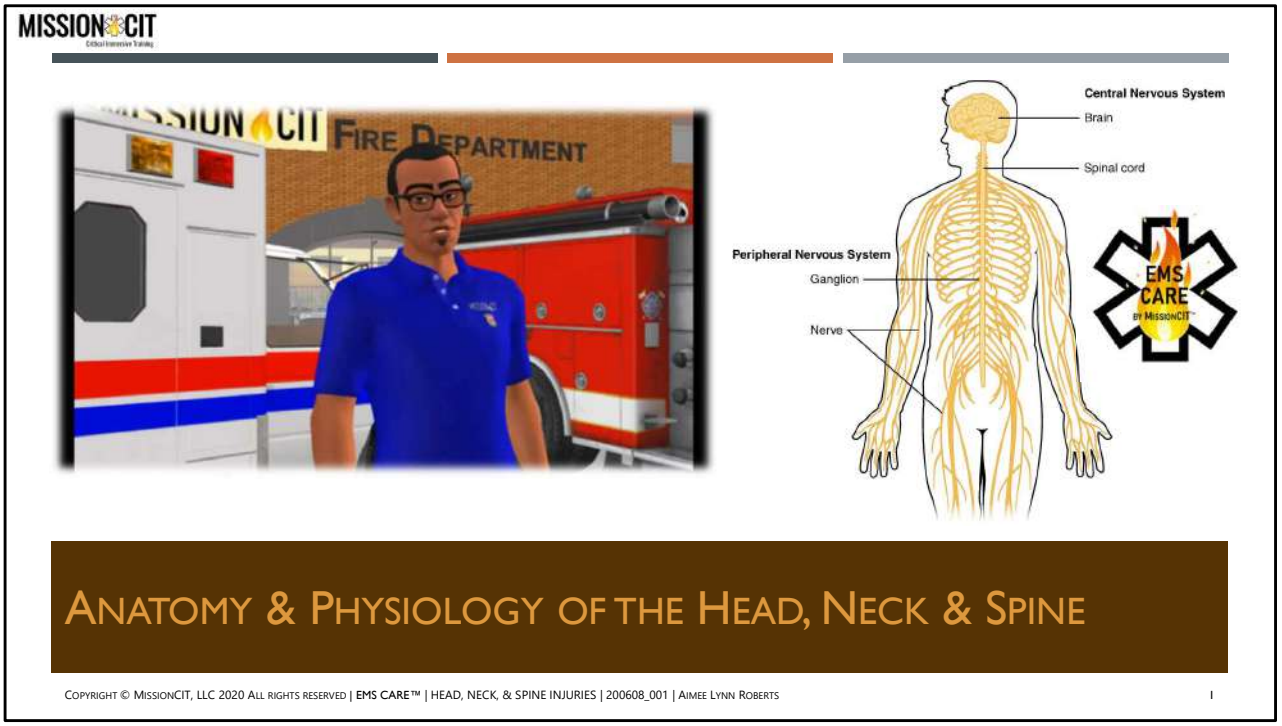


Thanks Missah. Let's begin by discussing the Anatomy of the Nervous system, including the head, neck and spine.

The nervous system is the most complex and highly organized body system. It receives information from the sensory organs via nerves, transmits the information through the spinal cord, and processes it in the brain.

The nervous system directs our body's reactions to the world and controls most of our internal functions. While doing everything from muscle movement and blood vessel dilation, to the learning of anatomy and

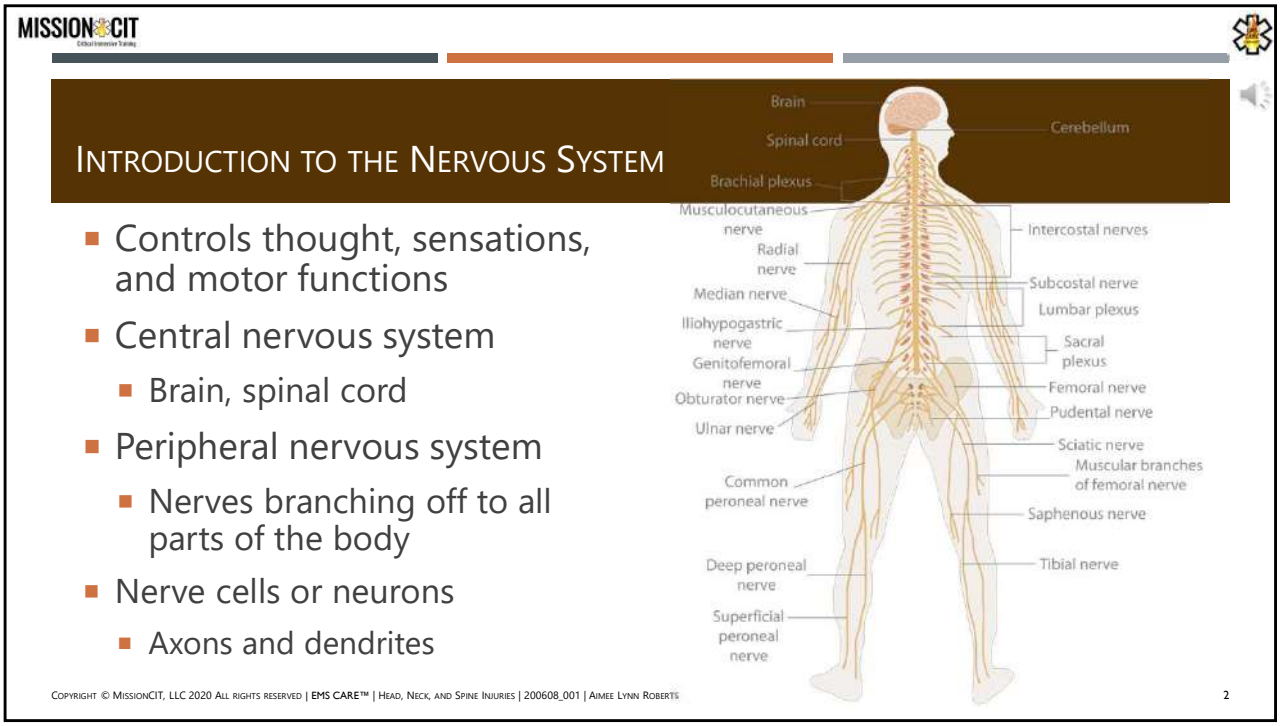
physiology facts.

How does it manage all this? By sending lightning-quick signals, electrical and chemical, between cells.

As this is a lot of information, we have divided the Lesson into two parts.

Part A, presents an overview of the entire nervous system along with details on the Central Nervous system.

Part B then discusses the Peripheral nervous system and the skeletal system.



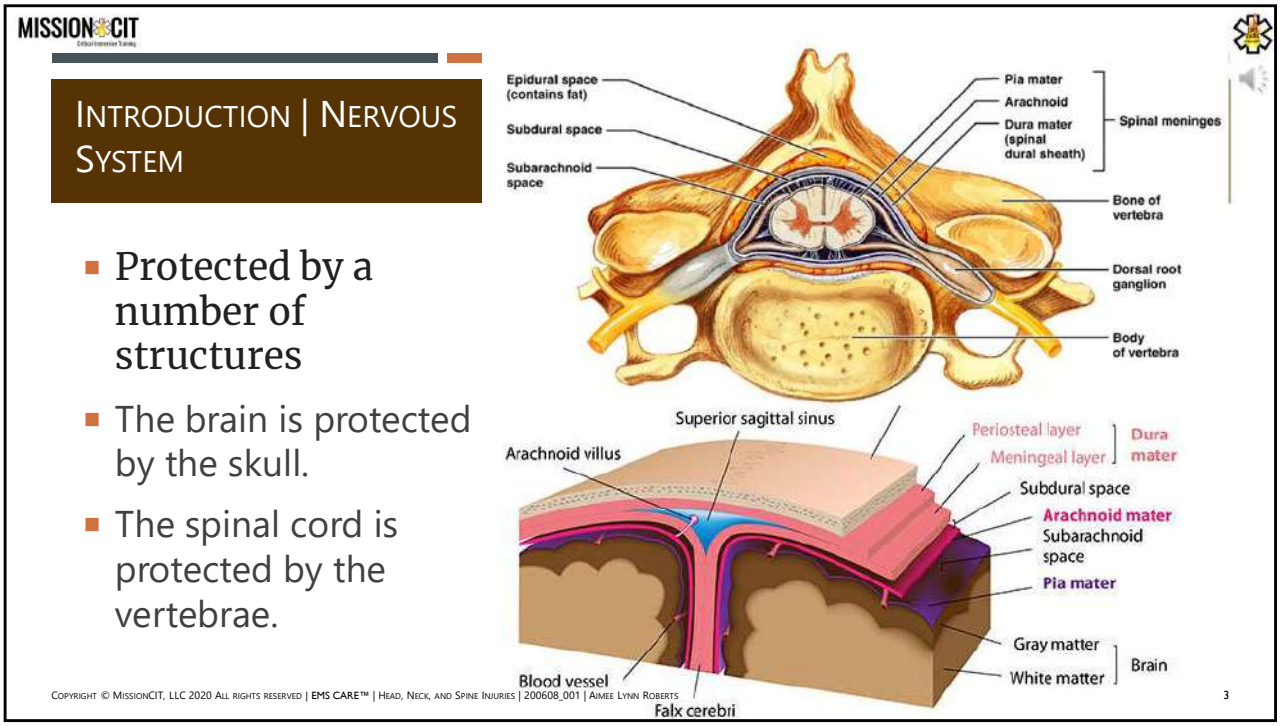
The nervous system controls thought, sensations, and motor functions. It has two main parts:

1. The central nervous system, which is made up of the brain and spinal cord. and
2. The peripheral nervous system consisting of nerves that branch off from the spinal cord, extending to all parts of the body.

The nervous system transmits signals between the brain and the rest of the body, including internal organs. In

this way, the nervous system's activity controls the ability to move, breathe, see, think, and more.

The basic unit of the nervous system is a nerve cell, or neuron. The human brain contains about 100 billion neurons. A neuron has a cell body, which includes the cell nucleus, and special extensions called axons and dendrites. Bundles of axons, called nerves, are found throughout the body. Axons and dendrites allow neurons to communicate, even across long distances.



Since the central nervous system is so important, it is protected by a number of structures and is enclosed in bone.

The brain is first protected by the skull (cranium). This offers physical protection and so naturally is one of the hardest bones in the body. The skull acts like a helmet for your brain, and helps to prevent damage from *mechanical stress*, that is things like knocks and falls.

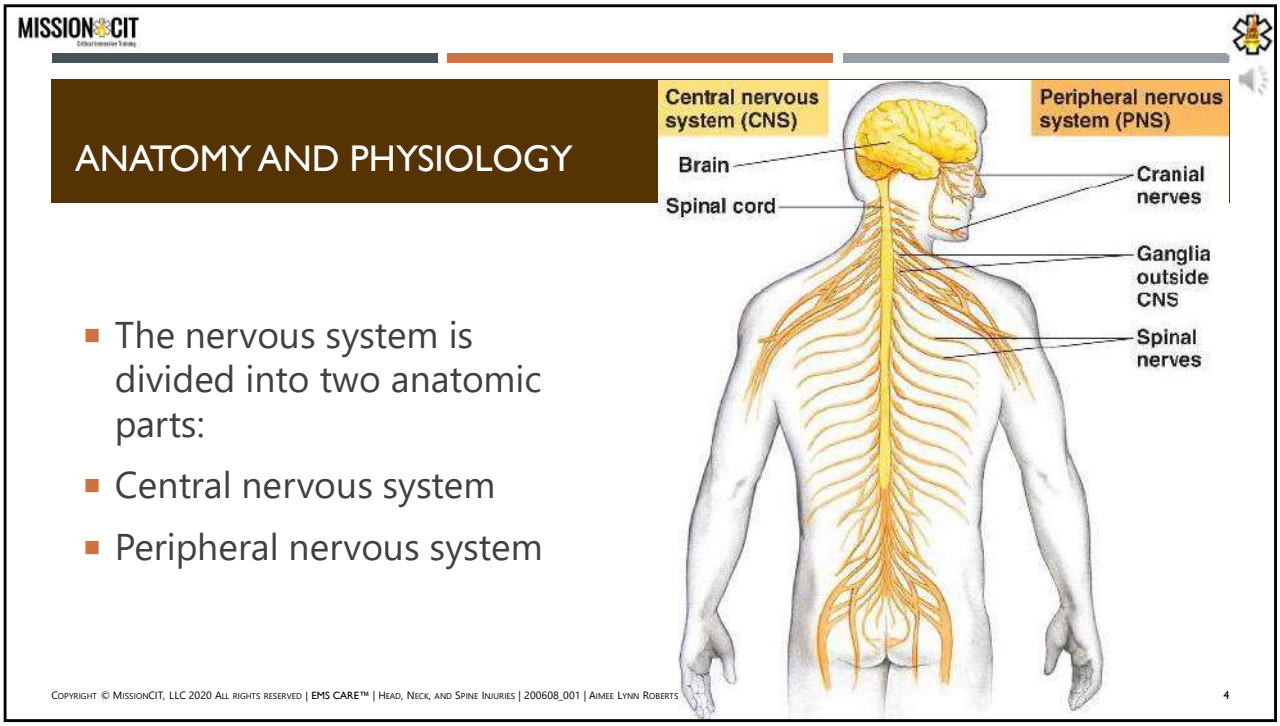
While the spinal cord is protected by the vertebrae of the spinal column. The brain and spinal cord are also

both covered with a protective tissue known as meninges.

The meninges are made out of connective tissue and provide a cushioning from the hard skull of the brain. And also against jolting from the spinal column.

Finally, there cerebrospinal that circulates the entire central nervous system. It occupies the space between the Pia Mater and Arachnoid and supplies nutrients, like blood in the rest of the body, disposes of waste and acts as a shock absorber

Despite this protection, serious injuries can damage the nervous system.



Again, the nervous system is divided into two anatomic parts:

Central nervous system and the Peripheral nervous system

The central nervous system consists of the brain and spinal cord. It is referred to as “central” because it combines information from the entire body and coordinates activity across the whole organism.

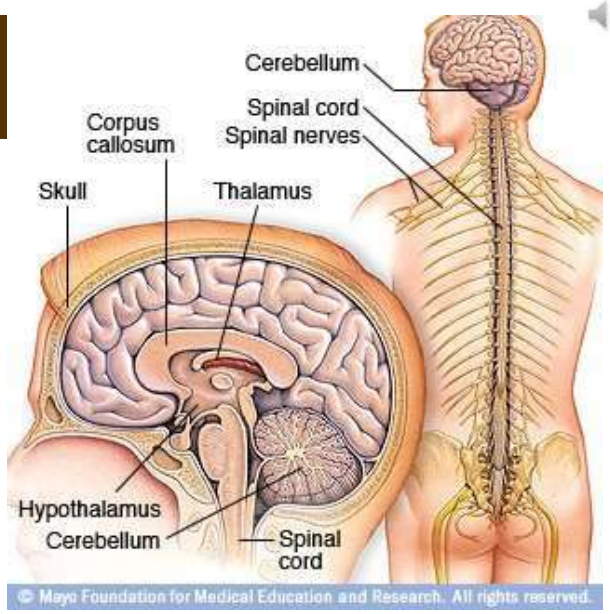
The peripheral nervous system refers to parts of the nervous system outside the brain and spinal cord. It includes the cranial nerves, spinal nerves and their roots and branches, peripheral nerves, and neuromuscular junctions.

We’ll examine these components in more detail over the next few slides

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Central Nervous System

- Includes the brain and spinal cord
- Brain is divided into four major areas:
  - Brainstem
  - Cerebellum
  - Diencephalon (thalamus & hypothalamus)
  - Cerebral Hemispheres



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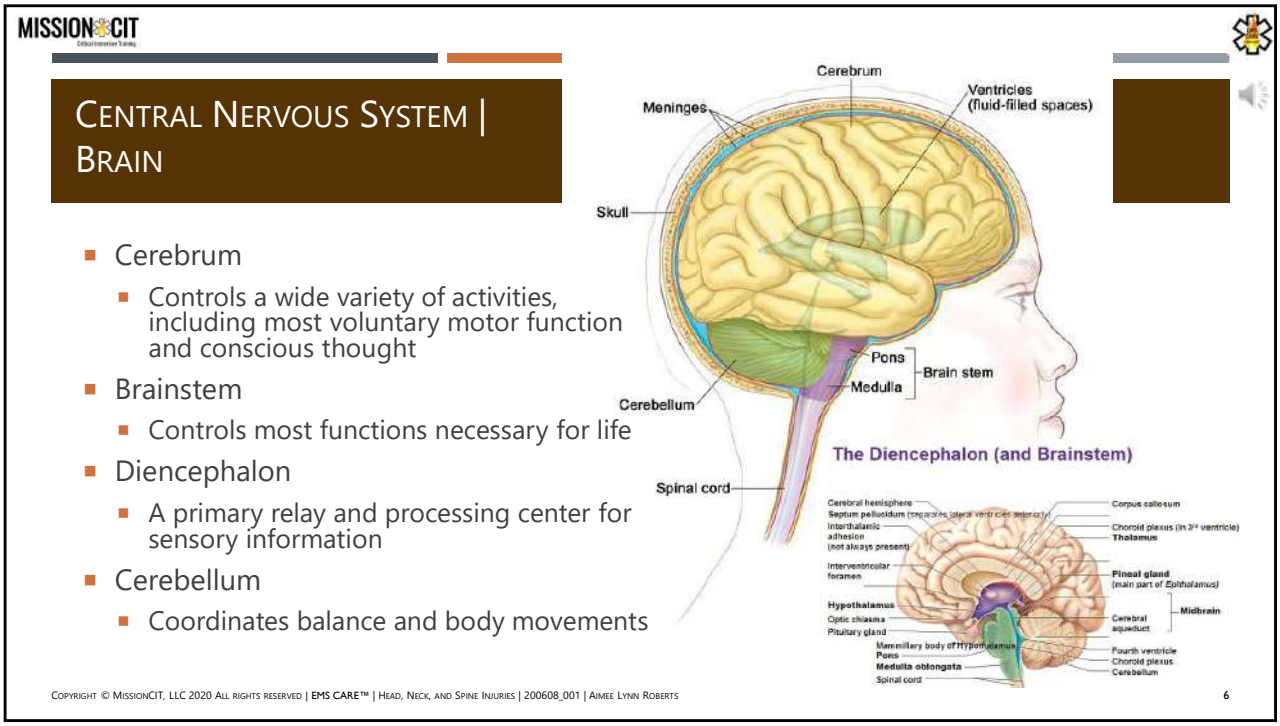
The Central nervous system (CNS) Includes the brain and spinal cord. The brain controls the body and is the center of consciousness. The nervous system is made up of vast neural networks; signaling within these circuits enables thinking, language, feeling, learning, memory, and all function and sensation.

The brain is divided into four main parts:

(1) the brain stem, consisting of the medulla, pons, and midbrain;

(2) the cerebellum;

(3) the diencephalon, with the thalamus and hypothalamus; and
(4) the cerebral hemispheres, comprised of the cerebral cortex, basal ganglia, white matter, hippocampi, and amygdalae.



The Brains four major parts include:

1. Cerebrum. The cerebrum (front of brain) is composed of the right and left hemispheres, which are joined by the corpus callosum. Functions of the cerebrum include: initiation of movement, coordination of movement, temperature, touch, vision, hearing, judgment, reasoning, problem solving, emotions, and learning.

1. Brainstem. The brainstem located in the middle of

the brain controls most functions necessary for life. It includes the midbrain, the pons, and the medulla. Functions of this area include: movement of the eyes and mouth, relaying sensory messages (such as hot, pain, and loud), respirations, consciousness, cardiac function, involuntary muscle movements, sneezing, coughing, vomiting, and swallowing.

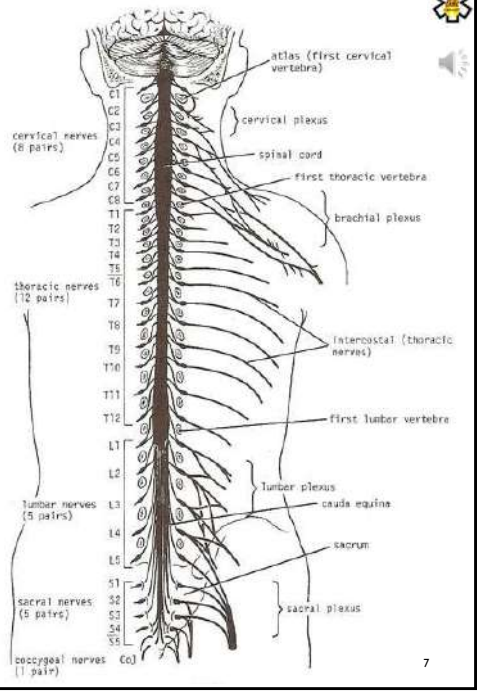
1. The diencephalon is a small part of the brain that is mostly hidden from view when you are looking at the outside of the brain. It is divided into four parts: the epithalamus, thalamus, subthalamus, and hypothalamus. The diencephalon acts as a primary relay and processing center for sensory information and autonomic control.

1. Cerebellum. The cerebellum or back of brain; is located at the back of the head. Its function is to coordinate voluntary muscle movements and to maintain posture, balance, and equilibrium.

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CENTRAL NERVOUS SYSTEM | SPINAL CORD

- Major Functions
  - Electrical Communications
  - Walking
  - Reflexes
- Structure
  - Cervical (neck)
  - Thoracic (chest)
  - Lumbar (abdominal)
  - Sacral (pelvic)
  - Coccygeal (tailbone)



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The spinal cord is a long, fragile tube like structure that begins at the end of the brain stem and continues down almost to the bottom of the spine. The spinal cord consists of nerves that carry incoming and outgoing messages between the brain and the rest of the body.

The spinal cord's major functions include:

- Electrical communication. Electrical currents travel up and down the spinal cord, sending signals which allow different segments of the body to communicate with the brain.

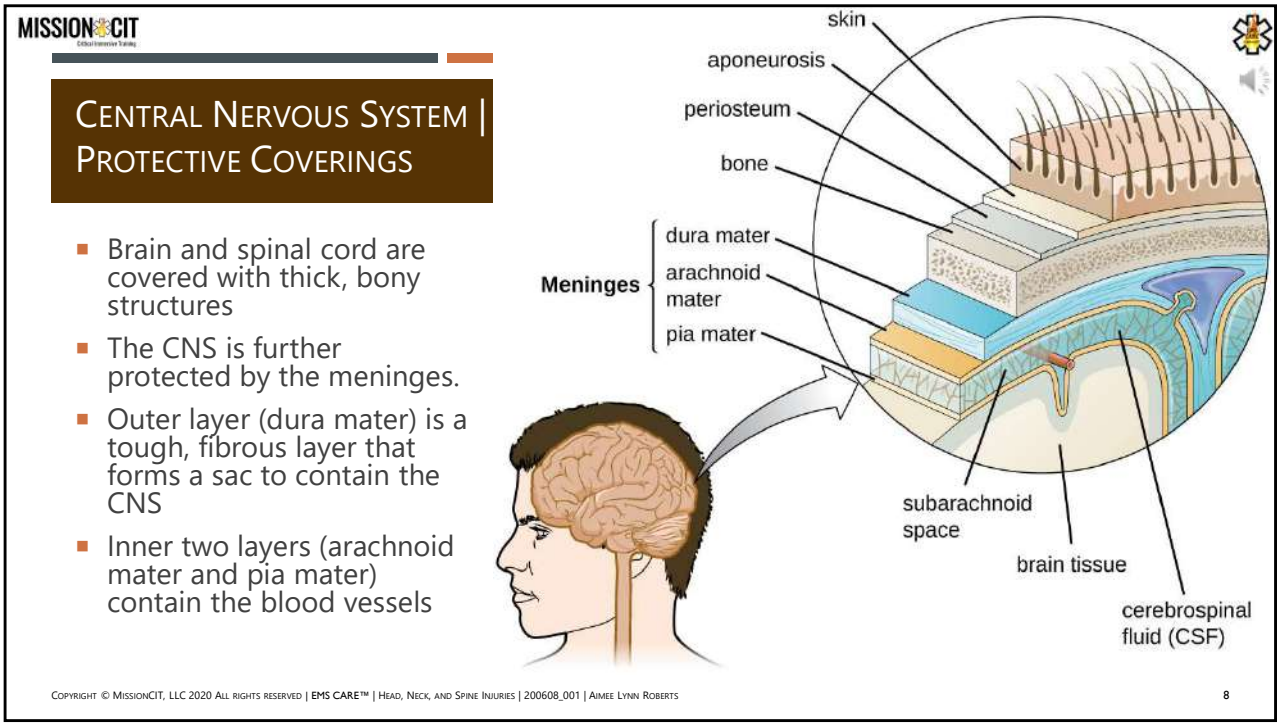
- Walking. While a person walks, a collection of muscle groups in the legs are constantly contracting. The action of taking step after step may seem incredibly simple to us since we have been doing it all of our lives, but there are actually a lot of factors that have to be coordinated properly to allow this motion to occur.
- Reflexes. Reflexes are involuntary responses resulting from stimuli involving the brain, spinal cord, and nerves of the peripheral nervous system.

The overall structure of the spinal cord is enclosed by the protection of the vertebral column. The spinal nerves are located in the spaces between the arches of the vertebrae. Spinal nerves are divided into these separate regions:

- Cervical (neck)
- Thoracic (chest)
- Lumbar (abdominal)
- Sacral (pelvic)
- Coccygeal (tailbone)

A spinal cord injury is when a part of the cord or the nerves located at the base of the spine are damaged. This can have a major effect on the body's "sensory, motor, and reflex capabilities if the brain is unable to

send information past the location of the injury.” The closer the injury is to the brain, the more expansive the damage.



Meninges are membranes that cover and protect the brain and spinal cord. There are three layers of meninges.

1. Dura mater or closest to the bone. The dura mater is a thick fibrous layer and a strong protective sheath over the entire brain and spinal cord. It is anchored to the inner surface of the cranium and vertebral cavity.

2. Arachnoid or loosely around the brain. The arachnoid mater is a membrane of thin fibrous tissue that forms a

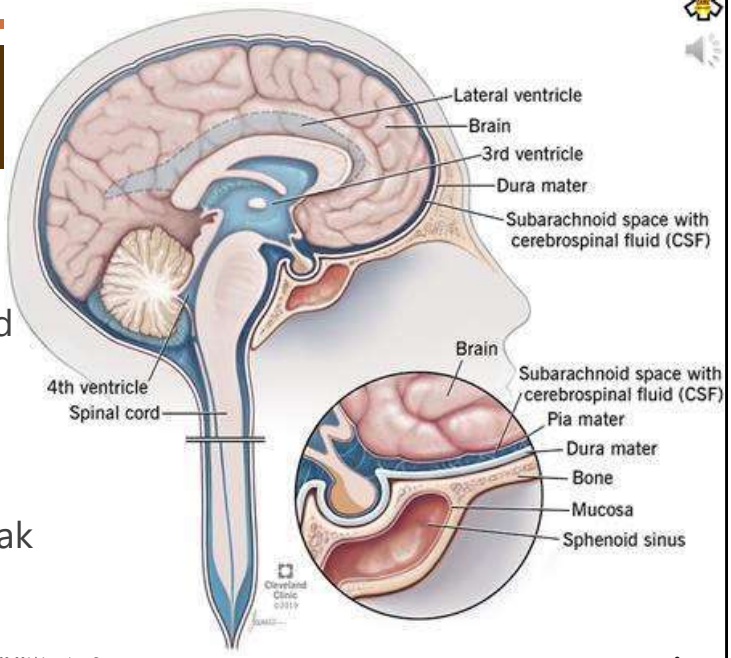
loose sac around the CNS. Beneath the arachnoid is a thin, filamentous mesh called the arachnoid trabeculae, which looks like a spider web, giving this layer its name.

3. Pia mater is closely attached to the brain and spinal cord surface. Pia mater is a thin fibrous membrane that follows the convolutions of gyri and sulci in the cerebral cortex and fits into other grooves and indentations.

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Central Nervous System | Cerebrospinal Fluid (CSF)

- Clear, water-like fluid, also called spinal fluid, found between the arachnoid and pia mater.
- Primarily acts as a shock absorber
- Upon severe injury, may leak from nose, ears or skull



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Cerebrospinal Fluid (CSF) cushions the brain and spinal cord. It is a clear, water-like fluid, also called spinal fluid, found between the arachnoid and pia mater. It primarily acts as a shock absorber.

CSF is produced in a chamber inside the brain, called the third ventricle. The area in the lateral ventricles that makes spinal fluid is called the choroid plexus. About 20cc of spinal fluid is made but not absorbed each hour. There is about 140 cc of spinal fluid that surrounds the brain and spine. The volume is about ½ can of soda

The brain and spinal cord are bathed and cushioned by this spinal fluid, which flows and circulates around the brain and spine.

When an injury does penetrate all the protective layers, clear, watery CSF may leak from the nose, the ears, or an open skull fracture.

That’s the end of Part A of this lesson. I will be back with you shortly for Part B to discuss the Peripheral Nervous and Skeletal systems.