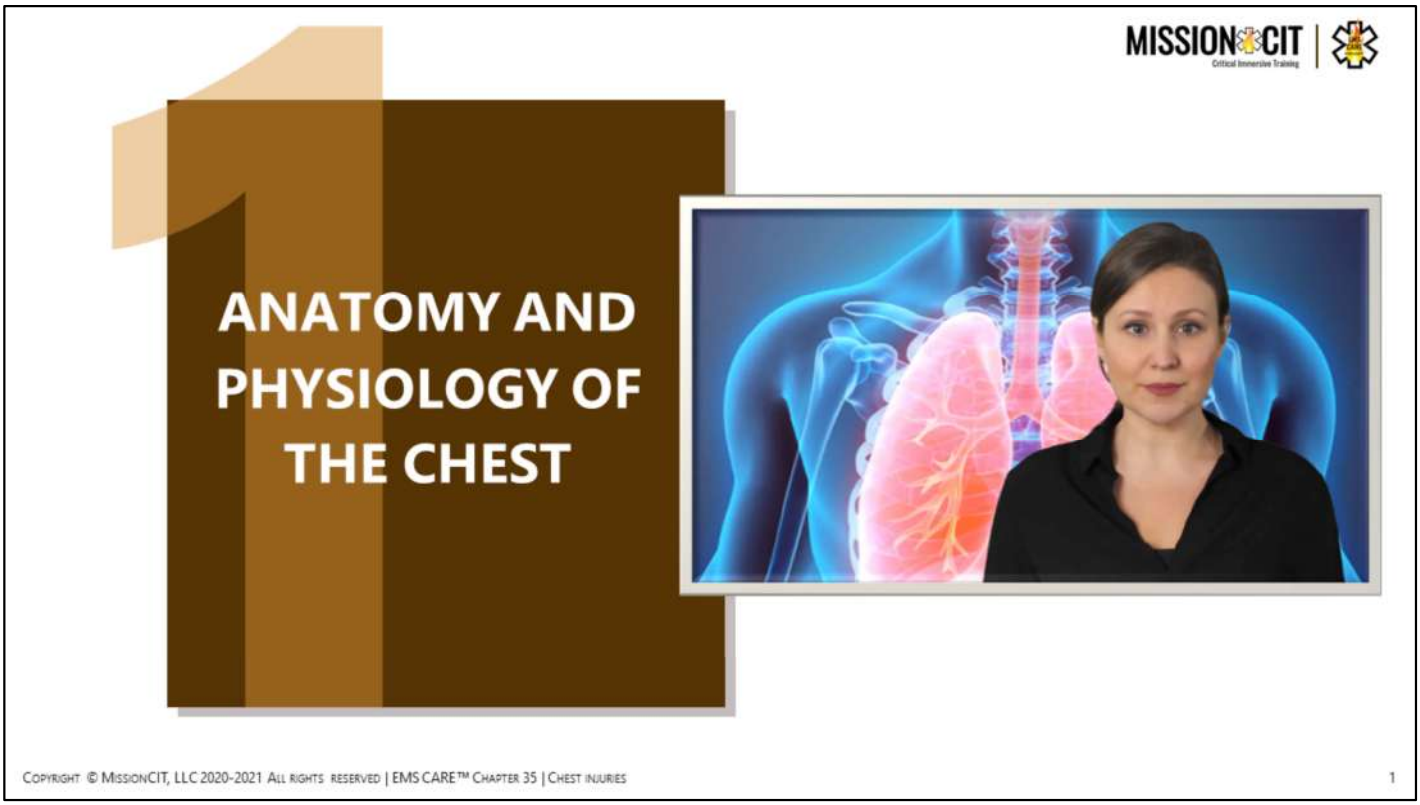
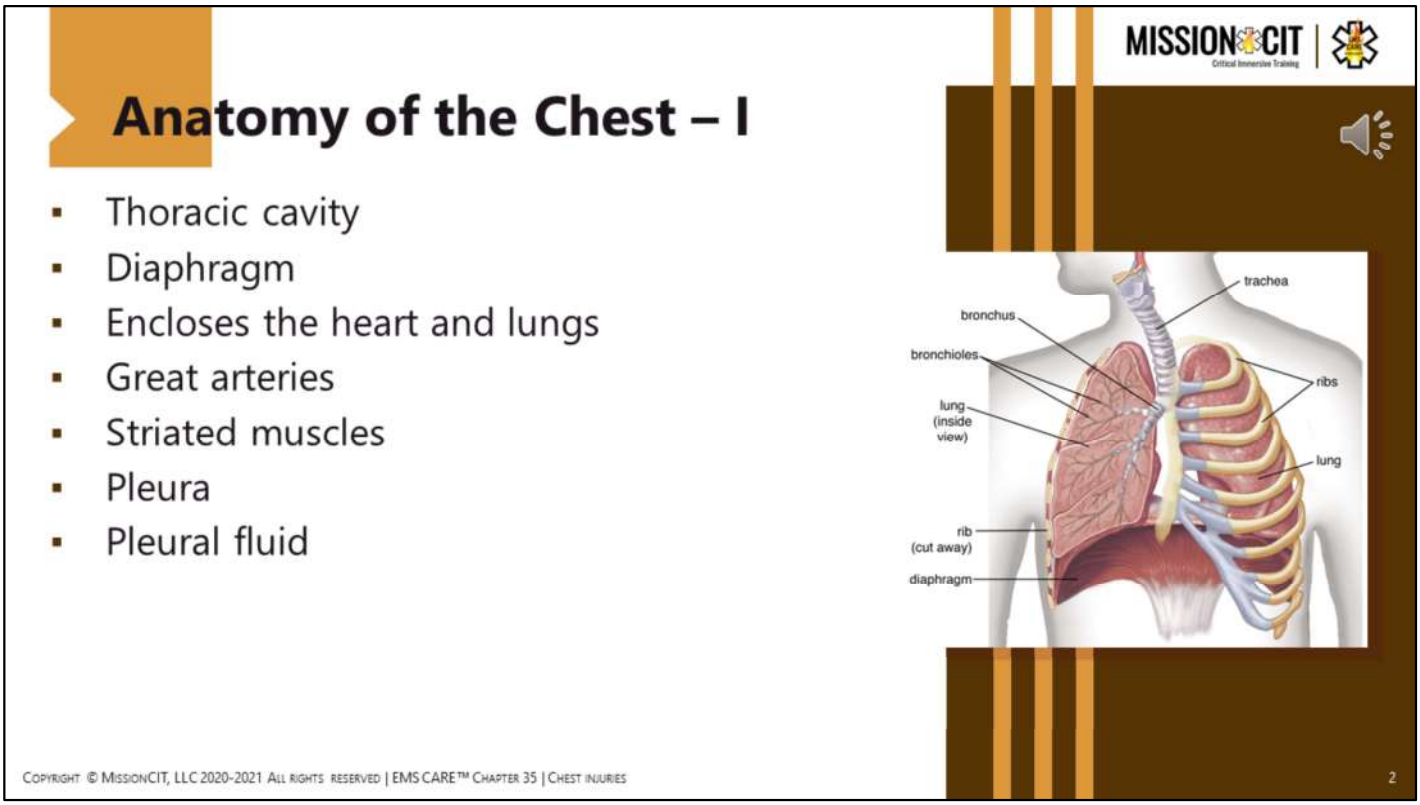


Hello and welcome to the first lesson where we talk about the anatomy and physiology of the chest. The chest or thoracic region is the second-largest hollow space in the body.



The thoracic cavity spans the area inferior to the neck and superior to the abdomen but does not span laterally to encompass the upper limbs. It is enclosed by the ribs, the vertebral column, and the sternum, or breastbone, and is separated from the abdominal cavity by the diaphragm. It contains the lungs, the middle and lower airways, the tracheobronchial tree, the heart, the vessels transporting blood between the heart and the lungs, the great arteries bringing blood from the heart out into general circulation, and the major veins into which the blood is collected for transport back to the heart. The heart is covered by a fibrous membrane sac called the pericardium that blends with the trunks of the vessels running to and from the heart. The thoracic cavity also contains the esophagus, the channel through which food is passed from the throat to the stomach.

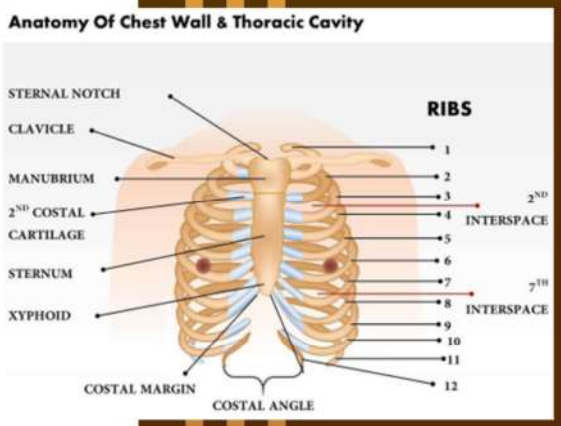
There are many unique aspects of the chest cavity such as the presence of striated muscles that allow for ventilation and pleura that covers the lungs as well as the thoracic cavity.

The pleura is a continuous sheet of endothelial, or lining, cells supported by a thin base of loose connective tissue. The membrane is well supplied with blood vessels, nerves, and lymph channels. The vessels of the visceral part of the pleura are intimately related with those of the lungs and bronchi; its arteries are branches of the bronchial arteries, and its veins mingle with the pulmonary network of capillaries. Beneath its inner side is a network of tiny lymph channels, or capillaries, that penetrate the lung substance, or parenchyma, and drain to the lymph nodes at the hilum of each lung, the point of entrance and departure for bronchi, blood vessels, and nerves.

A small amount of fluid, called pleural fluid between the parietal and visceral linings allows the lungs to move freely against the inner chest wall during respiration. Picture a cup on a wet glass surface. The water or fluid allows for the cup to slide easily over the surface. The same principle happens on the surface of the lungs with the visceral and parietal linings and pleural fluid. Keep in mind that there is a “space” or potential space between these linings where the pleural fluid resides.

Anatomy of the Chest – II

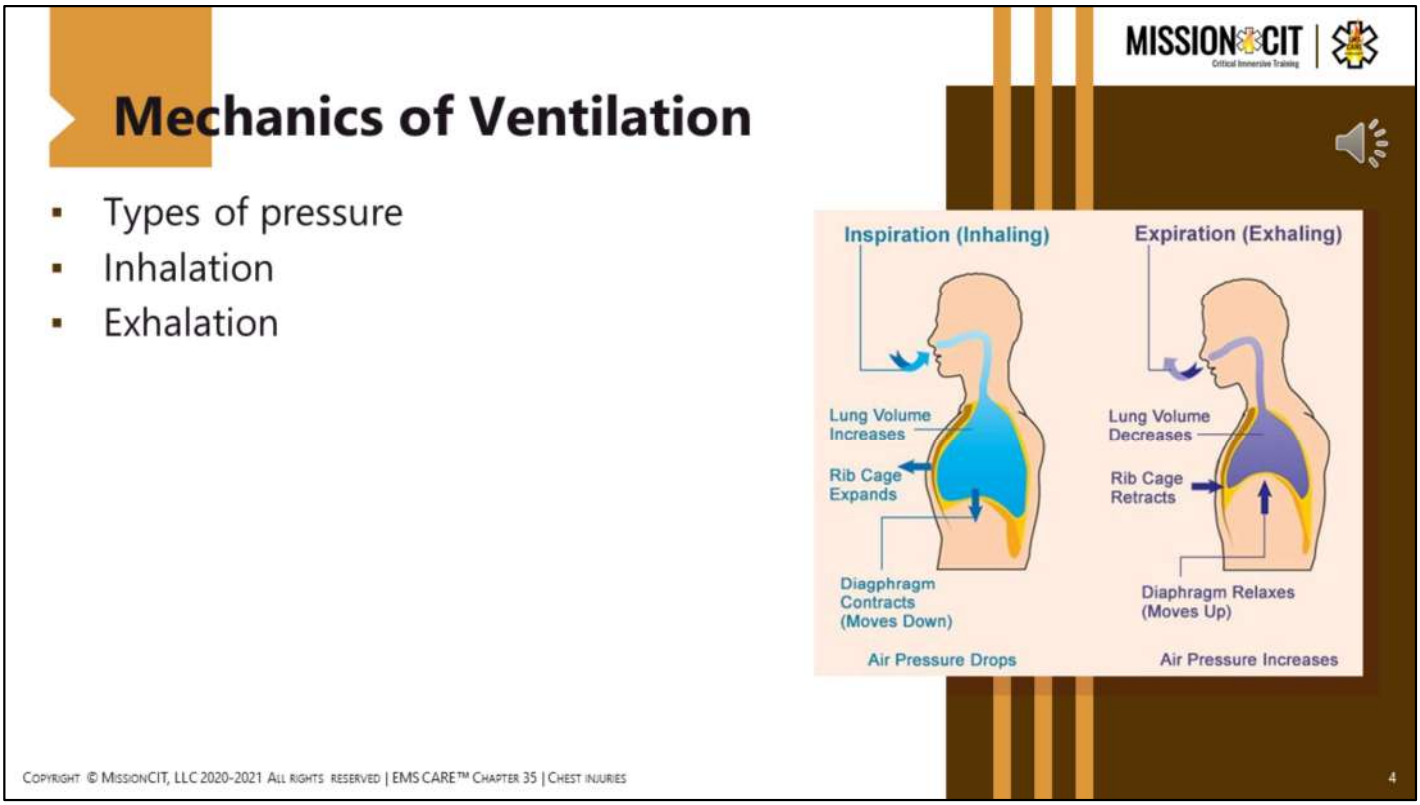
- Ribs
- Chest wall
- Rigid bones and cartilage
- Muscular components



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The chest cavity contains many vital organs such as the heart and the lungs. These vital organs are well protected by a cage of bones. The ribs form this cage which extends from the medial sternum, laterally and posteriorly to the thoracic vertebrae. The diaphragm, inferior to this cage, is the muscle that separates the thoracic cavity from the abdomen.

The chest wall is comprised of skin, fat, muscles, and the thoracic skeleton and provides stability for movement of the shoulder girdles and upper arms. Although the thoracic skeleton consists of rigid bones and cartilage, its interconnection with the muscular components forms for a dynamic structure that can expand during inspiration, thereby increasing intrathoracic volume and allowing for maximal breaths to take place.



In other words, ventilation, or breathing, is an active process with utilized negative pressure for inhalation and a passive process or an equal pressure gradient for exhalation.

The movement of air through the conducting passages between the atmosphere and the lungs is ventilation. The air moves through the passages because of pressure gradients that are produced by the contraction of the diaphragm and thoracic muscles.

Air, like other gases, flows from a region with higher pressure to a region with lower pressure. Muscular breathing movements and recoil of elastic tissues create the changes in pressure that result in ventilation. Pulmonary ventilation involves three different pressures:

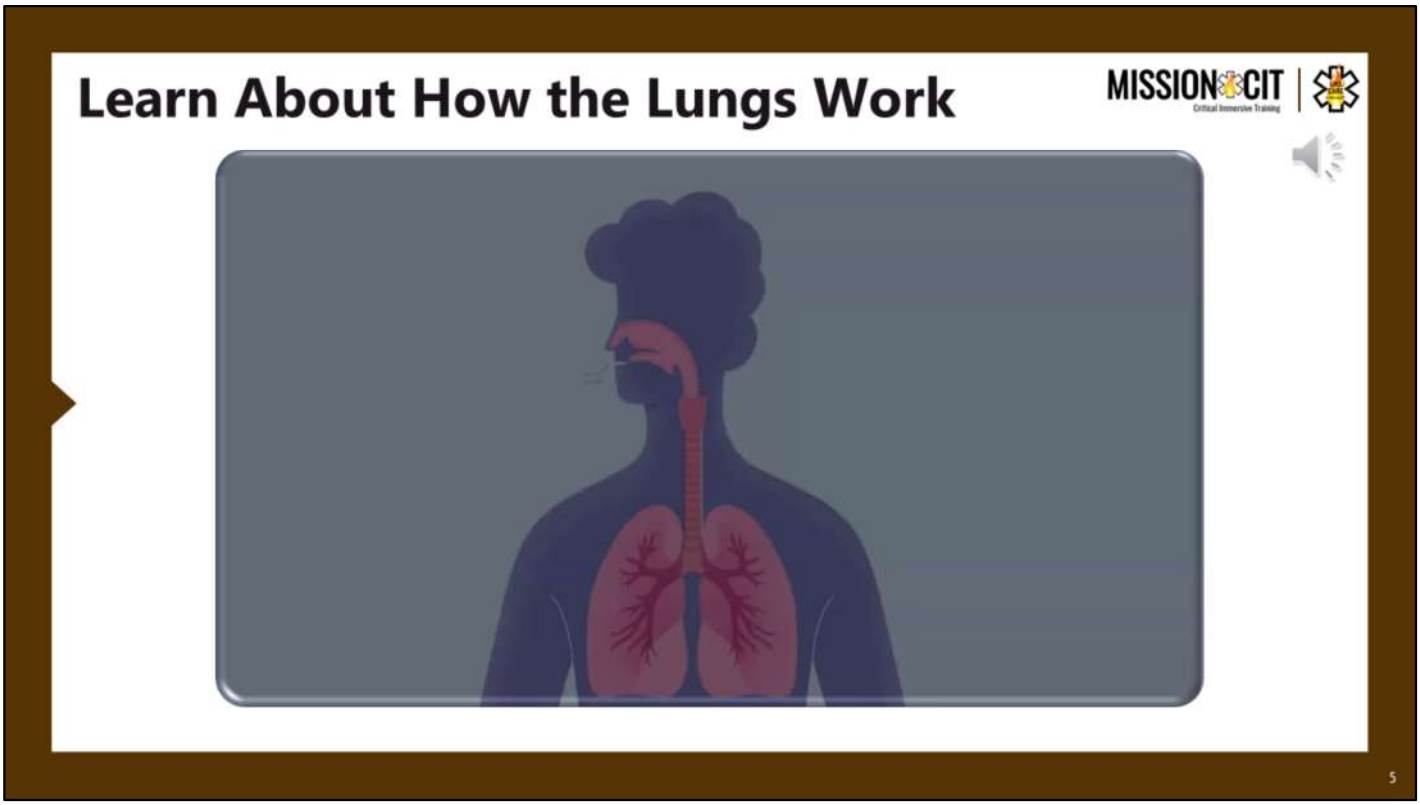
- Atmospheric pressure
- Interalveolar or intrapulmonary pressure
- Intrapleural pressure

Atmospheric pressure is the pressure of the air outside the body. Interalveolar pressure is the pressure inside the alveoli of the lungs. Intrapleural pressure is the pressure within the pleural cavity. These three pressures are responsible for pulmonary ventilation.

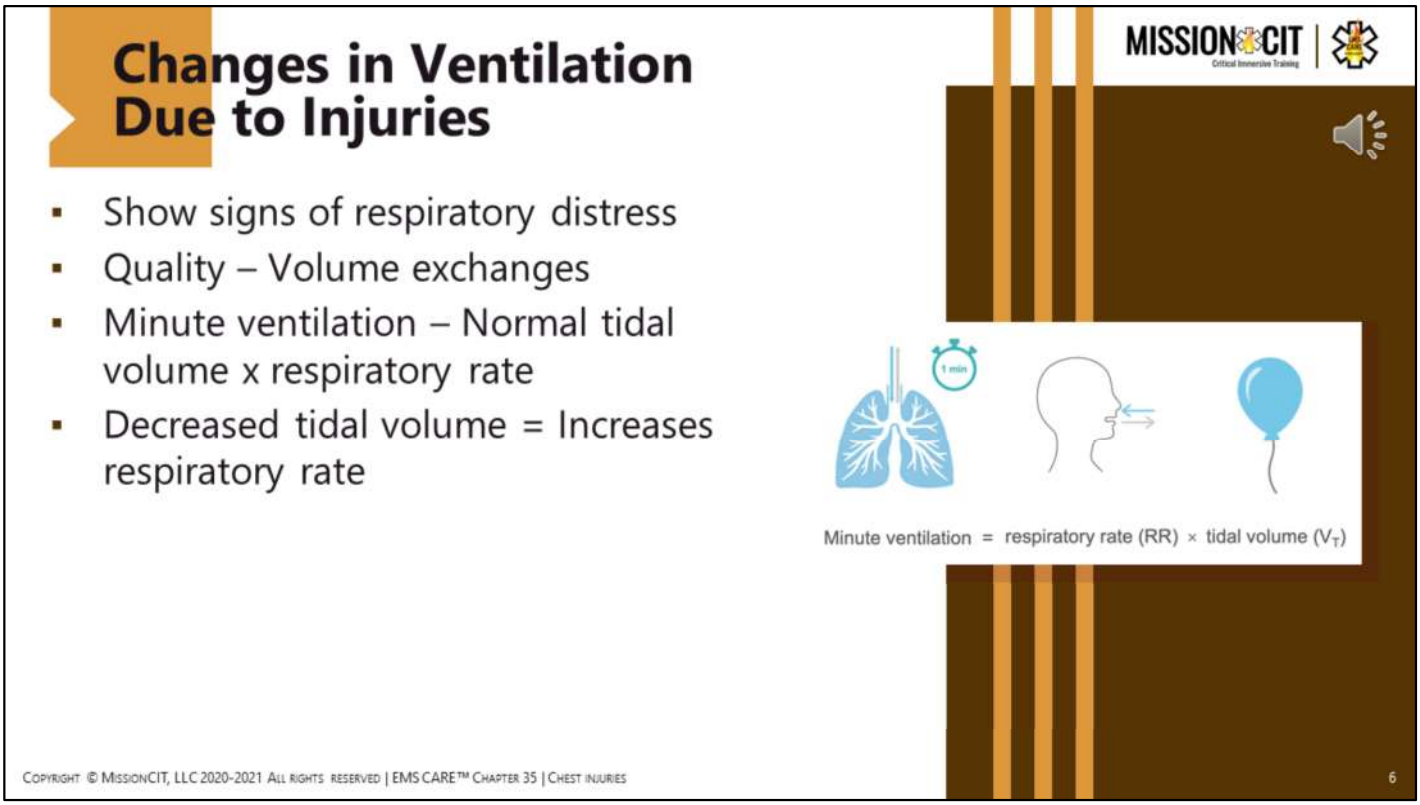
Inspiration or inhalation is the process of taking air into the lungs. It is the active phase of ventilation because it is the result of muscle contraction. During inspiration, the diaphragm contracts, and the thoracic cavity increases in volume. This decreases the intra-alveolar

pressure so that air flows into the lungs. Inspiration draws air into the lungs.

Expiration or exhalation is the process of letting air out of the lungs during the breathing cycle. During expiration, the relaxation of the diaphragm and elastic recoil of tissue decreases the thoracic volume and increases the intra-alveolar pressure. Expiration pushes air out of the lungs.



Watch this video by the National Heart, Lung, and Blood Institute (NHLBI), part of the National Institutes of Health (NIH) to learn about how the lungs work.



In the event of chest injuries, there will be changes in ventilation. As an EMT you will need to monitor respirations. We know a normal respiratory rate is twelve to twenty for adults. Any adult in a resting state with increased respirations over twenty or decreased respirations below twelve is in distress. Distressed individuals will show additional signs and symptoms of respiratory distress. Obtaining the quality as well as the rate will be vital. Quality will be described in volume exchanged, is the breath deep or shallow, is the breathing labored, is the breath regular?

Also, the minute ventilation or volume rate gives an idea of the possibility of chest injuries. This is the measure of the amount of air that moves through the lungs in one minute. It is calculated as the normal tidal volume multiplied by the respiratory rate. In general, patients with a decreased tidal volume will have an increased respiratory rate.

Besides the minute ventilation, there are other ways to determine if a person is suffering from chest injuries. And that's exactly what Justin will take you through next.