The Human Body

Topographic Anatomy

- Superficial landmarks
  - Serve as guides to structures that lie beneath them
- Topographic anatomy applies to a body in the anatomic position.
  - Patient stands facing you, arms at side, palms forward.

Planes of the Body

- Imaginary straight lines that divide the body
- Three main areas
  - Coronal plane: front/back
  - Transverse (axial) plane: top/bottom
  - Sagittal (lateral) plane: left/right

Directional Terms

- Anterior
- Posterior
- Midaxillary
- Midline
- Midclavicular line

Planes of the Body

Directional Terms

- Right and left
- Superior and inferior
- Lateral and medial
- Proximal and distal
- Superficial and deep
- Ventral and dorsal
- Palmer and planter
- Bilateral
Other Directional Terms

• Many structures are bilateral, appearing on both sides of midline.
• Abdomen is divided into quadrants for communication purposes.
  – RUQ
  – LUQ
  – RLQ
  – LLQ

Anatomic Positions

• Prone
• Supine

Anatomic Positions

• Shock position
• Trendelenburg’s position
• Fowler’s position

Anatomic Positions

• Recovery position
• Left Lateral Recumbent
• Right Lateral Recumbent
• Pregnancy position

Movement Terms

• Flexion is the bending of a joint.
• Extension is the straightening of a joint.
• Adduction is motion toward the midline.
• Abduction is motion away from the midline.
The Skeletal System

• Gives form to the body
• Protects vital organs
• Consists of 206 bones
• Acts as a framework for attachment of muscles
• Designed to permit motion of the body

The Skull
Cranium—made up of 4 bones
Face—made up of 14 bones
Foramen magnum is the opening at base of skull to allow brain to connect to spinal cord.

The Spinal Column
Composed of 33 bones (vertebrae)
Spine divided into 5 sections:
  Cervical
  Thoracic
  Lumbar
  Sacrum
  Coccyx

The Thorax
Formed by of 12 thoracic vertebrae and 12 pairs of ribs
Thoracic cavity contains:
  Heart, Lungs, Esophagus, Great vessels

The Pelvis

The Lower Extremity
• Hip
• Thigh
• Knee
• Leg
• Ankle
• Foot
The Musculoskeletal System: Anatomy

Functions of the Musculoskeletal System
- Gives the body shape
- Protects internal organs
- Provides for movement
- Consists of more than 600 muscles
Types of Muscles

- Skeletal (voluntary) muscle
  - Attached to the bones of the body

- Smooth (involuntary) muscle
  - Carry out the automatic muscular functions of the body

- Cardiac muscle
  - Involuntary muscle
  - Has own blood supply and electrical system
  - Can tolerate interruptions of blood supply for only very short periods

Anatomy of the Upper Airway

The Neck

The Glottic Opening
Oxygen and carbon dioxide is exchanged in alveoli and tissue.
Brainstem controls breathing.

Muscles of Breathing

Exchange of Oxygen and Carbon Dioxide

Control of Breathing

- Brain stem controls breathing:
  - Increases breathing rate if the carbon dioxide level in blood becomes too high
- Hypoxic drive is a “backup system.”
  - Activates when oxygen levels fall to stimulate breathing

Normal Breathing Characteristics

- Normal rate and depth
- Regular rhythm
- Good breath sounds in both lungs
- Regular rise and fall movements in the chest
- Easy, not labored

Normal Breathing Rates

- Adults: 12 to 20 breaths/min
- Children: 15 to 30 breaths/min
- Infants: 25 to 50 breaths/min
Recognizing Inadequate Breathing
- Irregular rhythm
- Labored breathing
- Muscle retractions
- Pale or blue skin
- Cool, clammy skin
- Faster respiratory rate

Infant and Child Anatomy
- Structures less rigid
- Airway smaller
- Tongue proportionally larger
- Dependent on diaphragm for breathing

The Circulatory System
- Blood Flow Through the Heart
- Electrical Conduction System
- SA node
- AV node
- Purkinje fibers
- The Heart
- SA node
- AV node
- Purkinje fibers
The Heart

Cardiac Output

- Normal resting heart rate (HR) is 60 to 100 beats/min.
- Stroke volume (SV)
  - Amount of blood moved by one beat
- Cardiac output (CO)
  - Amount of blood moved in 1 minute
  - \( HR \times SV = CO \)

Normal Heart Rates

- Adults: 60 to 100 beats per minute
- Children: 80 to 100 beats per minute
- Toddlers: 100 to 120 beats per minute
- Newborns: 120 to 140 beats per minute

Major Arteries and Veins

- Aorta
- Pulmonary
- Carotid
- Femoral
- Brachial
- Radial
- Superior vena cava
- Inferior vena cava
- Pulmonary
Components of Blood

- Plasma
- Red blood cells
- White blood cells
- Platelets

The Function of Blood

- Fighting infection
- Transporting oxygen
- Transporting carbon dioxide
- Controlling pH
- Transporting wastes and nutrients
- Clotting (coagulation)

Spleen

- Solid organ located under rib cage
- Filters blood
- Is particularly susceptible to injury from blunt trauma
- Can lead to severe internal bleeding

Physiology of the Circulatory System

- Pulse
  - The wave of blood through the arteries formed when the left ventricle contracts
  - Can be felt where an artery passes near the skin surface and over a bone
- Blood pressure
  - Amount of force exerted against walls of arteries
  - Systole: Left ventricle contracts
  - Diastole: Left ventricle relaxes
- Perfusion
  - Circulation of blood within an organ or tissue
  - If inadequate, the patient goes into shock

The Nervous System

- The nervous system controls the body’s voluntary and involuntary actions.
- Somatic nervous system
  - Regulates voluntary actions
- Autonomic nervous system
  - Controls involuntary body functions

Central Nervous System
Peripheral Nervous System

• Divided into two main portions:
  – Somatic nervous system
  – Autonomic nervous system

Peripheral Nervous System

• Somatic nervous system
  – Transmits signals from brain to voluntary muscles (allows for walking, talking)

• Autonomic nervous system
  – Involuntary actions (digestion, dilation)
  – Split into two areas
    • Sympathetic nervous system (flight-or-flight)
    • Parasympathetic nervous system (slows body)

The Skin

• Protects the body from the environment

• Regulates body temperature

• Transmits information from environment to the brain
Endocrine System

- Complex message and control system
- Made up of 7 glands
- Glands produce and release hormones.

Endocrine Glands

- Adrenal
- Ovary
- Pancreas
- Parathyroid
- Pituitary
- Testes
- Thyroid

The Endocrine System

The endocrine system controls release of hormones in the body.

The Abdomen

- Liver
- Bile ducts
- Small intestine
- Large intestine
- Appendix
- Rectum

Digestive System

- Mouth
- Salivary glands
- Oropharynx
- Esophagus
- Stomach
- Pancreas

The Digestive System
The Urinary System
- Controls fluid balance in the body
- Filters and eliminates wastes
- Controls pH balance

Life Support Chain
- All cells in body require oxygen, nutrients, and removal of waste.
- Circulatory system is the carrier of these supplies and wastes.
- If interference occurs, cells become damaged and die.

Life Support Chain
- Adenosine triphosphate (ATP)
  - Involved in energy metabolism
  - Used to store energy
- Aerobic metabolism uses oxygen.
- Cells switch to anaerobic metabolism when oxygen is limited.
- Lactic acid is a damaging waste product.
Life Support Chain

- Movement of oxygen, waste, nutrients occurs by diffusion.
- pH is critical to diffusion.
  - Measure of acidity or alkalinity
- Body spends large amount of energy to maintain normal pH.

Pathophysiology

- The study of functional changes that occur when body reacts to disease
- Respiratory compromise can lead to:
  - Shock
  - Alteration of cellular metabolism

Questions? Email Me!