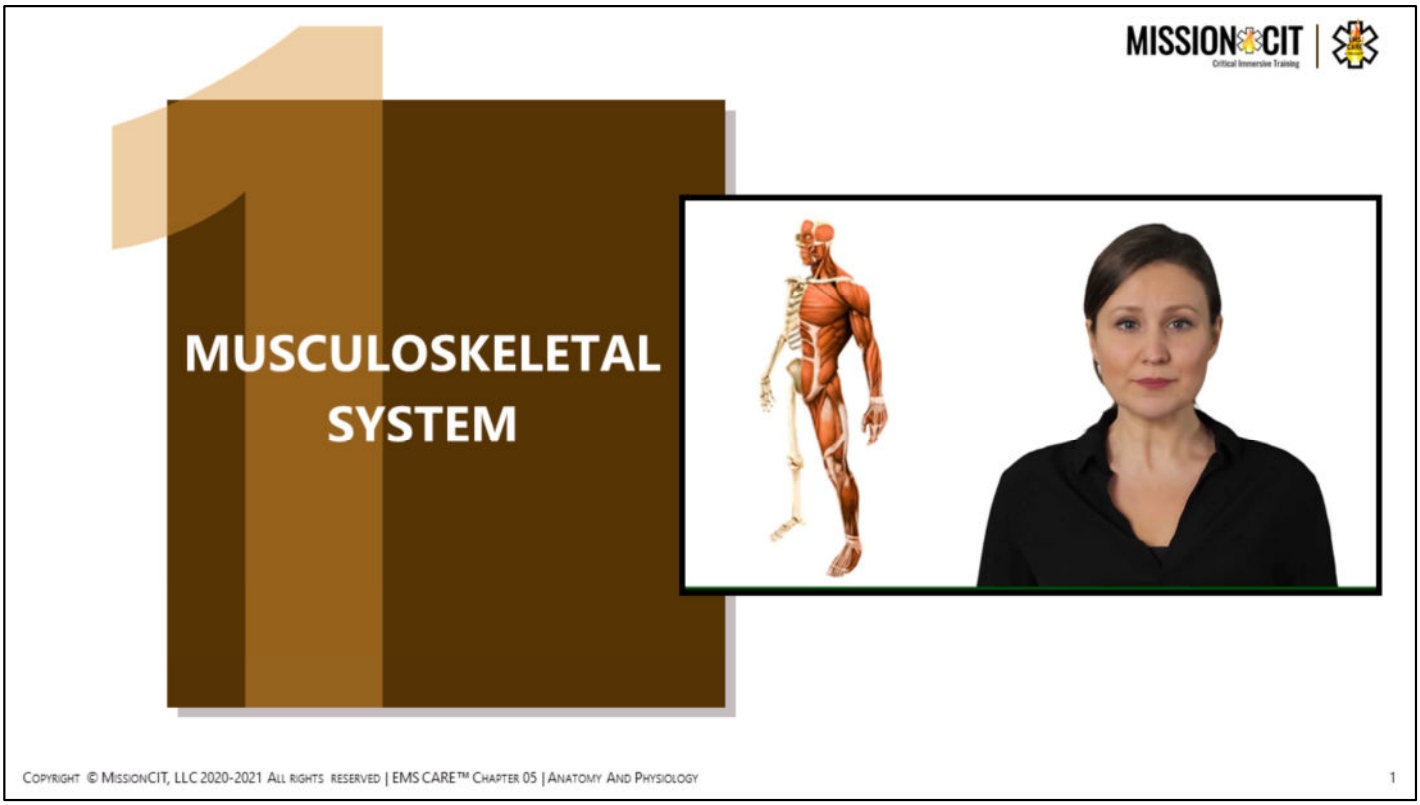
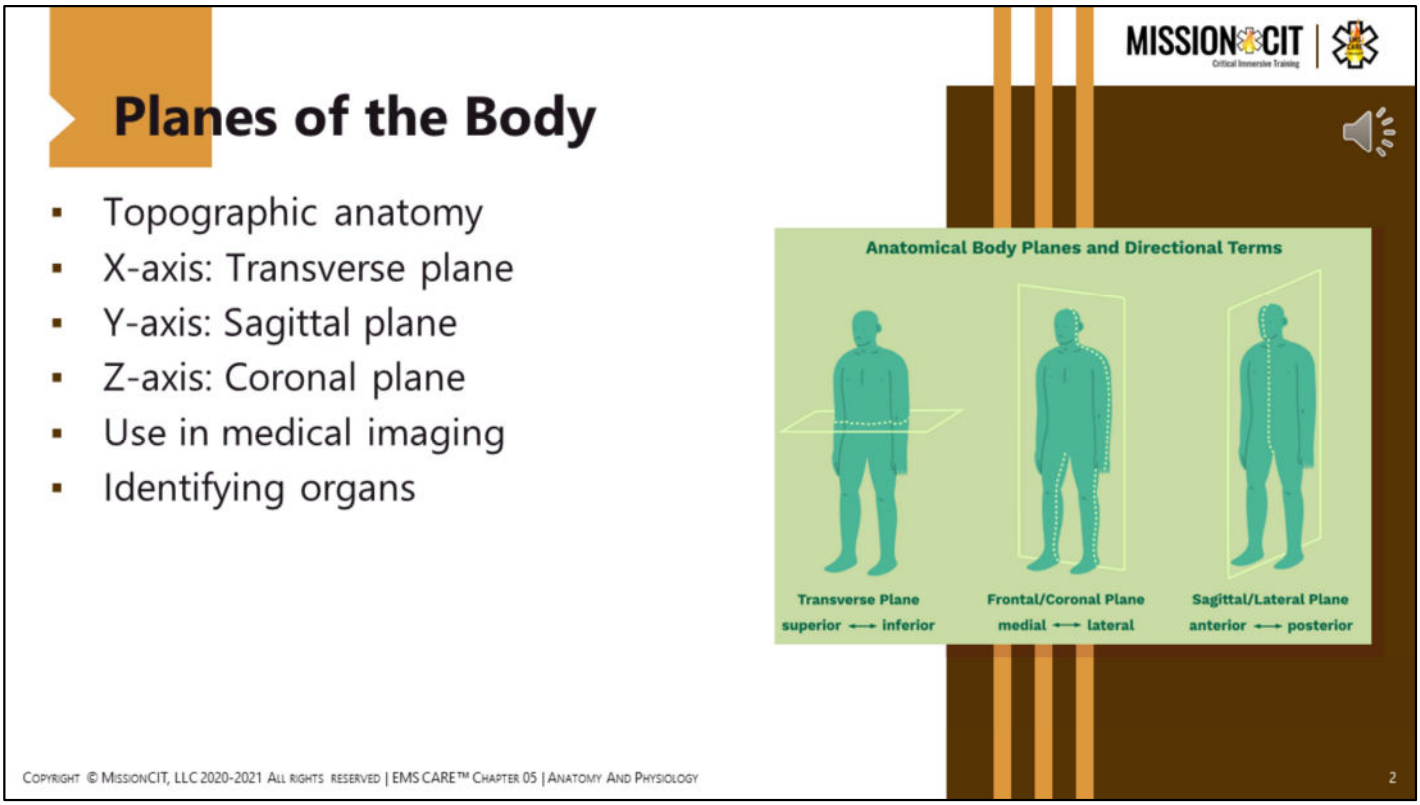


Hello, and welcome to this first lesson where we will be learning all about the musculoskeletal system, its role, and the different structures it encompasses.



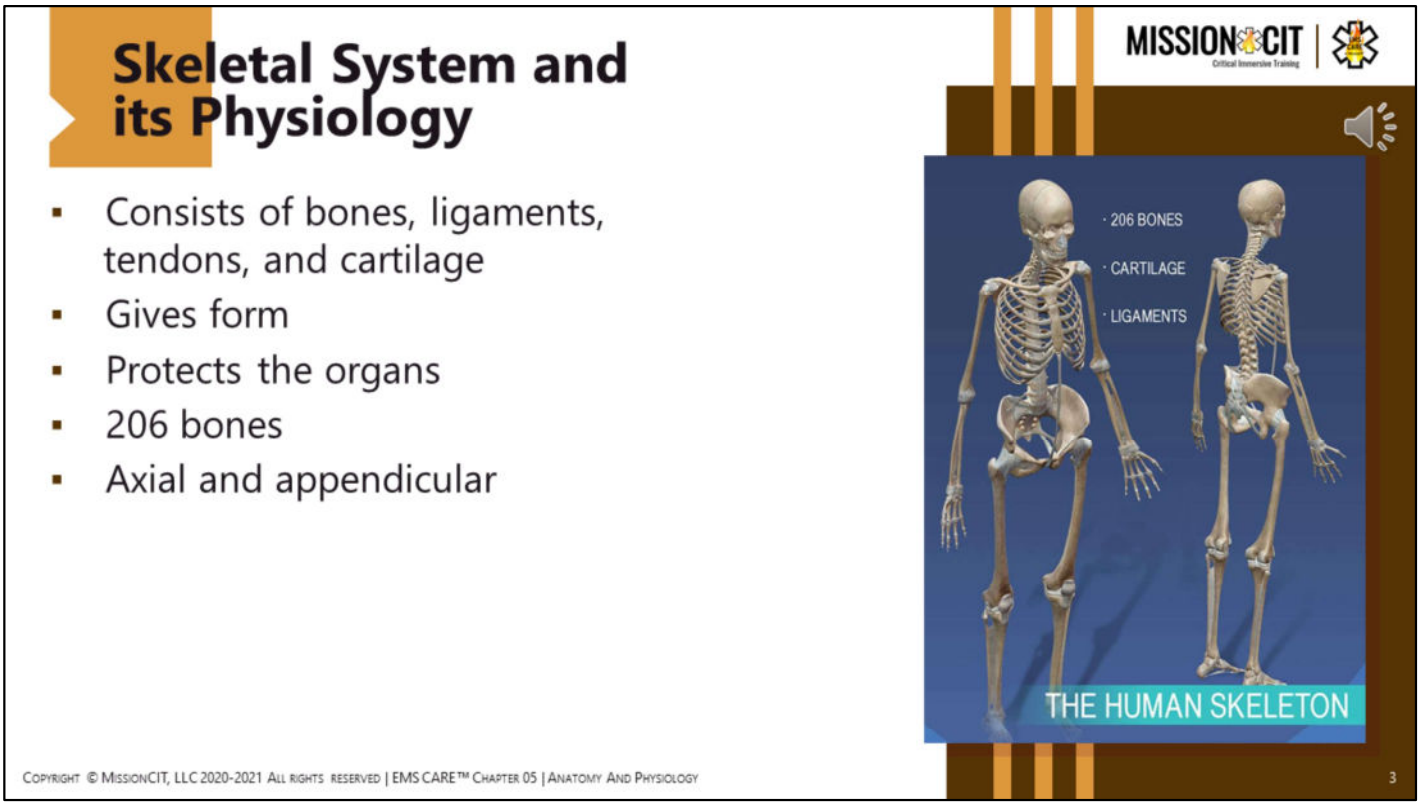
Topographic anatomy is a field that describes the layering of anatomical elements, their position with relation to each other, projection on the skin, blood supply structure, pathological conditions, and more based on the age, gender, and other unique attributes of an individual. From an EMT standpoint, this topographic anatomy serves as a guide to the structures that lie beneath the body. It also helps you to understand the relative position of different structures and organs when a patient is facing you in a standing position, arms at their side, and palms forward.

When the patient is in this position, imagine that straight lines are drawn on the body to divide it three ways.

The first is a line that separates the front and the back, and this is called the coronal plane. The transverse plane divides the body into top and bottom while the sagittal or lateral plane divides the body into left and right sides.

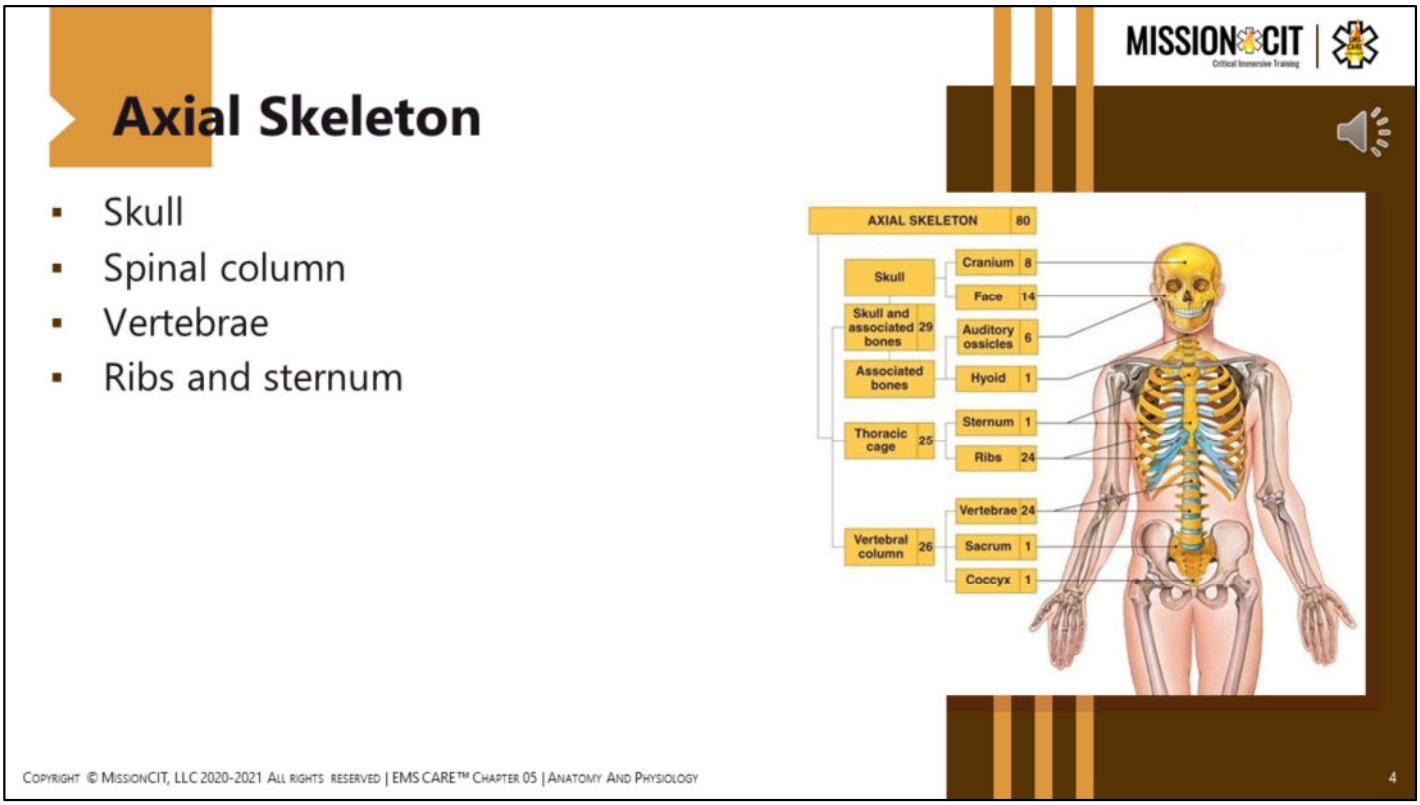
Now, you might wonder about the use of these body planes. Well, they help in medical imaging techniques such as CT and MRI scans where the technician uses the X, Y, and Z-axis of the planes to identify and locate the positions of the patient's internal organs, and the smaller structures that exist with them.

It also helps to mimic a particular structure's range of motion and can also help understand embryological development.



The skeletal system contains the bones, ligaments, tendons, and cartilage, and is responsible for giving us the recognizable human form. Besides, these bone structures also protect the vital organs in our body from possible damage. It is also responsible for 20 percent of the weight of the human body.

The skeletal system has about 270 bones at the time of birth and these fuse together over time to give just 206 bones in an adult. This skeletal system can be divided into axial and appendicular skeletons, where the axial skeleton consists of 80 bones in the skull, spinal column, and thorax regions while the appendicular skeleton has 126 bones in the pelvic girdle, shoulder girdle, upper, and lower extremities.



The skull is an important part of the axial skeletal system. It consists of 22 bones and all of them act as a single unit except for the mandible bone or the lower jaw. This is why the lower jaw is the only part of the body that moves in the entire skull structure. The upper part of the skull is called the cranium and its primary aim is to protect the brain from possible damage. The face consists of the remaining bones.

A unique bone in the skull is the hyoid, a small, U-shaped bone found just below the mandible. This is the only bone that does not form a joint and hence, is a floating bone. Its function is to help hold the trachea open and to form a bony connection for the tongue muscles.

The second part of the axial skeleton is the spinal column that is composed of 33 vertebrates. It is divided into five regions, namely,

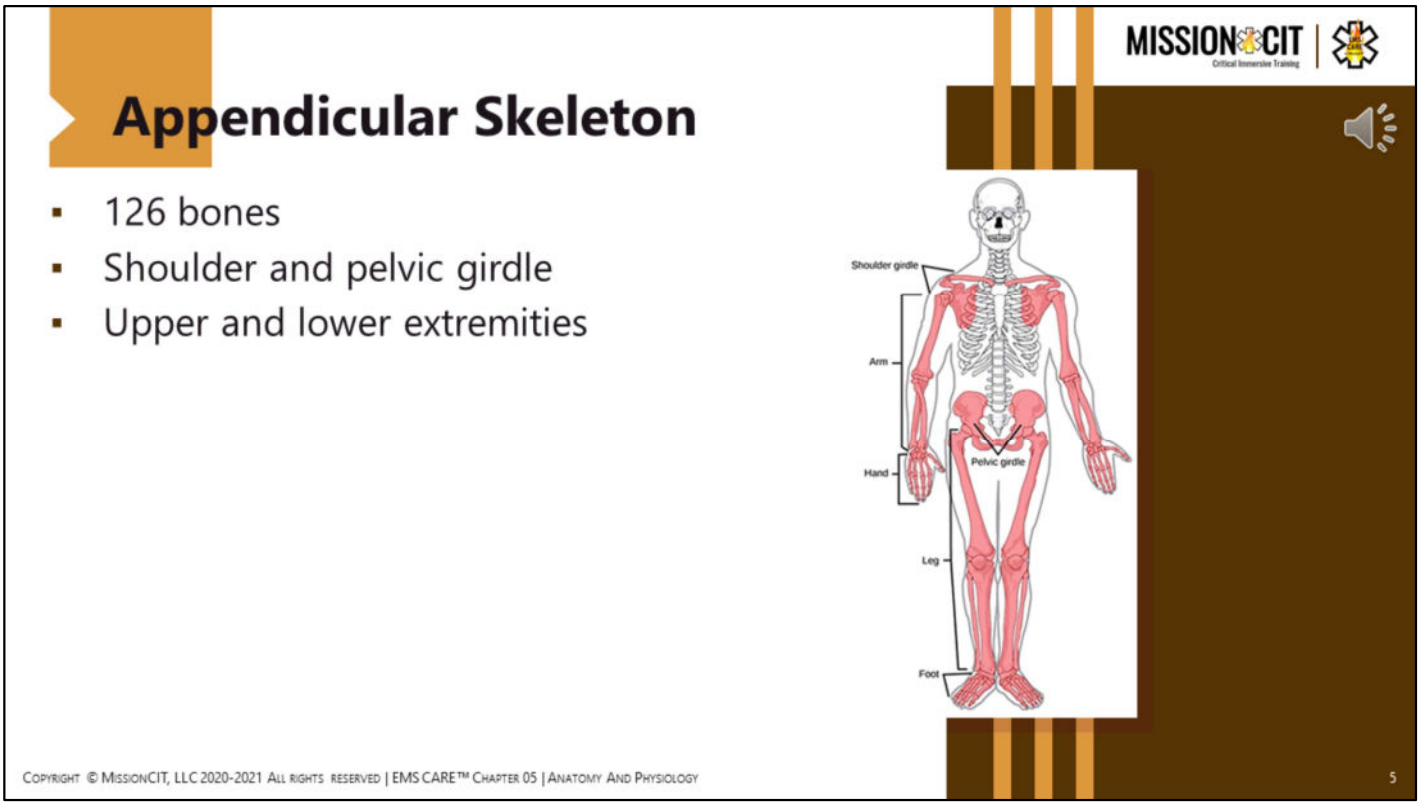
- The cervical or neck consists of 7 vertebrae
- Thoracic or chest consists of 12 vertebrae
- The lumbar or lower back consists of 5 vertebrae
- The sacrum consists of 1 vertebra
- Coccyx or tailbone consists of 1 vertebra

Except for the singular sacrum and coccyx, each vertebra is named for the first letter of its

region and its position along the superior-inferior axis. For example, the most superior thoracic vertebra is called T1 and the most inferior is called T12.

The final part of the axial skeleton is the thorax that is formed by 12 vertebrae and 12 pairs of ribs. It protects the lungs, heart, esophagus, and great vessels. The sternum, or breastbone, is a thin, knife-shaped bone located along the midline of the anterior side of the thoracic region of the skeleton. The sternum connects to the ribs by thin bands of cartilage called the costal cartilage.

There are 12 pairs of ribs that together with the sternum form the ribcage of the thoracic region. The first seven ribs are known as “true ribs” because they connect the thoracic vertebrae directly to the sternum through their band of costal cartilage. Ribs 8, 9, and 10 all connect to the sternum through cartilage that is connected to the cartilage of the seventh rib, so we consider these to be “false ribs.” Ribs 11 and 12 are also false ribs but are also considered to be “floating ribs” because they do not have any cartilage attachment to the sternum at all.



The appendicular skeleton consists of 126 bones divided among pectoral and shoulder girdles, and upper and lower extremities. The bones that form the appendicular skeleton are:

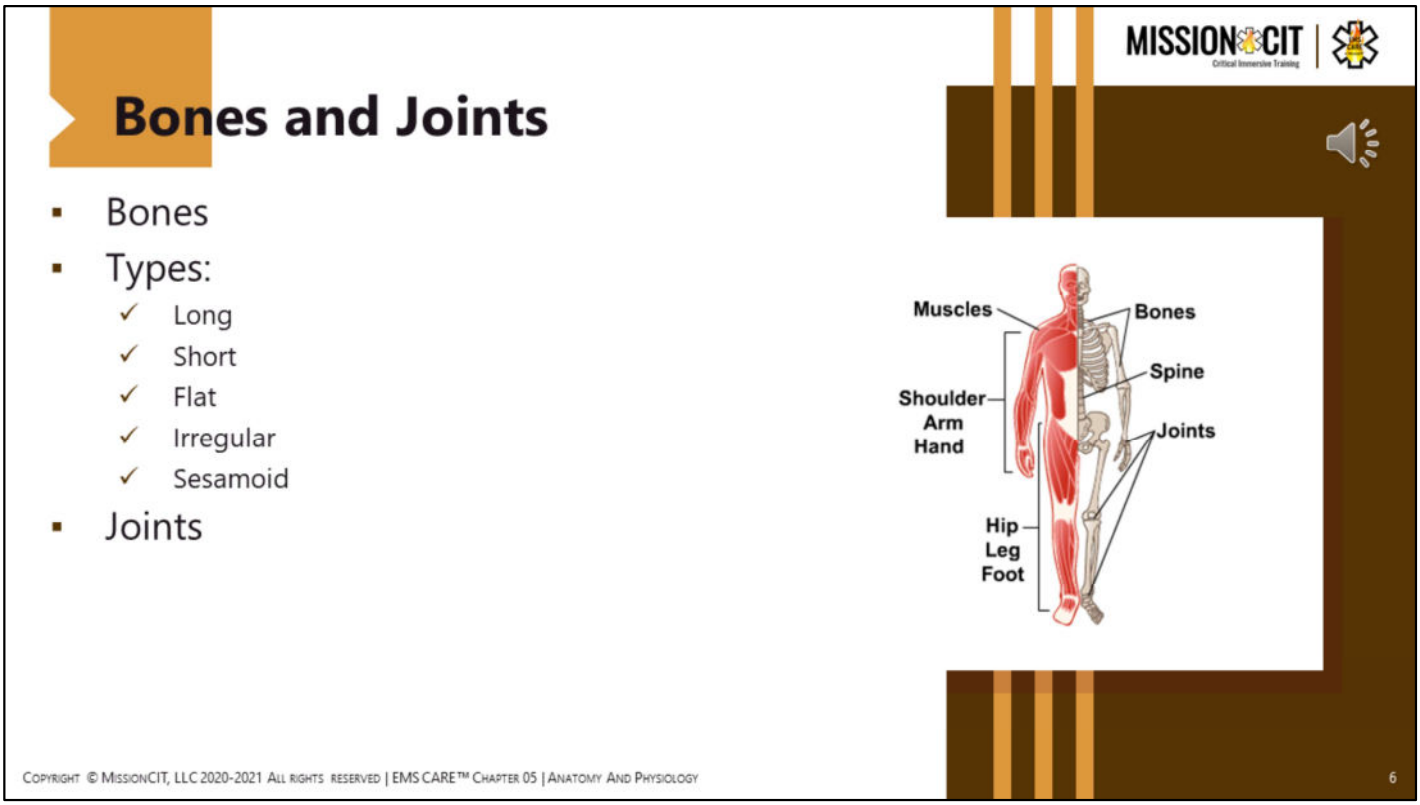
- 2 clavicle on the shoulders
- 2 scapula on the shoulders
- 2 humerus on the upper extremities
- 2 radius on the upper extremities
- 2 ulna on the upper extremities
- 16 carpals on the upper extremities
- 10 metacarpals on the upper extremities
- 56 phalanges, with 14 on each extremity
- 2 hip bones
- 2 femur on the lower extremities
- 2 tibia on the lower extremities
- 2 fibula on the lower extremities

- 2 patella on the lower extremities
- 14 tarsals on the lower extremities
- 10 metatarsals on the lower extremities

Out of these, the femur is the largest bone in the body, and it forms the ball and socket joint with the hips and the knee joint with the patella. Interestingly, the patella or kneecap is not present at birth and develops to help the child to crawl and walk. The tarsals and carpals form joints with the metatarsals and metacarpals respectively, and they end with the phalanges, which are nothing but the bones on your hands and feet. Each toe or finger has three phalanges, except for the big toe and thumb which have two apiece.

The pectoral girdle connects the upper extremities to the axial skeleton and consists of the right and left clavicles and scapula or the collarbone. The humerus is the bone of the upper arm that joins the clavicle to form the shoulder joint and joins the ulna and radius of the lower arm to form the elbow joints.

The pelvic girdle connects the lower extremities to the rest of the body.



The skeleton makes up around 30 to 40 percent of the total body mass and is made up of living and non-living bone matrix and bone cells. It is composed of 50 percent water and the remaining 50 percent is made up of collagen protein and crystals of calcium carbonate and phosphate.

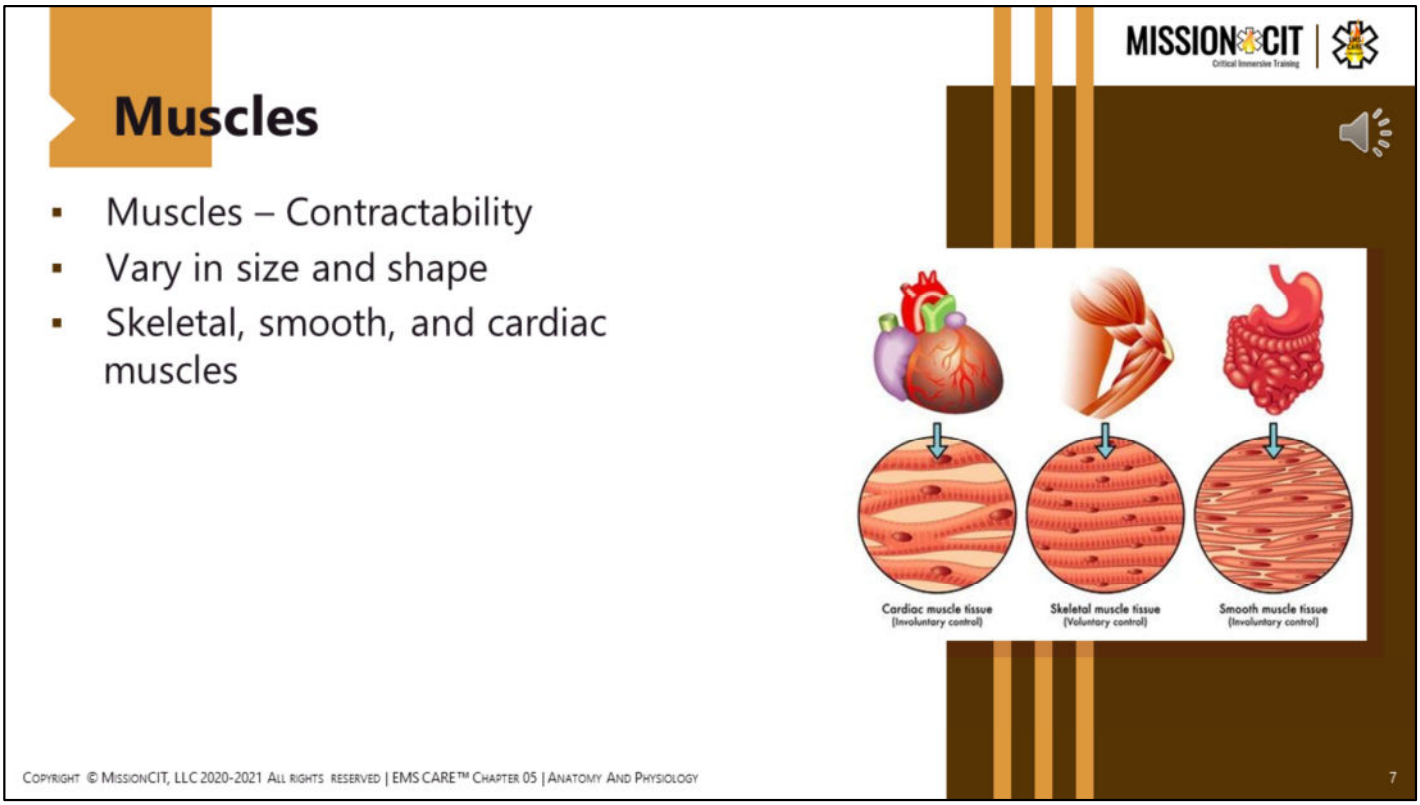
Bones are divided into many five types, and they are:

- Long bones are long and wide, and they are found in the extremities. They grow the most in childhood and are responsible for the bulk of the height of adults. Examples are the femur and tibia.
- Short bones have the same amount of width and length. Examples are carpals and tarsals.
- Flat bones vary greatly in size and shape but are thin and point in a single direction. Examples are the occipital bones.
- Irregular bones have unique shapes to fit into the skeleton. Examples are vertebrae.
- Sesamoid bones form after birth and inside the tendons to provide additional cushioning for walking and running. An example is a patella.

Joints or articulations are where two bones or cartilages meet. However, sometimes they leave small gaps in the meeting point to facilitate movement and this is called the synovial joint. When there are no gaps, it is called fibrous joints. There is also another joint type called

the cartilaginous joint where there is a layer of cartilage between two bone joints for extra flexibility.

Joints are also classified based on the kind of movement they facilitate. For example, the hinge joint on the knees restricts motion to one plane while the ball and socket joint of the hips allows both rotation and bending.



The muscular system consists of muscles, a specialized cell whose main function is contractability. These muscles are attached to bones or internal organs and are responsible for all movements in the human body. Besides movement, muscles also facilitate posture, joint stability, and heat production.

Muscles vary in size and arrangement, depending on their location. They can range from tiny strands in the middle ear to large masses such as the thigh muscles. Also, these muscles may converge at one point or can run parallel to the bone. Regardless of the size, shape, and alignment, every muscle fiber is a cylindrical muscle cell that is connected with other cells through the connective tissue.

Accordingly, muscles are divided into skeletal, smooth, and cardiac muscles. The skeletal muscles attach to the bones and facilitate movement, smooth muscles are found in hollow internal organs such as blood vessels, and cardiac muscles are found in the heart.

This brings us to the end of this lesson and in the next one, Justin will continue our journey through the respiratory and circulatory systems.