substernal chest pain

Summary

- Heart attack occurs when blood flow through coronary artery is completely blocked

- Cardiac dysrhythmias that occur during cardiac arrest:
  - VF
  - VT
  - Asystole/PEA

- For VF/pulseless VT—shock once, then perform 2 min of CPR
Summary

- Epinephrine is most commonly used cardiac drug
- Field termination of resuscitation is becoming more widespread
- Cardiogenic shock occurs when >40% of myocardium is unable to effectively pump blood; most common cause is AMI

Summary

- General care for patients suspected of experiencing AMI: O₂, IV, ECG, & transport
- Do not use “emergency mode” transport unless patient’s condition deteriorates
- CHF is circulatory congestion due to inadequate flow of blood

Summary

- Patients with CHF have shortness of breath that is worse when patient is lying down; may awaken patient at night
- Hypertensive emergency is sudden ↑ in BP, which results in functional disturbances of CNS, heart, or kidneys
- Patients with hypertensive crisis have markedly elevated BP