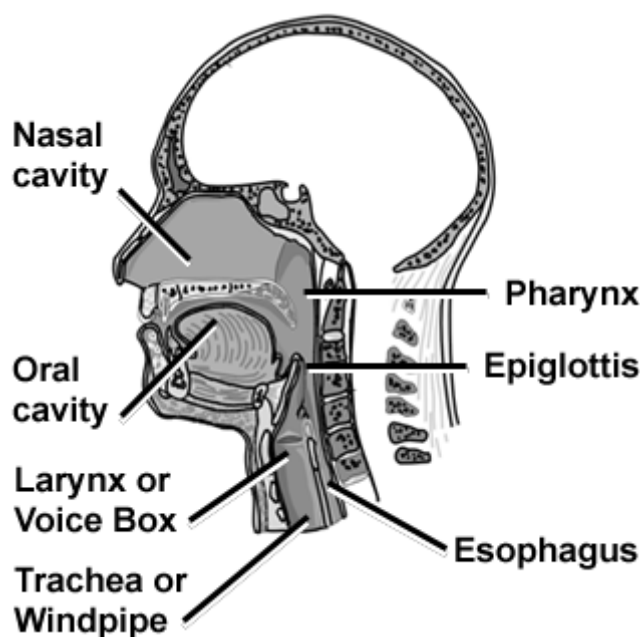


MEDICAL PROBLEMS IN TBI: RESPIRATORY MANAGEMENT IN TBI: NORMAL BREATHING AND THE RESPIRATORY SYSTEM

The purpose of the respiratory system is to supply oxygen to body tissues and to remove carbon dioxide, which is a waste product, from the body tissues. Breathing is the process by which oxygen in the air is brought into the lungs and into close contact with the blood, which absorbs it and carries it to all parts of the body. At the same time, the blood gives up carbon dioxide, which is carried out of the lungs with air breathed out.

Upper Respiratory System



The parts of the upper respiratory system are illustrated above.

The **Nasal cavity** or **Nose** is the preferred entrance for outside air to enter into the respiratory system.

The **Oral cavity** or **Mouth** is an alternative way for air to enter the respiratory system.

The **Pharynx** or **Throat** collects incoming air from the nose and mouth and passes it downward to the trachea (windpipe).

The **Epiglottis** is a flap of tissue that guards the entrance to the trachea, closing when anything is swallowed in order to prevent food or fluid from entering the lungs.

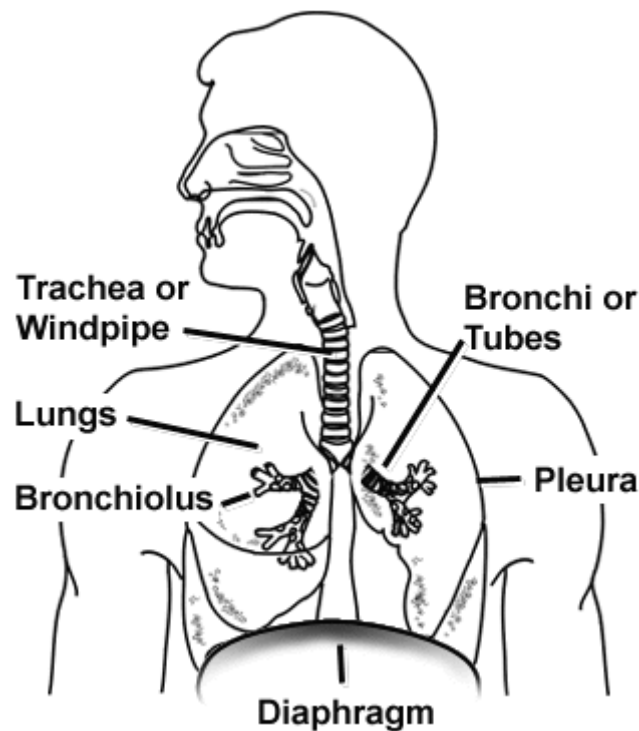
The **Larynx** or **Voice Box** contains two vocal cords. Air moving through the larynx creates voice sounds.

The **Esophagus** is the passage leading from the mouth and throat to the stomach.

The **Trachea** or **Windpipe** is the passage leading from the pharynx to the lungs.

The **Bronchi** or **Tubes** are the two main tubes into the lung that divide from the trachea. The bronchi subdivide into the lobar bronchi -- three on the right side and two on the left. These, in turn, subdivide further.

Lower Respiratory System



The parts of the lower respiratory system are illustrated above.

The **Bronchioles** are the smallest subdivisions of the bronchi, at the end of which are the alveoli (plural of alveolus).

The **Alveoli** are the very small air sacs that are the destination of inhaled air. The capillaries are blood vessels that are imbedded in the walls of the alveoli. The blood discharges carbon dioxide into the alveoli and takes up oxygen from the air in the alveoli.

The **Lungs** are elastic organs with sponge-like tissue. Inhalation requires an active effort, whereas exhalation occurs automatically. The right lung is divided into three lobes and the left is divided into two lobes.

The **Pleura** are the two membranes (actually one continuous

membrane folded on itself) that surround each lobe of the lungs and separate the lungs from the chest wall. The pleural space is the space between the two pleura.

Diaphragm is the strong wall of muscle that separates the chest cavity from the abdominal cavity. By moving downwards, it creates suction to draw in air and expand the lungs.

Ribs are bones separating and protecting the chest cavity. They move to a limited degree, helping the lungs to expand and contract.

Muscles of the Respiratory System

There are four sets of muscles that control the respiratory system.

The **Diaphragm** is a dome-shaped muscle, which separates the chest from the abdominal cavity. It is the major muscle and the one that begins the inhalation process. During inhalation, the diaphragm contracts and moves downwards, pushing out the abdomen and creating suction which draws in the air and expands the lungs.

The **Intercostal muscles**, located between the ribs, act to increase and decrease the diameter of the chest cage. The ability to take a deep breath and cough is affected by the loss of the intercostal muscles.

The **Abdominal muscles** are the most essential for an effective cough. When the abdominal muscles contract, the diaphragm is forced upward and coughing or forcefully blowing out air results.

The **Accessory muscles**, located in the neck, act to elevate the rib cage and can assist in deep respiration. However, they alone are not sufficient to support deep ventilation.

Based on Brain Injury Patient Care and Education Manual, by Pinecrest Rehabilitation Hospital; Neuro section of the Trauma Manual, Jackson Memorial Hospital; and Recovering from Head Injury; a Guide for Patients, by Nova University Neuropsychology Service, and edited for PoinTIS by the Louis Calder Memorial Library of the University of Miami School of Medicine and the PoinTIS Advisory Committee, and on Rehabilitation of Persons with Traumatic Brain Injury, NIH Consensus Statement 1998 Oct. 26-28.