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Objectives

• To understand the physiology of the:
  – Cardiovascular system
  – Respiratory System
  – Cerebrovascular System

• Understand how to perform effective CPR in both Adults and children

• Solidify the team approach to resuscitation
Anatomy and Physiology

• In order to best perform CPR and to detect impending cardiovascular emergencies, a good understanding of the basic physiology is important

• We will discuss the respiratory, cardiovascular, cerebrovascular systems
Respiratory System

• The respiratory system has four components:
  1. The airways that conduct the air between the outside and inside
  2. The alveoli
  3. The neuromuscular component
  4. The vascular component
Respiratory System
Respiratory System

• Upper Airway
  – Nose & Mouth
  – Pharynx
  – Larynx

• Lower Airway
  – Trachea: windpipe
  – Bronchi: Right and Left
  – Bronchioles: branches of the bronchi that end at the alveoli

Lord Akryl, Wikimedia Commons
Respiratory System

• **Alveoli**:
  – Place where the exchange of oxygen and carbon dioxide occurs

• **Neuromuscular Component includes**:
  – Brain center for respiration
  – Nerves to and from the muscles of respiration
  – Muscles of respiration
Respiratory System

• There are two functions of the respiratory system
  1. To deliver oxygen to the blood from the air
  2. To eliminate carbon dioxide from the blood to the air

• In the average person there is a match between the ventilation (volume of breaths x rate) and the perfusion of blood to the lungs
Respiratory System

- During CPR the blood flow to the lungs is reduced to 20%-33% of its normal volume.
- So much less ventilation is needed to remove carbon dioxide and provide oxygen.
- During CPR the respiratory rate should be 8-10 breaths per minute.
- Each breath should last roughly 1 second.
Cardiovascular System

• Has a great many functions but two of it’s primary functions are:
  1. Delivery of carbon dioxide rich blood from the body to the lungs
  2. Delivery of oxygen rich blood from the lungs to the body and brain

• During normal conditions the relative oxygen and carbon dioxide concentrations remain constant
• This constant control is performed by the coordinated effort of the respiratory center of the brain, the respiratory system and the cardiovascular system

• The brain senses the concentration of carbon dioxide in the blood:
  – If this level rises then there are increase signals sent to the respiratory muscles to increase depth and rate
Respiratory System

– Once the levels of carbon dioxide are reduced to the “normal” range. Then the signals from the brain, decrease accordingly

• The key respiratory muscle is the diaphragm
  – During inspiration the muscle plunges toward the abdomen
  – Decreases the intra-thoracic pressure
  – Allows air to flow from outside into the lungs because of the pressure difference
Respiratory System

• So when the respiratory effort of a patient does not match the need, this is referred to as Respiratory failure

• When there is no respiratory effort, that is termed respiratory arrest
Cardiovascular System

- Major Components:
  - Heart
  - Arteries
  - Capillaries
  - Veins
Cardiovascular System

- **Right Atrium**
  - Receives blood returning from the body
- **Right Ventricle**
  - Sends this blood to the lungs
- **Left Atrium**
  - Receives blood from the heart
- **Left Ventricle**
  - Pumps blood through the aorta to the body

Jordi March i Noguè, *Wikimedia Commons*
Cardiovascular System

• So during a cardiac arrest, the goal is to mimic normal cardiac activity
• This is achieved through chest compressions
• Find the xiphoid process and go two finger breadths above onto the chest. Place your palms on this location and begin compression.
• Goal is for 100 cycles per minute
• Effective compressions are smooth, regular and have minimal interruption
Cardiovascular System
Interdependence

• So with all these different parts there has to be some sort of coordination
• This falls to the Cerebrovascular system
• The brain, spinal cord and an expansive network of nerves control most functions
• Specialize sensors in the brain control cardiac function, vascular function and respiratory function
• So any damage to these areas of the brain can then lead to Respiratory or Cardiac arrest.
Interdependence