



Cornell Tech : Medical Literacy

Trauma

A multisystem approach

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The Golden Hour

The time period after traumatic injury during which there is the highest likelihood that prompt medical treatment will be effective in preventing mortality.

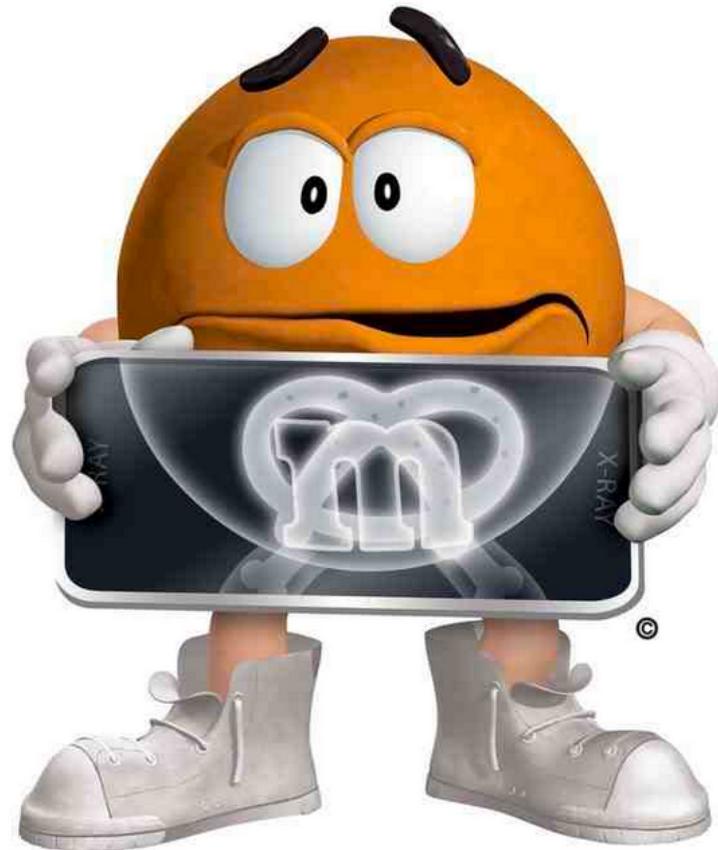


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Mortality & Morbidity

Morbidity – an unhealthy state of an individual



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What do you do?



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What do you do?



This is 911.

*Please state the nature
of your emergency.*



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What do you do?



I just saw a high speed motorcycle collision. The driver suffered blunt trauma from the impact and from a fall.



What do you do?



Ok sir. May I ask you a few questions?



What do you do?



Ok sir. May I ask you a few questions?

Is the victim breathing?

Respiration

Breathing is the process of moving air in and out of the lungs (also known as **ventilation**).

Breathing is one part of respiration

Respiration is the process of the production of energy typically with the intake of oxygen and release of carbon dioxide.



Respiration

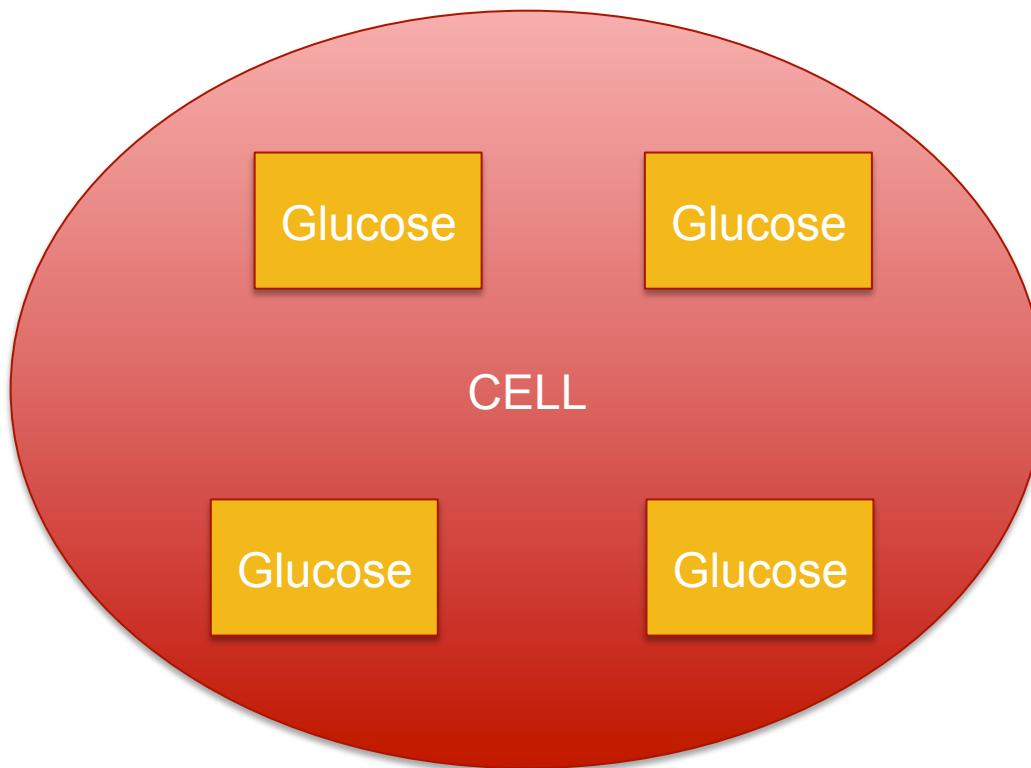
CELL



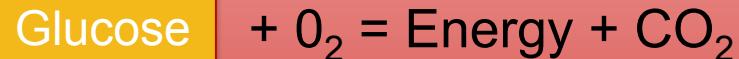
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Respiratory System



Respiration



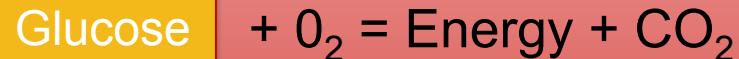
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Respiration



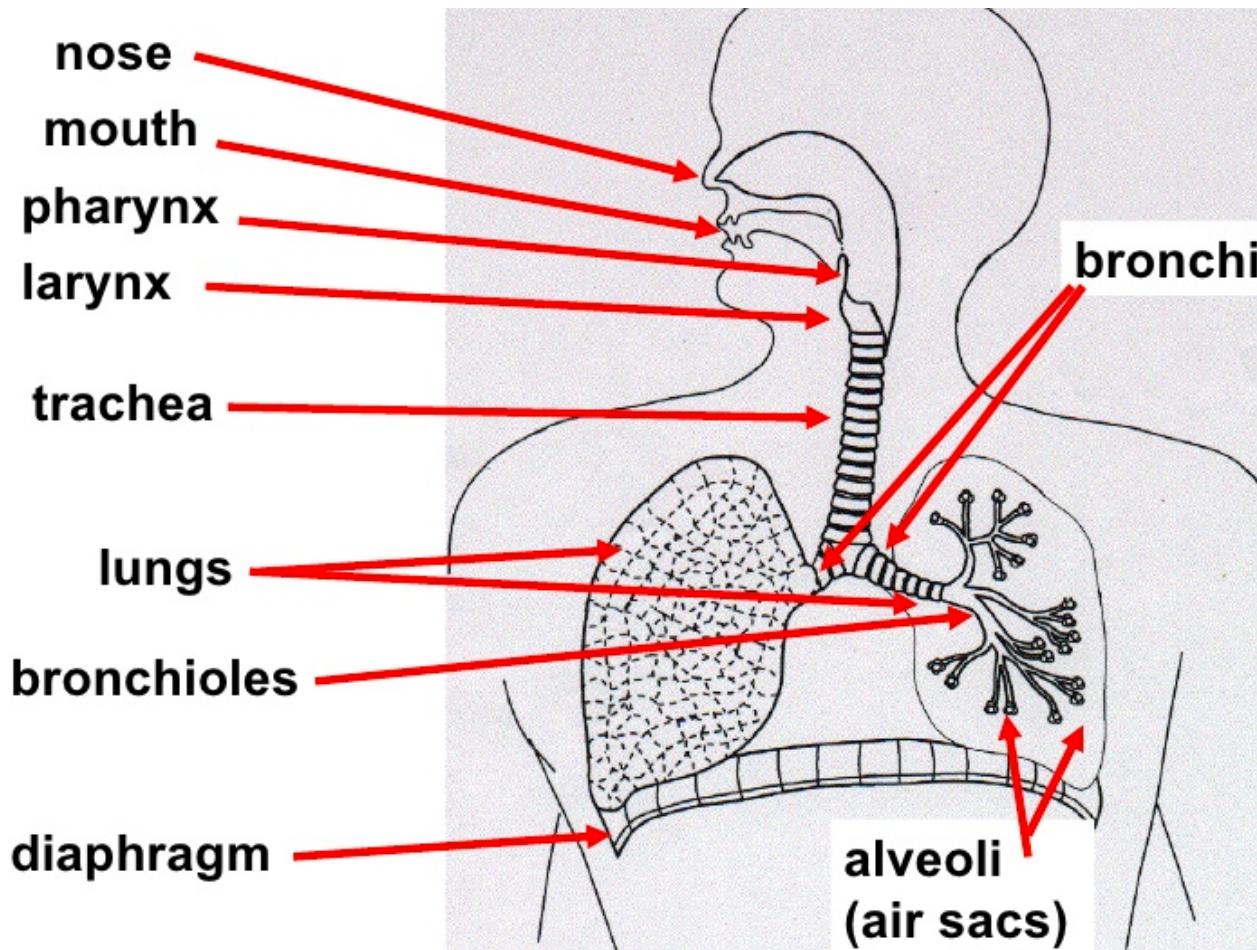
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Respiratory System (Pulmonary)



What do you do?



Is the victim breathing?

No. He is not breathing !!

What is your Differential Diagnosis ?



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What is your Differential Diagnosis ?

What is a differential diagnosis?

the process of differentiating between two or more conditions that share similar **signs** and **symptoms**



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What is your Differential Diagnosis ?

Sign : any indication of a medical condition that can be objectively observed by someone other than the patient

Symptom : a subjective indication of a disease or disorder



What is your Differential Diagnosis ?

Neurogenic – related to injury to the central nervous system as breathing is controlled by the brain

- OR -

Mechanical – lungs can not expand or contract

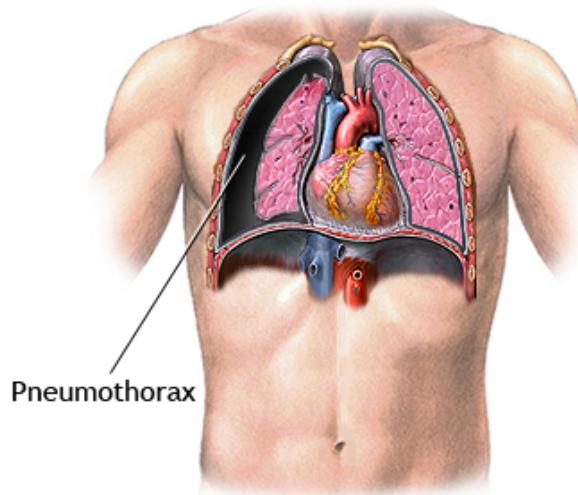


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Pneumothorax

Collection of air in the space between the **lung** and the **pleura** that can prevent the lung from expanding and contracting.



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What do you do?



No wait. He is breathing.

OK. Does he have a pulse?

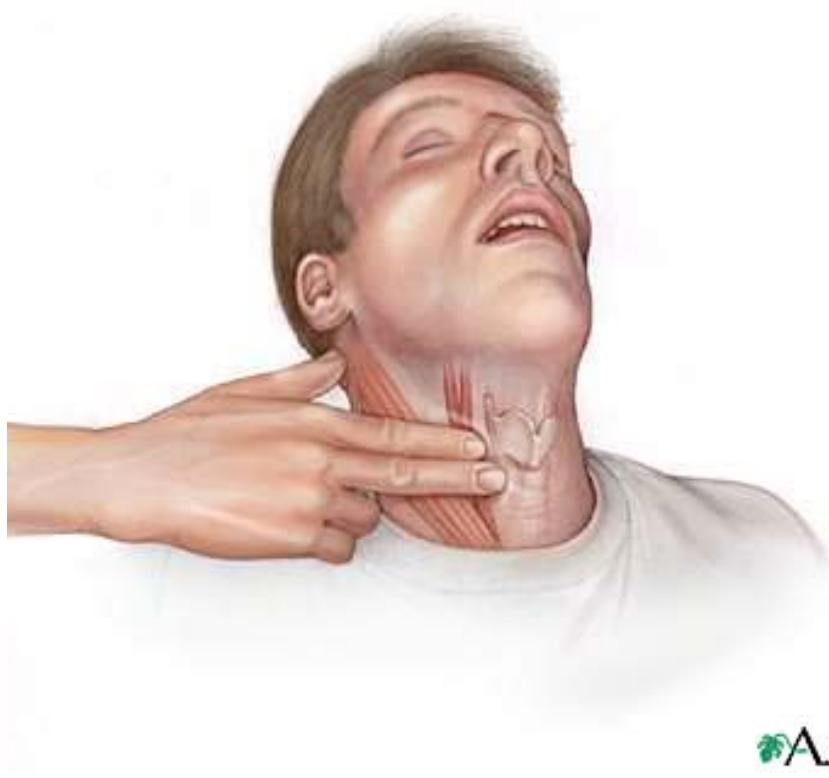


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Pulse

The rhythmic dilation of an artery that results from the heart beating



ADAM.



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Pulse

The rhythmic dilation of an artery that results from the heart beating

Heart rate is measured in beats per minute (bpm)

Each contraction of the heart is a beat.



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Circulation

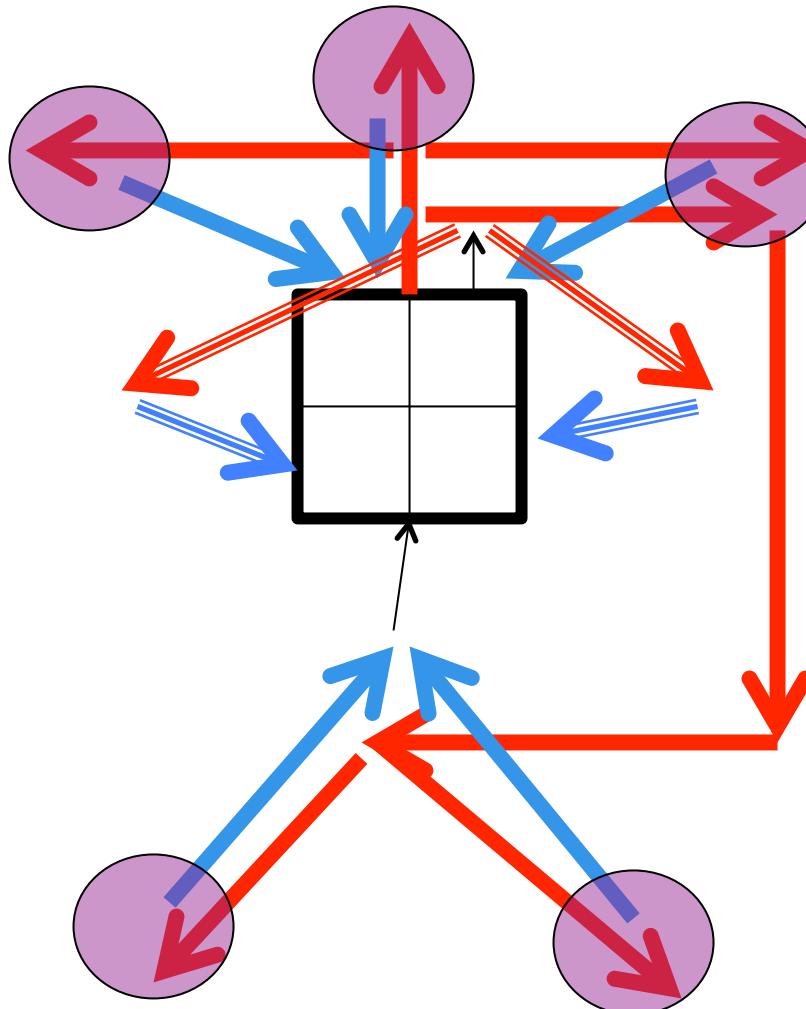
The movement of blood through the vessels of the body induced by the pumping action of the heart



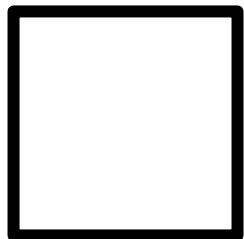
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Circulation



Circulation

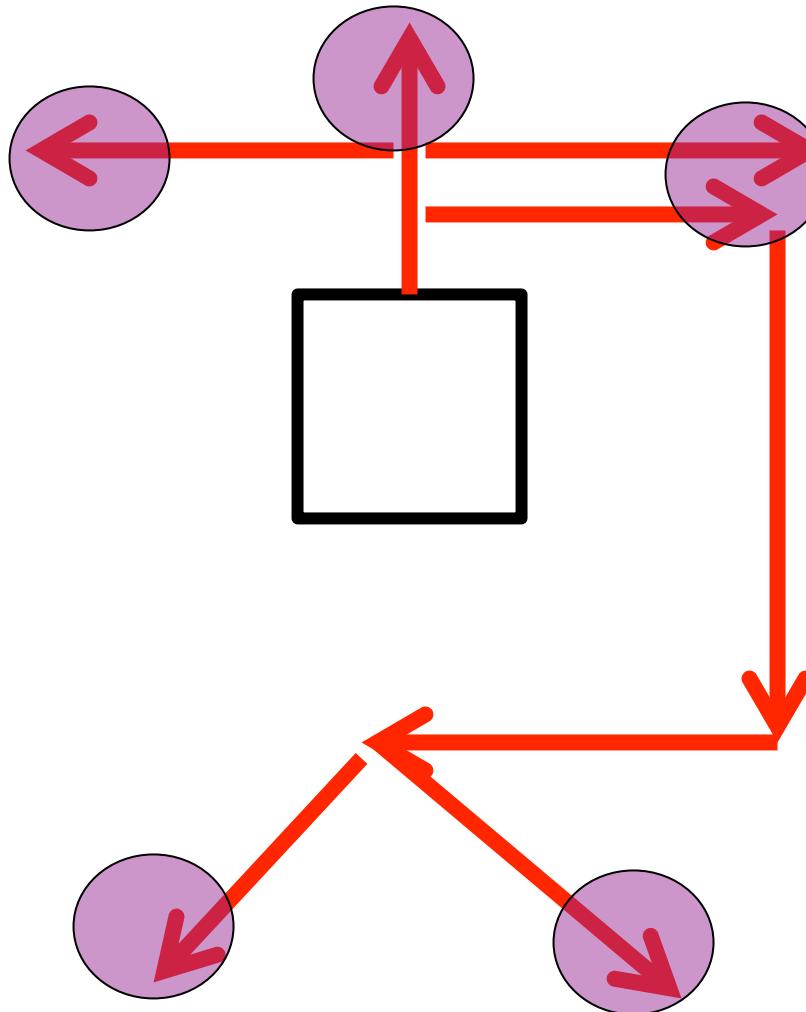


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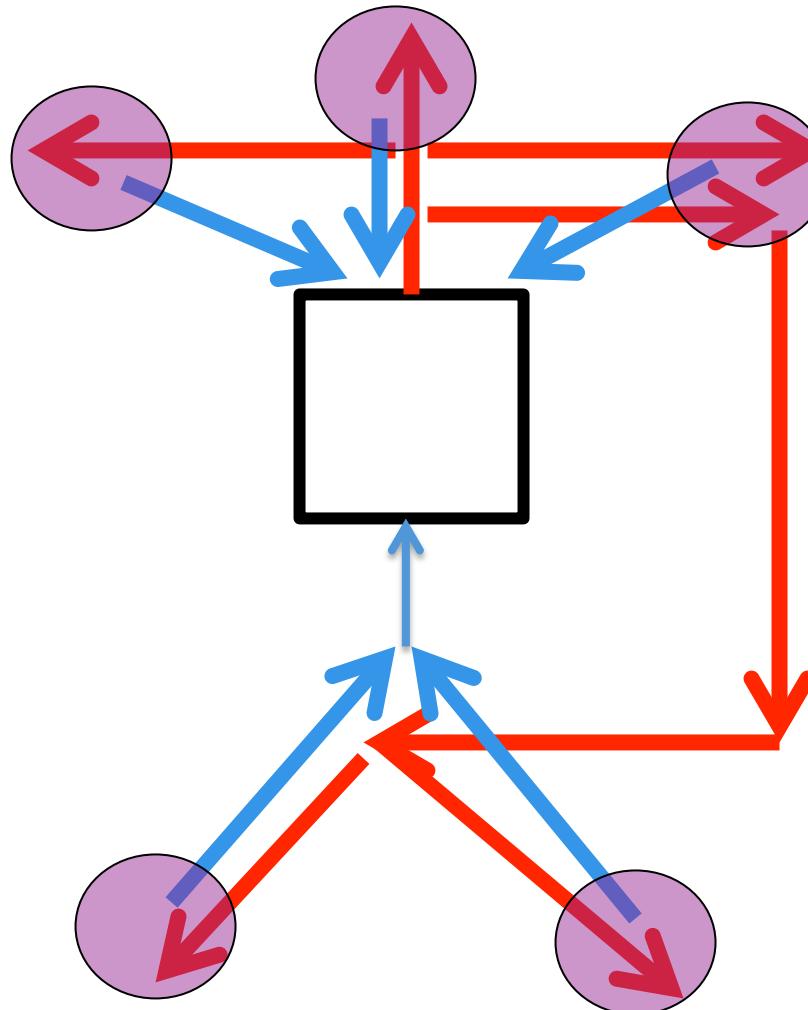
Circulation

Arteries



Circulation

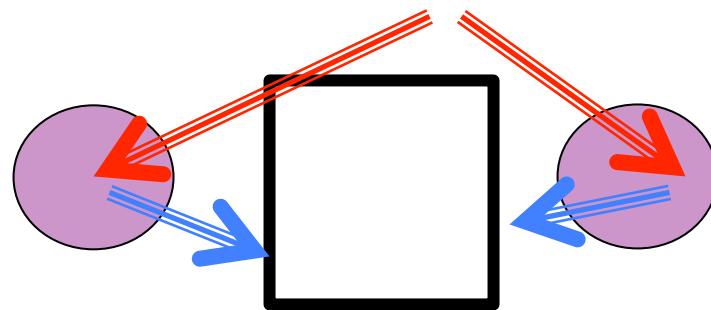
Arteries
Veins



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Circulation



Pulmonary Arteries Pulmonary Veins

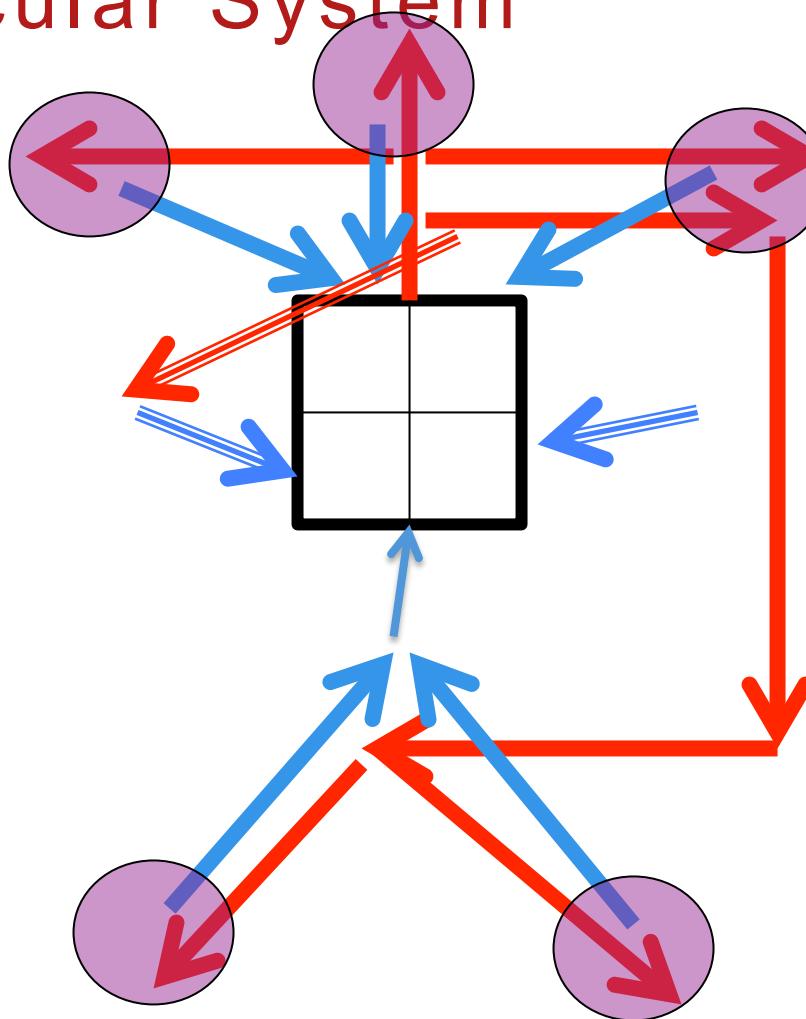


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Cardiovascular System

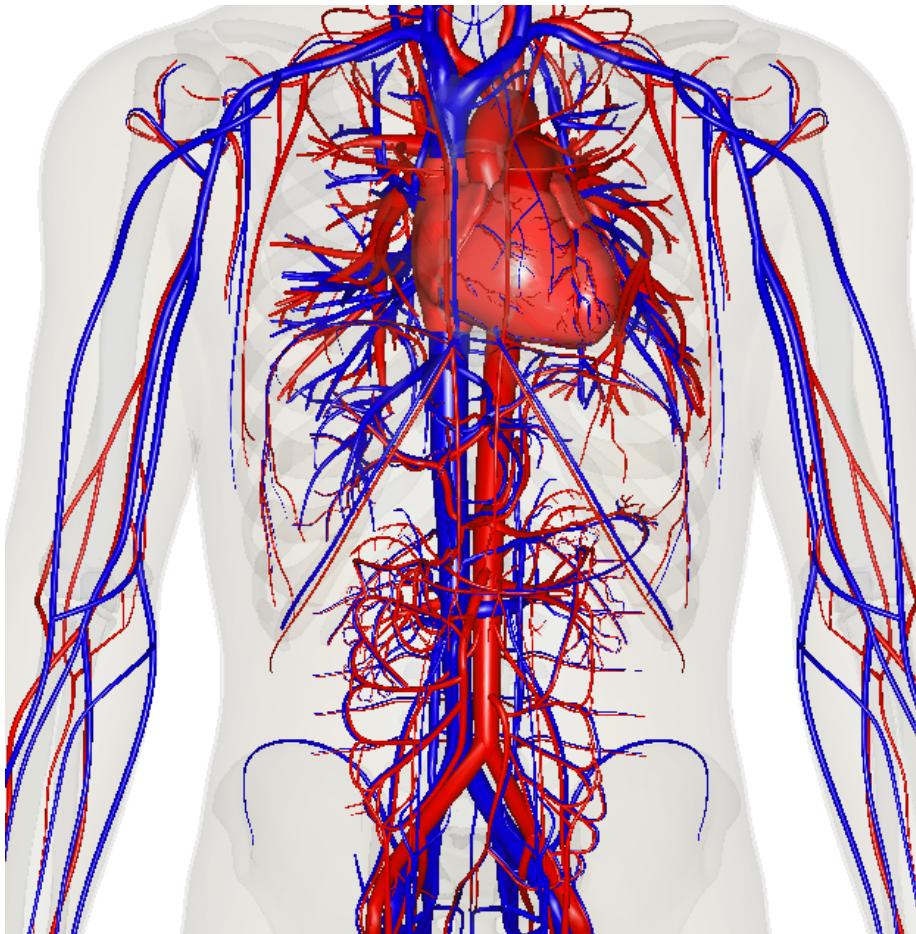
Systemic
Pulmonary



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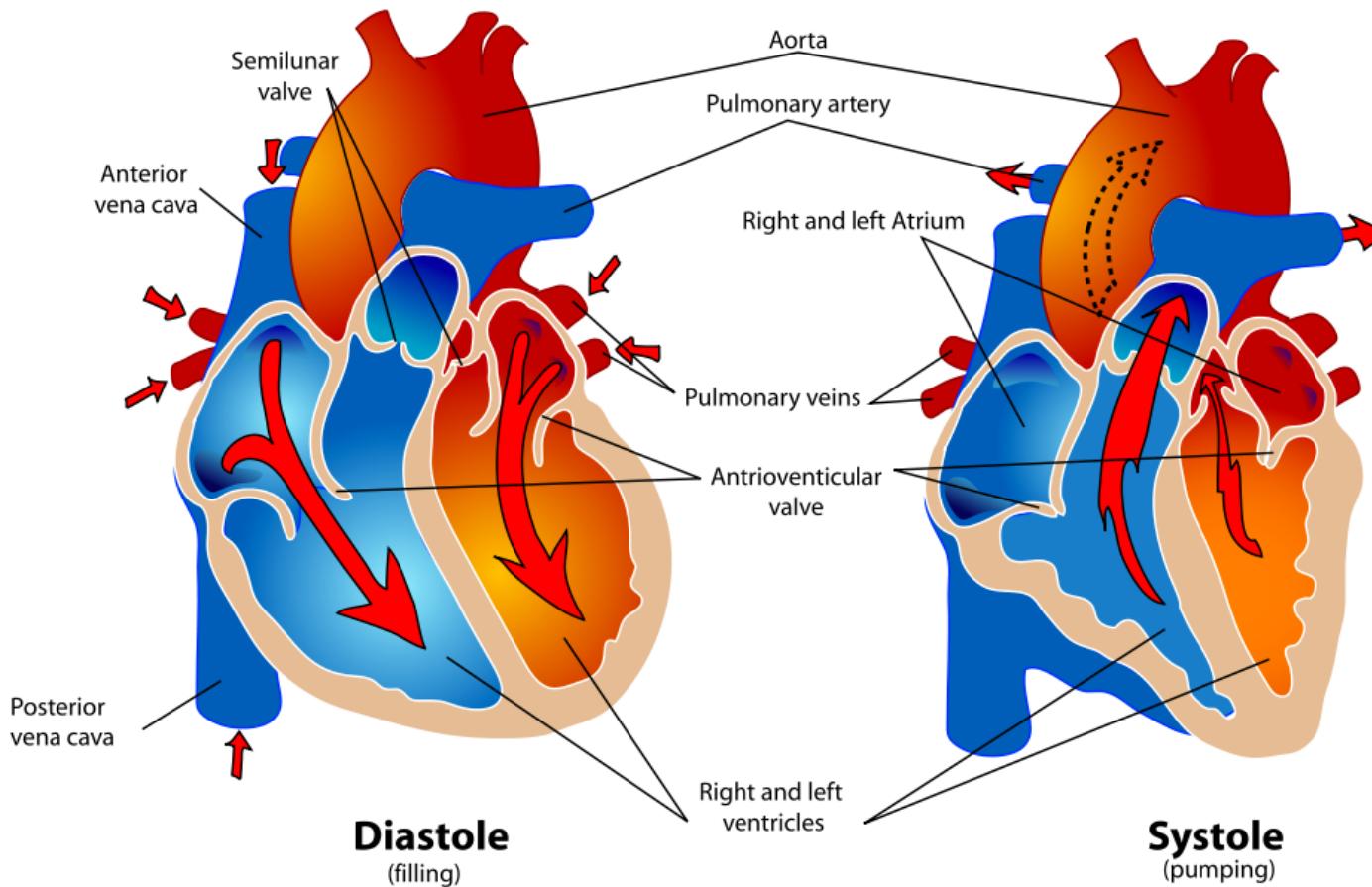
Cardiovascular System



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Circulation



Blood Pressure

Pressure of the blood in the circulatory system

Reported as

Systolic Pressure

Diastolic Pressure

Hypertension (increased blood pressure)

Hypotension (decreased blood pressure)



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Hypotension in Trauma

Reduced pressure in the cardiovascular system

Blood loss (loss of fluid in the pipes)

Cardiac Tamponade (fluid surrounding the heart limiting ability to pump)

Cardiac arrest (loss of heart function)



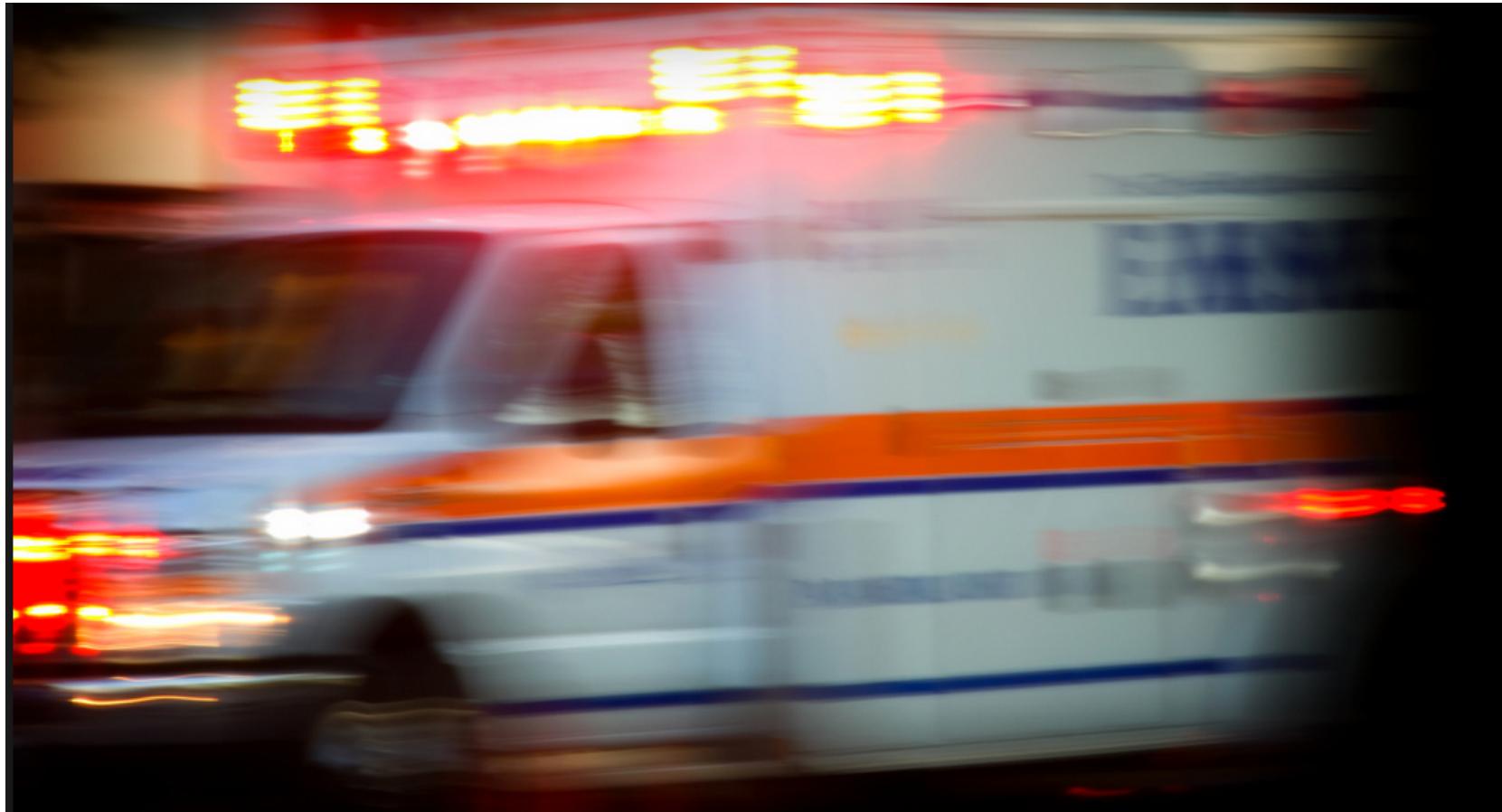
What do you do?



He has a pulse. And the ambulance is here.



Enroute to the Level I trauma center



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Telemetry

Wireless transmission and reception of measured quantities for remote monitoring



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Telemetry

Wireless transmission and reception of measured quantities for remote monitoring



Pulse
Blood Pressure

Pulse Oximetry
EKG



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Pulse Oximetry

Measures oxygen saturation (how much oxygen is in the blood)

Pass 2 wavelengths of light through a thin body part (earlobe or finger)

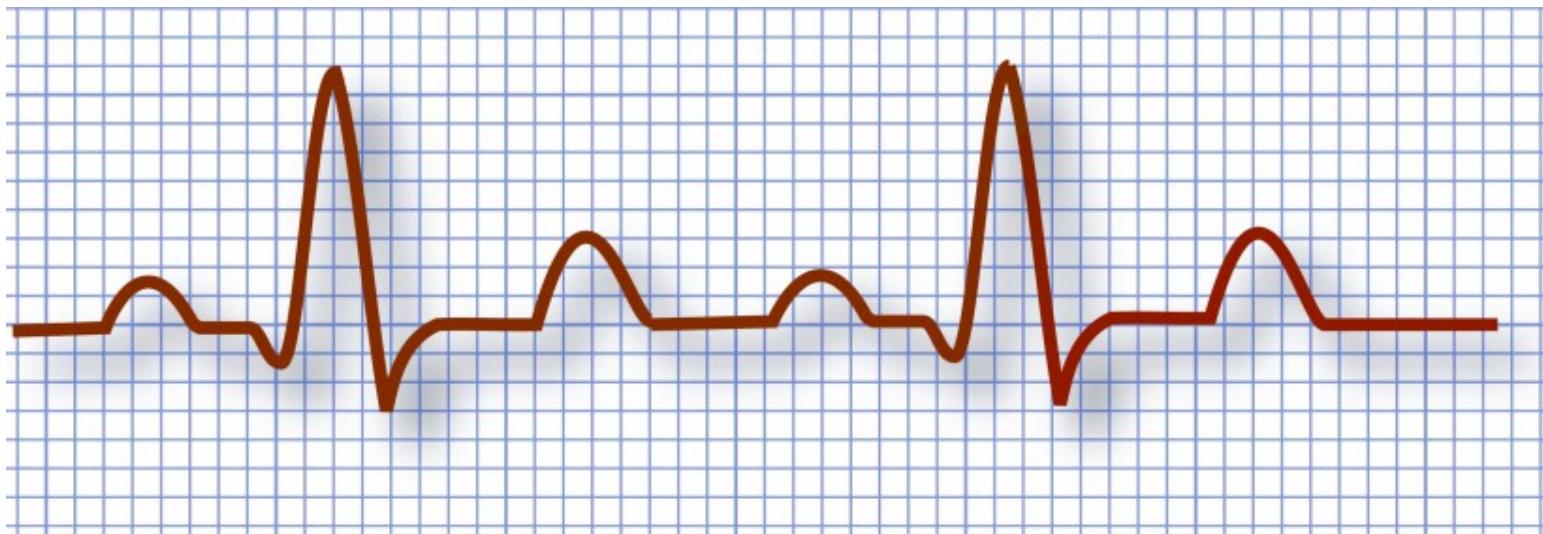
Absorption differs based on the amount of oxy-hemoglobin versus deoxy-hemoglobin

Reported as % of blood that is oxyhemoglobin



EKG - Electrocardiography

Records the timing and strength of the electrical impulses through the heart.



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Meanwhile at the Hospital

“TRAUMA TEAM TO THE ED”



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Initial resuscitation

ABC's - Airway, Breathing, Circulation

Trauma radiographs

IV Access

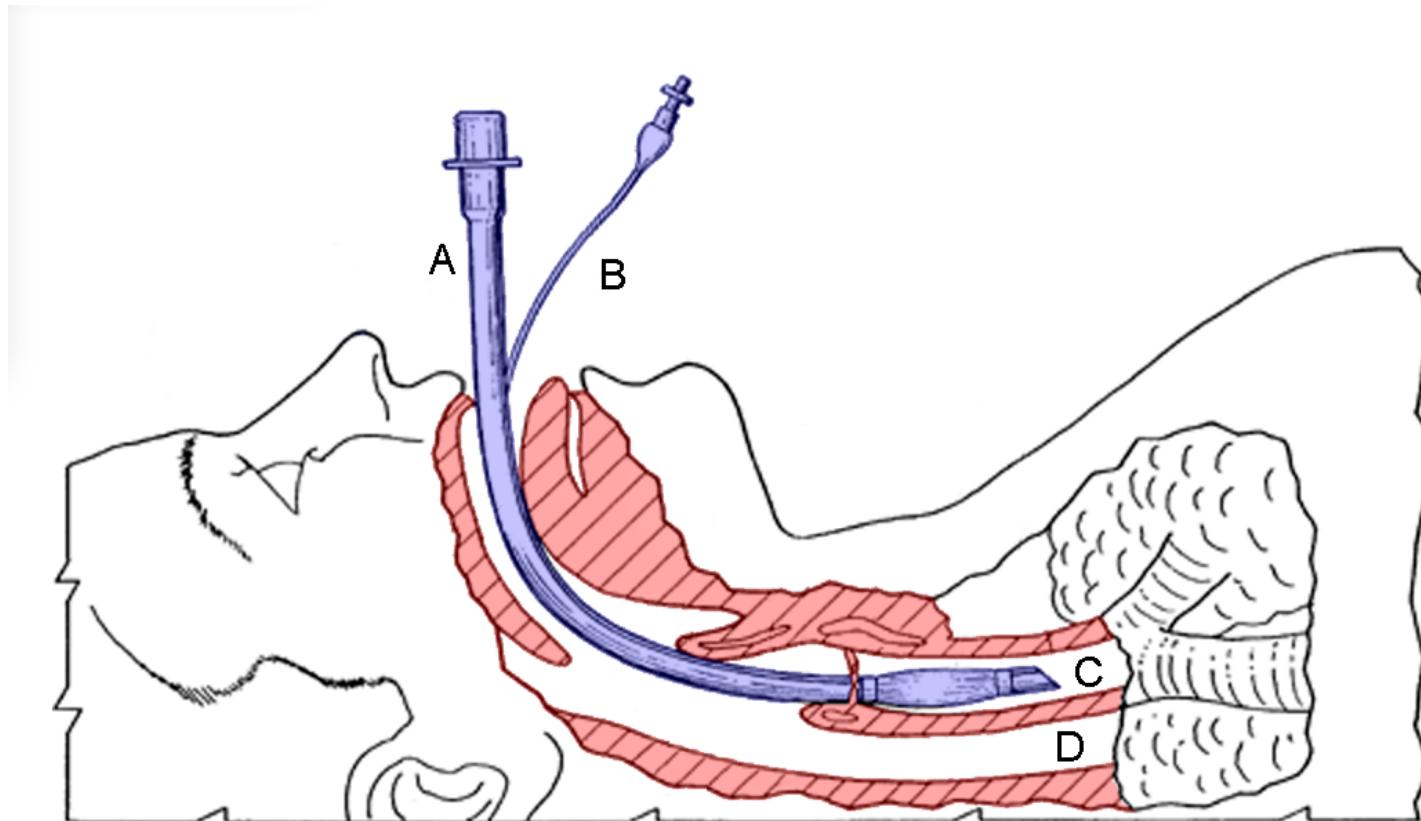
FAST Scan



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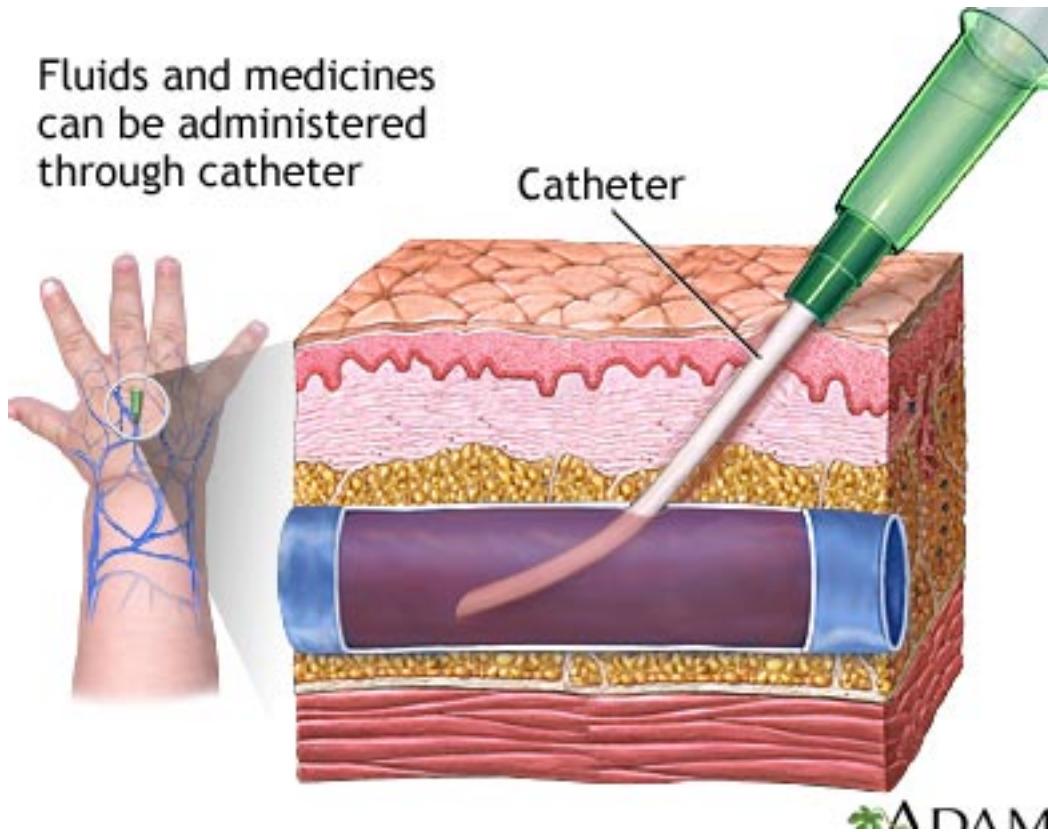
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Intubation (Mechanical Ventilation)



Intravenous Access

Fluids and medicines can be administered through catheter



Shock

Shock is a medical emergency in which the organs and tissues of the body are not receiving an adequate flow of blood. This deprives the organs and tissues of oxygen (carried in the blood) and allows the buildup of waste products. Shock can result in serious damage or even death.



Shock

Shock is a medical emergency in which the organs and tissues of the body are not receiving an adequate flow of blood. This deprives the organs and tissues of oxygen (carried in the blood) and allows the buildup of waste products. Shock can result in serious damage or even death.

Hypovolemic – loss of blood (pressure) from the circulatory system

Cardiogenic - loss of the heart (pump) function

Septic – infection can release toxins causing diffuse injury



Trauma Series

What could kill this patient right away?

Pneumothorax (Air in chest)

Bleeding - Belly/Pelvis

Spinal Cord injury



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Trauma Series



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FAST Scan

What is going to kill this patient next?

Bleeding into the Abdomen

Bleeding into the Pericardium

(Sac surrounding the heart)



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FAST Scan

Focused Assessment with Sonography for Trauma

Sonography = Ultrasound - Different materials reflect/transmit sound differently

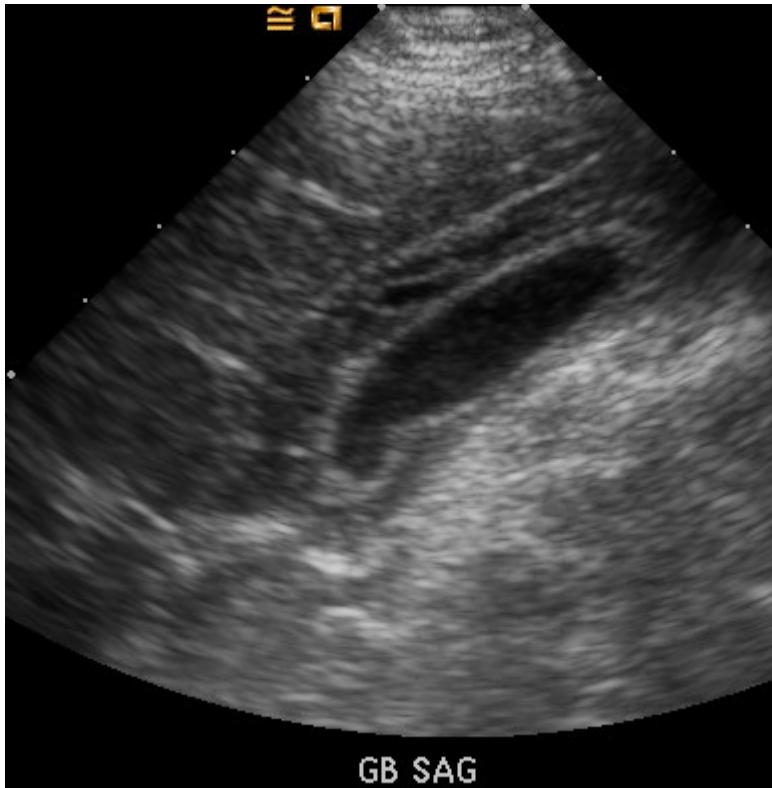
Looking for Fluid (Blood) where it should not be



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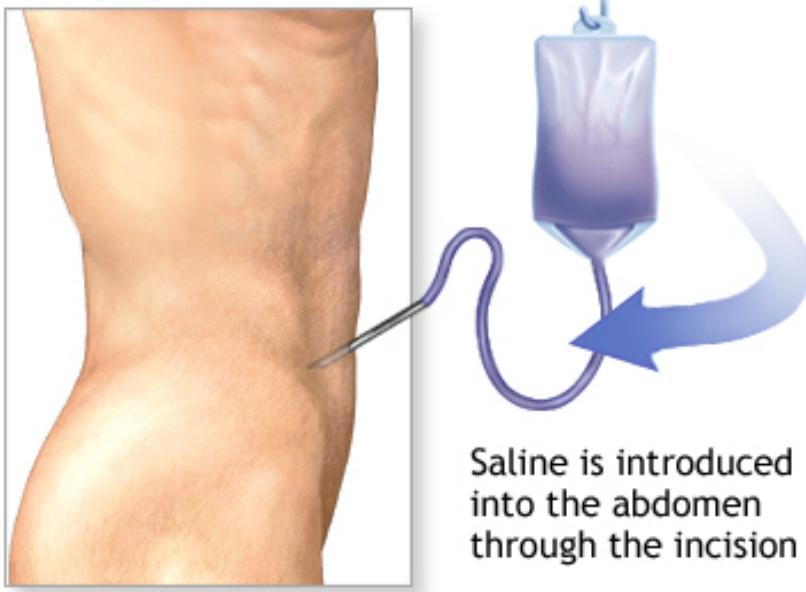
FAST Scan



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Invasive versus non-invasive testing



The patient is stable but

Need to evaluate for additional injuries

Head trauma (intracranial injury)

Cervical Spine injury

Chest injury

Abdominal / Pelvic Organ injury

Fractures



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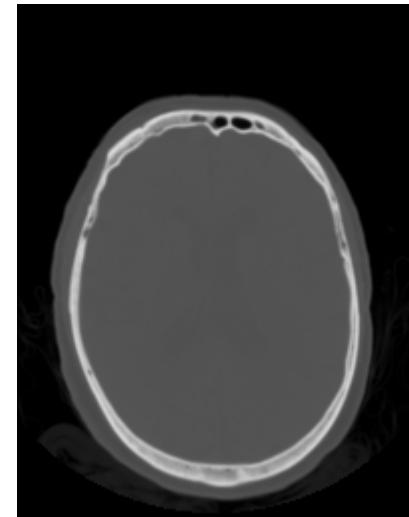
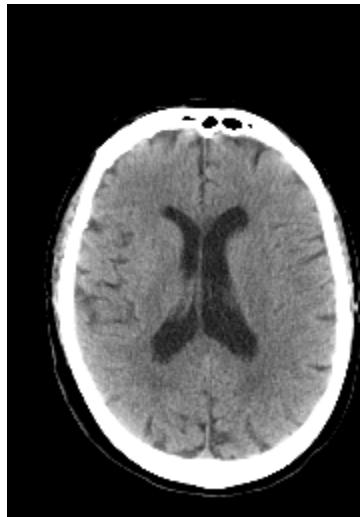
Computed Tomography



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Computed Tomography



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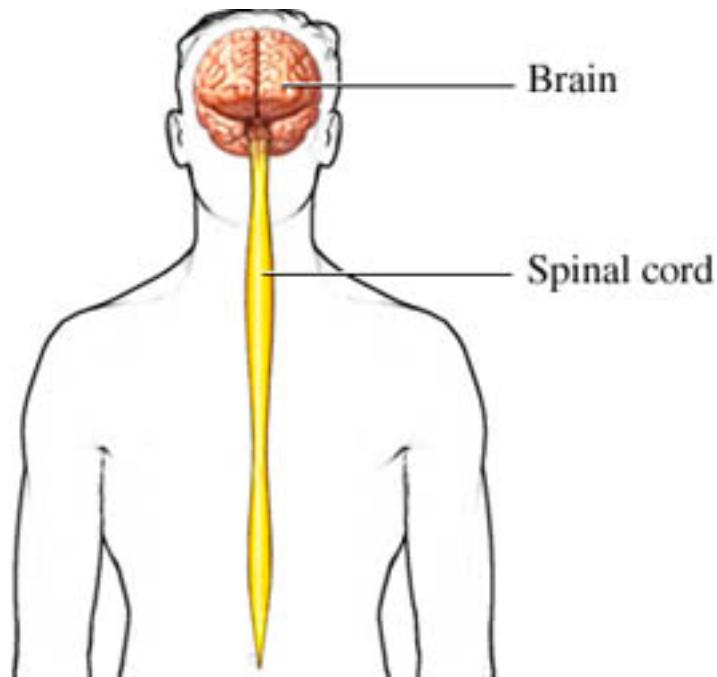
Computed Tomography



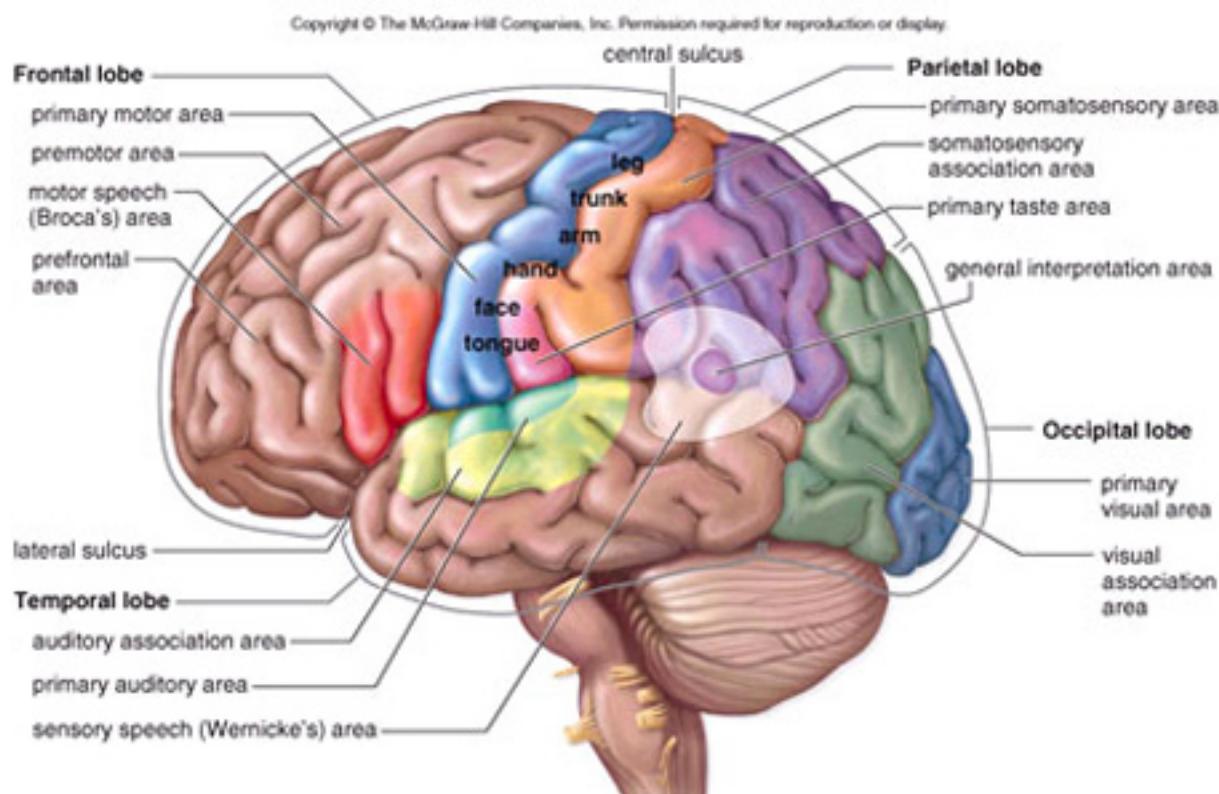
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Central Nervous System



Central Nervous System



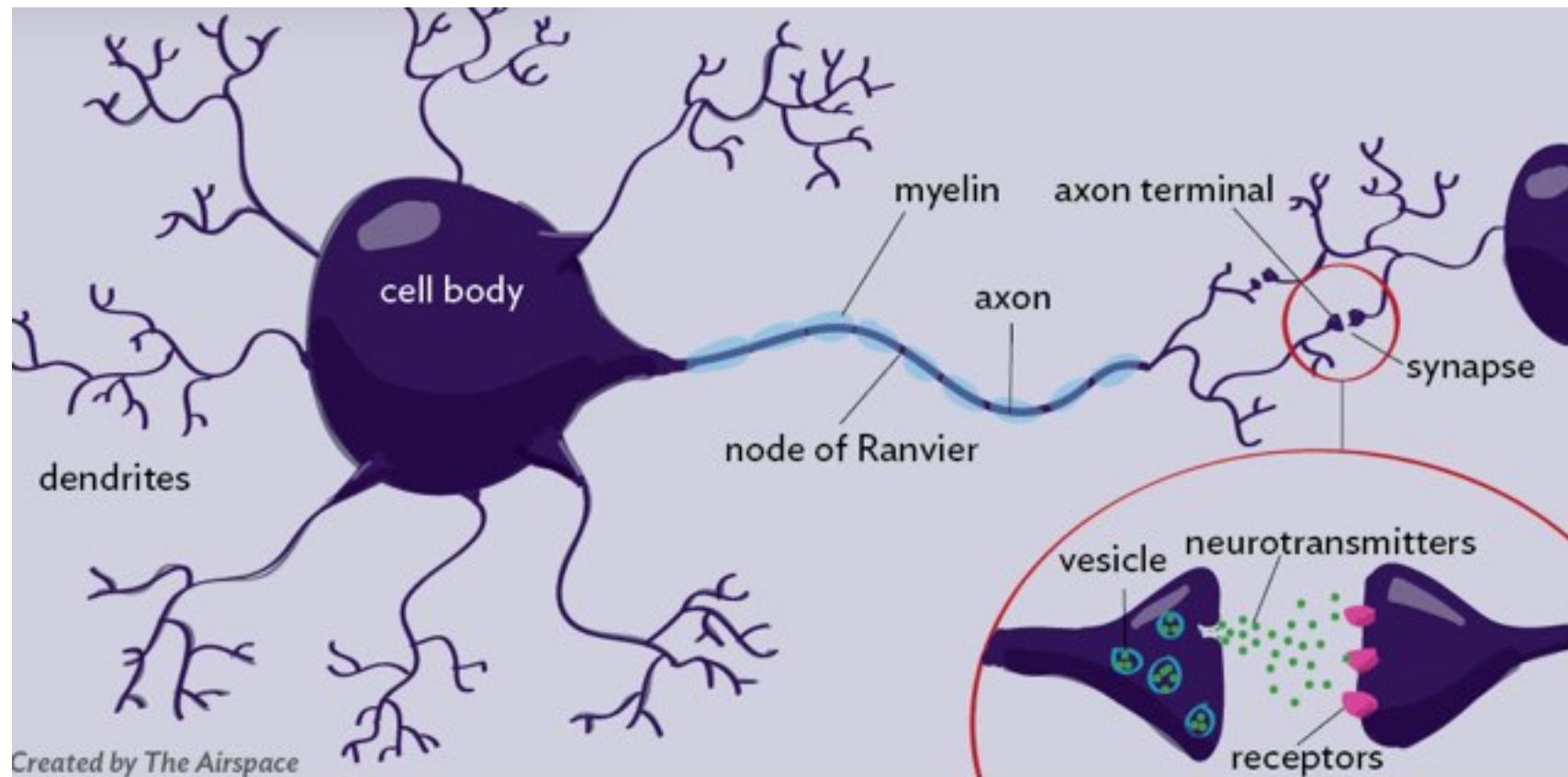
Central Nervous System



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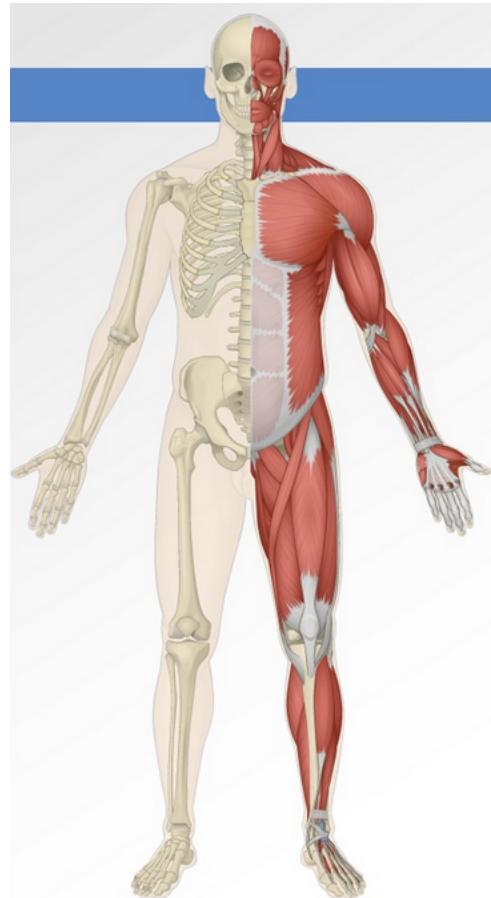
Central Nervous System



Fractures



Musculoskeletal System



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Musculoskeletal System

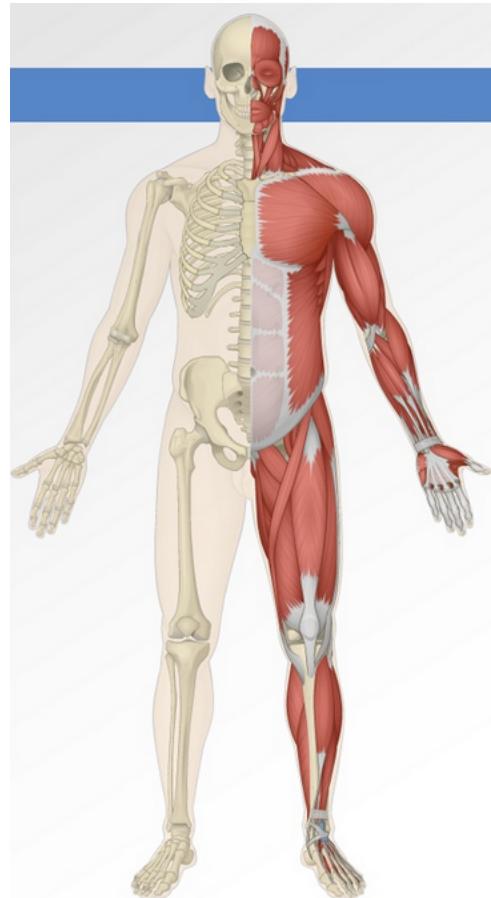
Bones (osseous)
Muscles (musculo)

Ligaments

Tendons

Cartilage

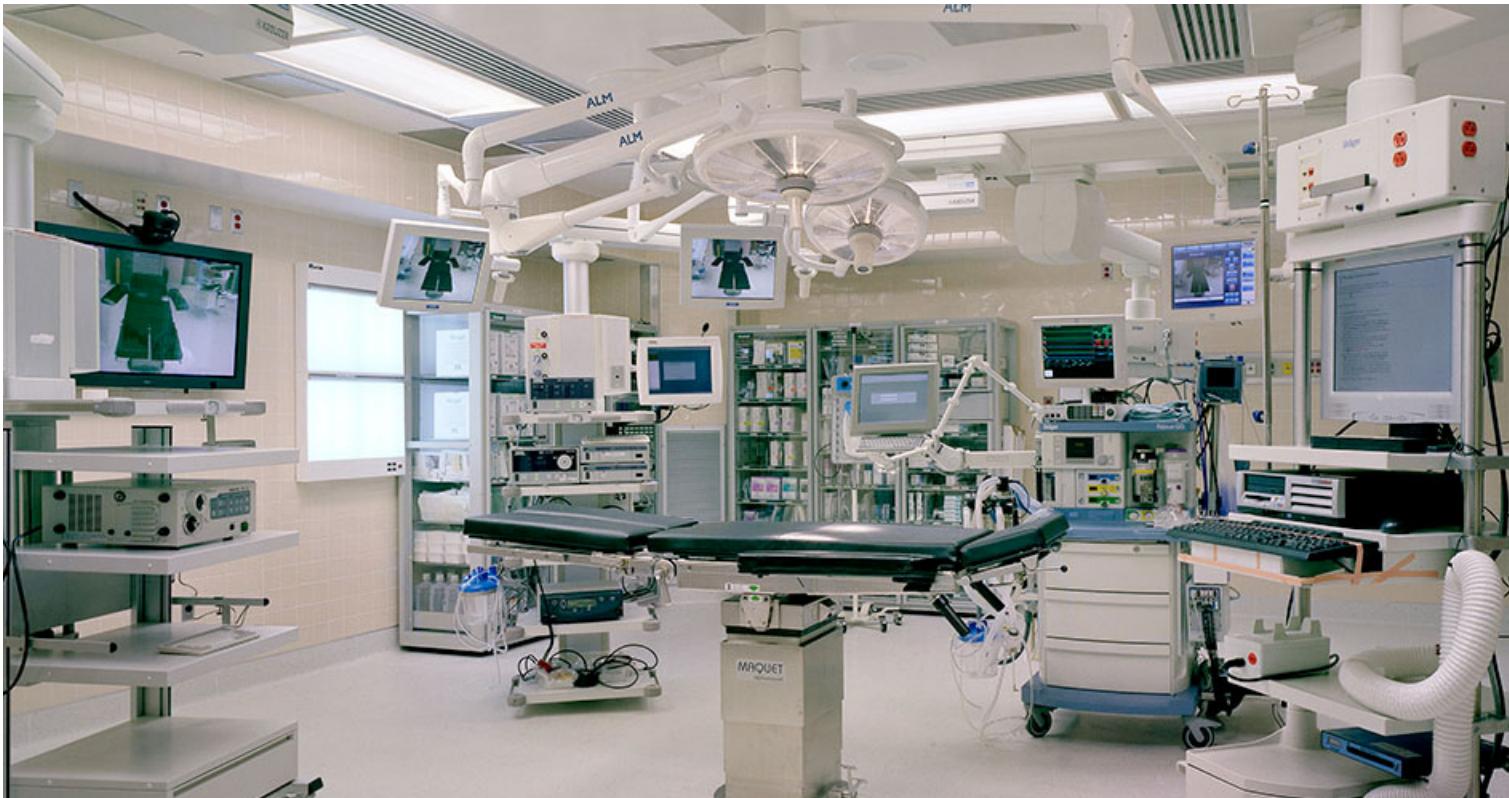
Joints (arthro)



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Due to extent of injuries the patient was taken to the operating room



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And then to the intensive care unit



And then to the general surgical floor



And then to surgical rehabilitation



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And then to home



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Glossary of Terms



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Glossary

Respiration : the process of the production of energy typically with the intake of oxygen and release of carbon dioxide.

Ventilation : The process of moving air in and out of the lungs (also known as breathing)

Glucose : A simple sugar which the body uses to produce energy



Glossary

Lungs : The pair of organs within the thorax of higher vertebrates which oxygenates blood and removes its carbon dioxide

Trachea : (windpipe) membranous tube reinforced by rings of cartilage extending from the larynx (voicebox) to the bronchial tubes (in the lungs) used to convey air to and from the lungs



Glossary

Alveoli : the tiny air sacs in the lung where air exchange takes place

Bronchi : the major air passages of the lungs (tubes)

Lung : organs consisting of elastic sacs with branching passageways that takes in air to accommodate the transfer of O₂ into the blood and CO₂ back out



Glossary

Pleura: membranes surrounding the lungs. Normally it is a virtual space (no significant material within the layers of the membrane)

Pneumothorax : the presence of air or gas in the cavity between the lungs and the chest wall which may cause collapse of the lung and limit ventilation.



Glossary

Pulse : rhythmic throbbing of arteries as blood is propelled through

Circulation: movement of blood through the arterial and venous systems of the body



Glossary

Arteries : vessels that carry oxygenated blood (bright red) away from the heart to the body

Veins : vessels that return deoxygenated blood (dark red blood) to the heart

Pulmonary : related to the lung



Glossary

Systole : when the ventricles of the heart are contracted

Diastole : when the ventricles of the heart are relaxed

Blood pressure : the pressure of the blood against the walls of the arteries – typically reported systole / diastole



Glossary

Hypertension : Elevated blood pressure

Hypotension : Decreased blood pressure

Cardiac tamponade : pressure on the heart that occurs when blood or fluid builds up in the space between heart muscle and the covering sac of the heart (pericardium)

Cardiac arrest : loss of heart function (pump is off)



Glossary

Telemetry : Transmission of data to receiving location for monitoring

Pulse oximetry : measurement of the oxygen saturation (how much O₂) of blood

EKG (ECG) : electrocardiogram, measurement of the heart's electrical activity as tracings on paper (or now digitally) Depending on the orientation of the leads the tracing should have characteristic shapes that deviate in a predictable manner with specific types of pathology



Glossary

Resuscitation : restoring to life from near or apparent death

Intubation: introduction of a tube into the trachea to keep it open and to mechanically provide ventilation (air exchange)

Shock: the condition in which tissues in body do not receive enough O₂ and nutrients to allow cells to function which leads to cell death, organ failure, and may result in death.



Glossary

Central Nervous System (CNS): the brain and spine – coordinates activities of the peripheral nervous system (nerves other than the brain and spine)



Glossary

Mortality : death

Morbidity : any unhealthy state of an individual

Golden Hour : the first hour after the occurrence of a traumatic injury which is considered the most critical for successful treatment in order to limit morbidity and mortality



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Glossary

Invasive : actions involve a break in the skin and/or contact with any internal body cavity other than a natural or artificial orifice

Non-invasive : no break in the skin and there is no contact with any internal body cavity other than a natural or artificial orifice



Glossary

Differential Diagnosis : the process of differentiating between two or more conditions that share similar signs and symptoms

Signs : any indication of a medical condition that can be objectively observed by someone other than the patient

Symptom : a subjective indication of a disease or disorder

