Objectives

1. Define key terms introduced in this chapter.
2. Describe the relationship between chest pain or discomfort, heart disease, and cardiac arrest (slide 44).

Objectives

3. Describe the structure and function of the circulatory system, including (slides 14-27):
   a. The cardiac conduction system
   b. Conductive tissue and conductivity
   c. Contractile tissue and contractility
   d. Automaticity
   e. Effects of the autonomic nervous system (sympathetic and parasympathetic) on the heart
   f. Gross anatomy of the heart
   g. Systemic and pulmonary circulation
   h. Coronary arteries
   i. Plasma and formed elements of the blood
4. Explain the relationship between electrical and mechanical events in the heart (slides 28-30).
Objectives

5. Describe the processes of depolarization and repolarization, and relate the waves and intervals of a normal electrocardiogram (ECG) to the physiological events they represent (slide 29).

6. Discuss the relationship between hypoxia, damage to the cardiac conduction system, premature ventricular contractions, ventricular tachycardia, and ventricular fibrillation (slide 30).

7. Describe the roles of the heart and blood vessels in maintaining normal blood pressure (slides 31-34).

8. Explain the importance of early recognition of signs and symptoms and the early treatment of patients with cardiac emergencies (slides 35-36).

9. Explain the pathophysiology and the appropriate assessment and management of the following conditions that may be classified as cardiac compromise or acute coronary syndrome (slides 40-63):
   a. Angina pectoris
   b. Myocardial infarction
   c. Aortic aneurysm or dissection
   d. Congestive heart failure
   e. Cardiogenic shock
   f. Hypertensive emergencies
   g. Cardiac arrest

10. Explain the typical presentation of myocardial ischemia or infarction in females (slide 49).

11. Explain the indications, contraindications, forms, dosage, administration, actions, side effects, and reassessment for nitroglycerin (slides 65-66).

12. Explain the special considerations in assessing and managing pediatric and geriatric patients with cardiac emergencies (slides 67-72).

13. Explain the assessment-based approach to assessment and emergency medical care for cardiac compromise and acute coronary syndrome (slides 74-83).

14. Discuss the indications and contraindications for fibrinolytic therapy in patients with cardiac emergencies (slides 78-79).
Objectives

15. Given a series of scenarios, demonstrate the assessment-based management of a variety of patients with cardiovascular emergencies, including: Explain the indications, contraindications, forms, dosage, administration, actions, side effects, and reassessment for aspirin (slides 80-83).

Multimedia Directory

Slide 30  Explanation of Some Cardiac Rhythms Animation
Slide 39  Coronary Artery Disease Video
Slide 42  Understanding Coronary Heart Disease Video
Slide 45  Angina Pectoris and Nitroglycerin Video
Slide 48  Understanding Myocardial Infarctions Video
Slide 64  Understanding Dysrhythmias Video
Slide 70  Understanding Congenital Heart Defects Animation
Slide 84  Information about AEDS Video
Slide 85  Understanding Ventricular Fibrillation Video

Topics

- Review of the Circulatory System Anatomy and Physiology
- Cardiac Compromise and Acute Coronary Syndrome (ACS)
- Nitroglycerin
- Age-Related Variations: Pediatrics and Geriatrics
- Assessment and Care: General Guidelines
Dispatch

EMS Unit 23

Respond to 321 Congress Street, Reali’s Restaurant for a 49-year-old male with chest discomfort.

Time out 1735

Upon Arrival

- Patient found seated at a table, clutching his chest
- Patient's name is Paul Antak
- "I feel like someone is standing on my chest"
How would you proceed to assess and care for this patient?

Review of the Circulatory System Anatomy and Physiology

The Circulatory System

The Conduction System
The Conduction System

The Circulatory System

The Heart

The Heart
The Circulatory System

The Vessels

Major Arteries and Veins

Coronary Arteries

Right coronary artery

Apex (interior)
Anterior descending branch
The Circulatory System

The Blood

Components of Blood

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Number (per mm³ of blood)</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythrocytes (red blood cells)</td>
<td>4-6 million</td>
<td>Transport oxygen and help transport carbon dioxide</td>
</tr>
<tr>
<td>Leukocytes (white blood cells)</td>
<td>6000-11,000</td>
<td>Defense and immunity</td>
</tr>
<tr>
<td>Platelets</td>
<td>290,000-350,000</td>
<td>Blood clotting</td>
</tr>
</tbody>
</table>

Clot Formation

- Thrombus
- Platelets
- Thrombin
- Fibrin
The Electrocardiogram

- Depolarization
- Repolarization
- P wave
- QRS complex
- T wave

Explanation of Some Cardiac Rhythms

Click here to view an animation and explanation of some cardiac rhythms.
Blood Pressure

- Systolic blood pressure
- Diastolic blood pressure

Inadequate Circulation
Cardiac Compromise and Acute Coronary Syndrome (ACS)
Atherosclerosis

- Arteriosclerosis
- Atherosclerosis
- Coronary artery disease (CAD)

Coronary Artery Disease

Click here to view a video on the topic of coronary artery disease.

Return to Directory
Acute Coronary Syndrome

Back to Objectives

- Unstable angina
- Myocardial infarction
- Myocardial ischemia

Understanding Coronary Heart Disease

Click here to view a video on the topic of understanding coronary heart disease.

Return to Directory
Acute Coronary Syndrome

Angina Pectoris

• Pathophysiology
• Assessment

Angina Pectoris and Nitroglycerin

Click here to view a video on the topic angina pectoris and nitroglycerin.

Return to Directory
Emergency Medical Care

- ABCs
- O₂
- Pulse oximeter
- Nitroglycerin (if prescribed)
- Aspirin
- ALS

Acute Coronary Syndrome

Acute Myocardial Infarction

Understanding Myocardial Infarctions

Click here to view a video on the topic of understanding myocardial infarctions.

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### Acute Myocardial Infarction

<table>
<thead>
<tr>
<th>Angina Pectoris</th>
<th>Myocardial Infarction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of Discomfort</td>
<td>Subternal or across chest</td>
</tr>
<tr>
<td>Radiation of Discomfort</td>
<td>Neck, jaw, arms, back, shoulders</td>
</tr>
<tr>
<td>Nature of Discomfort</td>
<td>Dull or heavy discomfort with a pressure or squeezing sensation</td>
</tr>
<tr>
<td>Duration</td>
<td>Usually 2 to 15 minutes, subsides after activity stops</td>
</tr>
<tr>
<td>Other symptoms</td>
<td>Usually none</td>
</tr>
<tr>
<td>Precipitating Factors</td>
<td>Extremes in weather, exertion, stress, meals</td>
</tr>
<tr>
<td>Factors Giving Relief</td>
<td>Stopping physical activity, reducing stress, nitroglycerin</td>
</tr>
</tbody>
</table>

### Emergency Medical Care

- ABCs
- O₂
- Pulse oximeter
- Nitroglycerin (if prescribed)
- Aspirin
- ALS
- Reassess

### Acute Coronary Syndrome

**Aortic Aneurysm or Dissection**
Aortic Aneurysm

Causes

Signs

Symptoms

Aortic Dissection

Causes

Signs

Symptoms

Other Causes of Cardiac Compromise

Heart Failure
Heart Failure

- Pathophysiology
- Cardiogenic shock
- Signs and symptoms

Normal cardiac output
Normal blood pressure

Decreased cardiac output
Decreased blood pressure

Aorta

Normal heart

Left ventricular hypertrophy

Congestive Heart Failure

- Cause
- Acute versus chronic
- Edema

Assessment of Heart Failure

- Mild to severe confusion.
- Cyanosis.
- Tachypnea.
- May cough up pink sputum.
- Low, normal, or high blood pressure.
- Rapid heart rate.
- A desire to sit upright.
- Anxiety.
- Distended neck veins. (Late)
- Crackles.
- Shortness of breath (dyspnea).
- Pale, cool, clammy skin.
- Abdominal distention.
- Pedal and lower extremity edema.

Don't have art yet - wds

Need figure 17 - 12

19/01/2013
Emergency Medical Care

- ABCs
- O₂
- Nitroglycerin (if prescribed)
- Reassess

Other Causes of Cardiac Compromise

Hypertensive Emergencies

- Pathophysiology
- Assessment
Other Causes of Cardiac Compromise

Cardiac Arrest

• ABCs
• $O_2$
• Pulse oximeter
• Semi-Fowler’s
• ALS
Understanding Dysrhythmias

Click here to view a video on the topic of understanding dysrhythmias.

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Nitroglycerin

Back to Topics

- Indications
- Contraindications
- Forms
- Administration
- Side effects

Back to Objectives
Pediatric Considerations

- Congenital condition
- Typically respiratory in nature
Understanding Congenital Heart Defects

Click here to view a video on the topic of congenital heart defects.

Return to Directory

Geriatric Considerations

- Watch for deterioration
- Past medical history significant
Assessment and Care: General Guidelines

Assessment-Based Approach: Cardiac Compromise and Acute Coronary Syndrome

Scene Size-Up and Primary Assessment

Back to Objectives
Assessment-Based Approach: Cardiac Compromise and Acute Coronary Syndrome

Secondary Assessment

Secondary Assessment

History
- Onset
- Provocation
- Quality
- Radiation
- Severity
- Time

Fibrinolytics

- Purpose
- Indications
- Contraindications

Back to Objectives
Physical exam
Baseline vital signs
Signs and symptoms

Assessment-Based Approach:
Cardiac Compromise and Acute Coronary Syndrome

Emergency Medical Care

- O₂
- Position of comfort
- Nitroglycerin (if prescribed)
- Aspirin
- ALS
Assessment-Based Approach: Cardiac Compromise and Acute Coronary Syndrome

Reassessment

Continually reassess for changes.

Information about AEDS

Click here to view a video on the topic of AEDS.

Return to Directory
CASE STUDY

Primary Assessment

- “I feel like someone is standing on my chest.”
- Alert and oriented
- Rapid, adequate breathing
- $O_2$ started at 15 lpm via nonrebreather mask
- Skin pale, cool, and slightly moist
- No sign of other injuries

Follow-Up
CASE STUDY

Secondary Assessment

- O: sudden onset
- P: nothing makes it better or worse
- Q: dull, squeezing pain; radiating to left arm
- S: 8/10
- T: 20 minutes ago

CASE STUDY

Secondary Assessment

- S: chest discomfort, irregular pulse, sweaty and pale skin
- A: none
- M: medication for HTN and nitroglycerin
- P: HTN
- L: in the middle of a meal
- E: started while eating his meal

CASE STUDY

Physical Exam

- Pupils equal and responsive
- No JVD
- Clear, equal bilateral breath sounds
- BP: 180/110 mmHg; P: 98 irregular; RR: 28; SpO2: 98 percent on O2
- Medical direction gives permission to assist in administration of nitroglycerin and aspirin
**CASE STUDY**

**Physical Exam**
- Patient becomes unresponsive, pulseless, and apneic

---

**CASE STUDY**

**Treatment and Reassessment**
- Move patient to floor; apply AED, indicates a shockable rhythm
- ALS called
- Patient defibrillated; CPR started, five cycles of 30:2
- After two minutes a palpable carotid and radial pulse; patient still unresponsive

---

**CASE STUDY**

**Treatment and Reassessment**
- ALS arrives: “Where are you with your cardiac arrest management?”
- ALS performs
  - Advanced airway management
  - IV access
  - Medication administration
CASE STUDY

Treatment and Reassessment

• BP: 102/84mmHg, P: 102 irregular, RR: 10 assisted
• Arrive at hospital
• ED continues post-resuscitation care

Critical Thinking Scenario

• 46-year-old female reported to have anxiety and tingling in her fingers
• Arrive on scene at an office building
• The woman’s supervisor greets you first and tells you the patient was at her desk, began feeling nauseated and short of breath, and then broke out in a sweat and became pale
• Her coworkers became concerned and called 911

Critical Thinking Scenario

• The patient appears nervous
• She states she’s been under tremendous stress lately. She is extremely tired and woke up last night with a dull aching pain in her back and chest
• She has no known medical history and is taking no medications
Critical Thinking Scenario

Vital signs:
• BP: 102/70 mmHg
• HR: 110 bpm
• RR: 28 times per minute
• SpO$_2$: 94 percent
• Skin is pale, cool, and clammy

Critical Thinking Questions

1. Do her vital signs concern you?
2. Would you consider withholding oxygen delivery with this patient?
3. Explain how this patient may be having non-classical signs of myocardial ischemia.
4. What is your treatment plan for this patient?

Reinforce and Review

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