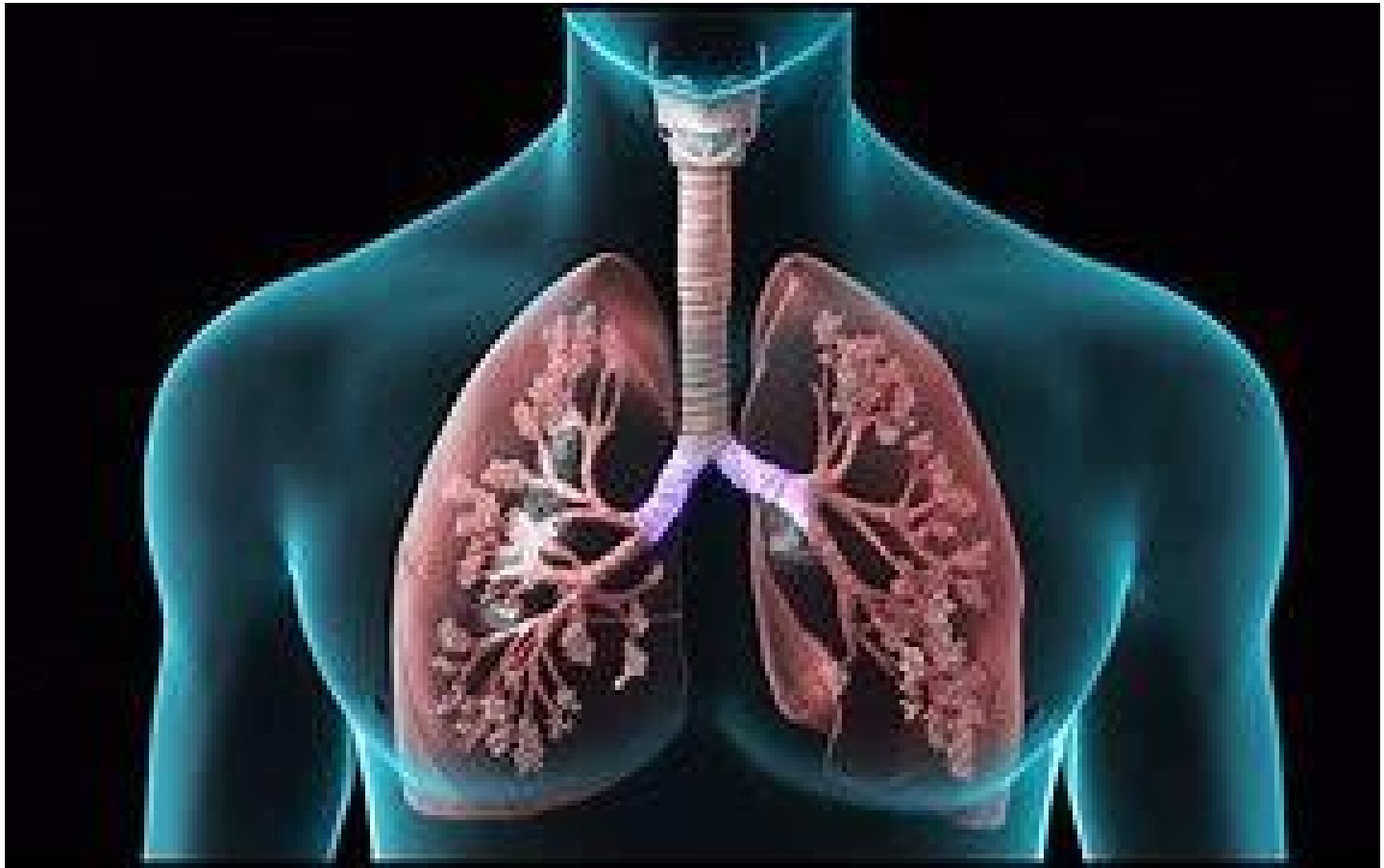
RESPIRATORY SYSTEM



- RESPIRATION
- PULMONOLOGY
- PULMONOLOGIST
- STRUCTURE OF THE RESPIRATORY SYSTEM
- DISEASE CONDITIONS
- DIAGNOSTIC TESTS
- THERAPEUTIC PROCEDURES
- MEDICAL TERMS
- ABBREVIATIONS

- **Pulmonology** is the medical study of the structure and diseases of the **respiratory system**, which includes all of the air passages from the nose to the tiny air sacs in the lungs
- A **pulmonologist** is a physician who specializes in the diagnosis and treatment of diseases and conditions related to the respiratory system.

- **Respiration - the mechanical process of breathing**
- **Exchange of air at the lungs is called external respiration.**
- **Internal (cellular) respiration, which involves an exchange of gases at the level of the cells within all organs of the body.**

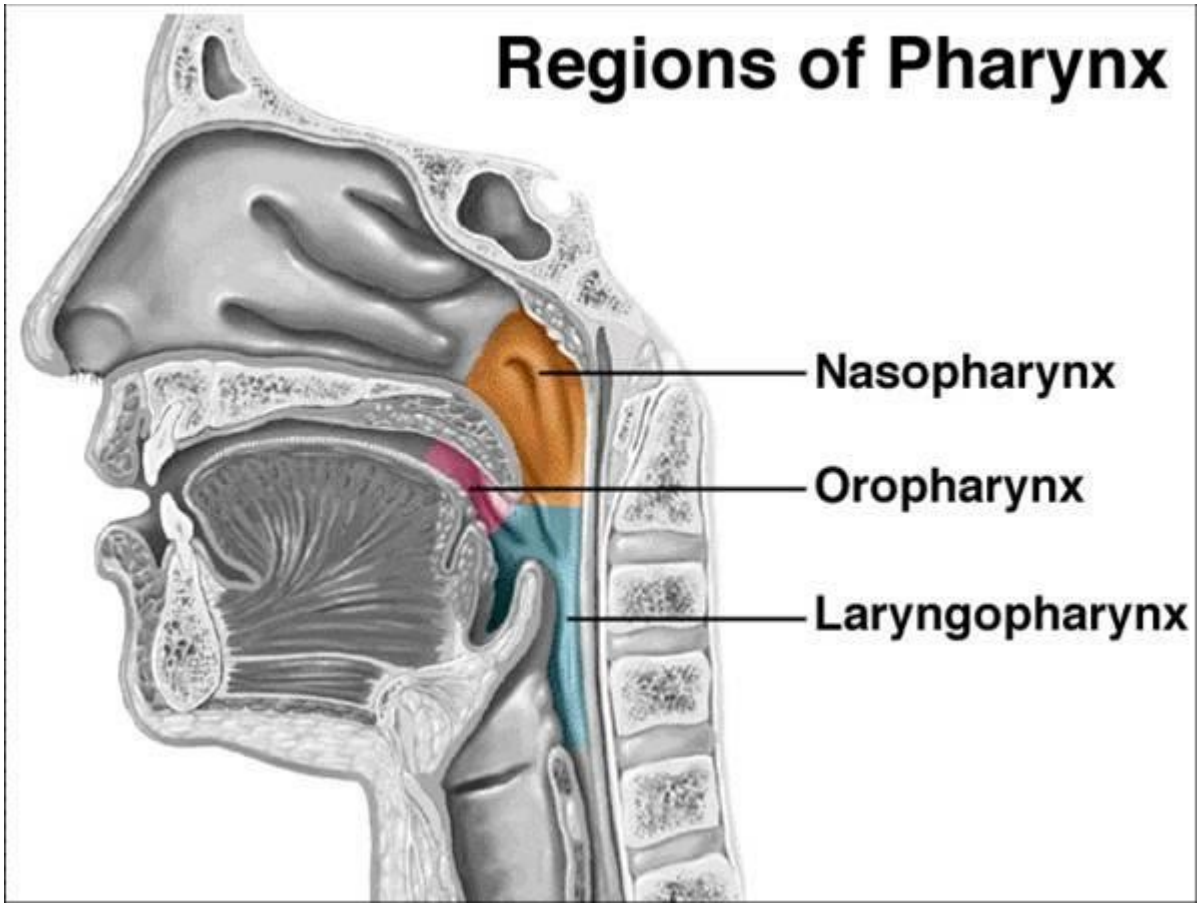
STRUCTURE AND FUNCTIONS

- Air enters the body via the nose through two openings called **nostrils or nares.**
- Air then passes through **the nasal cavity** , lined with a mucous membrane and **fine hairs(cilia)** to help filter out foreign bodies, as well as to warm and moisten the air.
- **Paranasal sinuses** are hollow, air-containing spaces within the skull that communicate with the nasal cavity - produces mucus- a lubricating fluid
- The sinuses **lighten the bones** of the skull and help produce sound.

PARANASAL SINUSES

- The air next reaches the **pharynx (throat**).

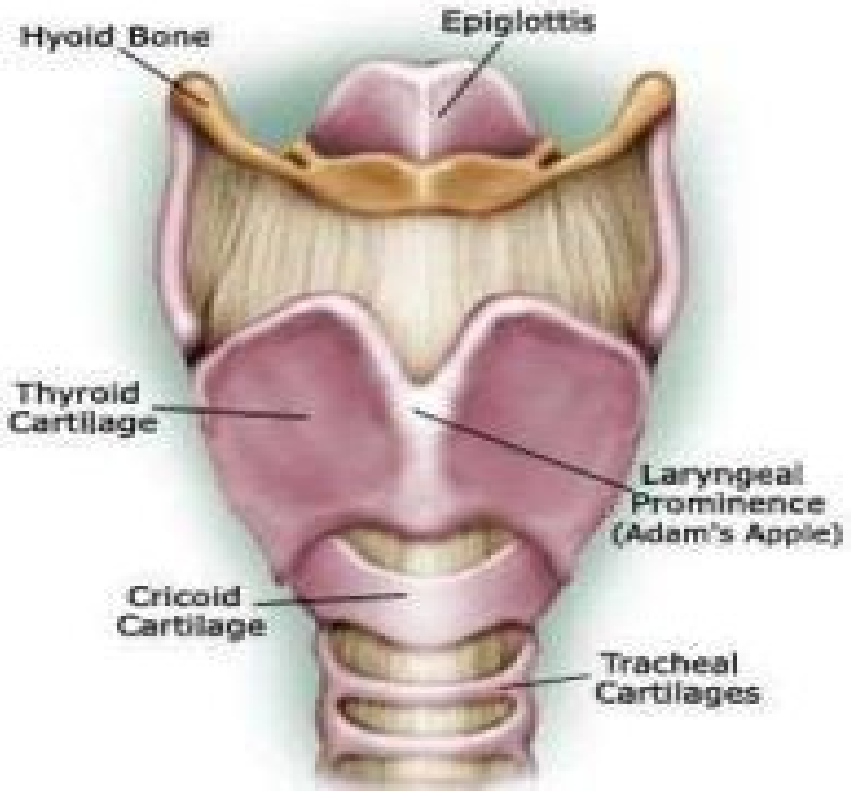
1. **nasopharynx** .It contains the **pharyngeal tonsils, or adenoids**, which are collections of lymphatic tissue. They are more prominent in children and, if enlarged, can obstruct air passageways.
2. Below the nasopharynx and closer to the mouth is the second division of the pharynx, **the oropharynx** . The **palatine tonsils** , two rounded masses of lymphatic tissue, are in the oropharynx.
3. The third division of the pharynx, **the laryngopharynx** , serves as a common passageway for food from the mouth and air from the nose. It divides into the larynx (voice box) and the esophagus.


Regions of Pharynx
Nasopharynx
Oropharynx
Laryngopharynx

LARYNX

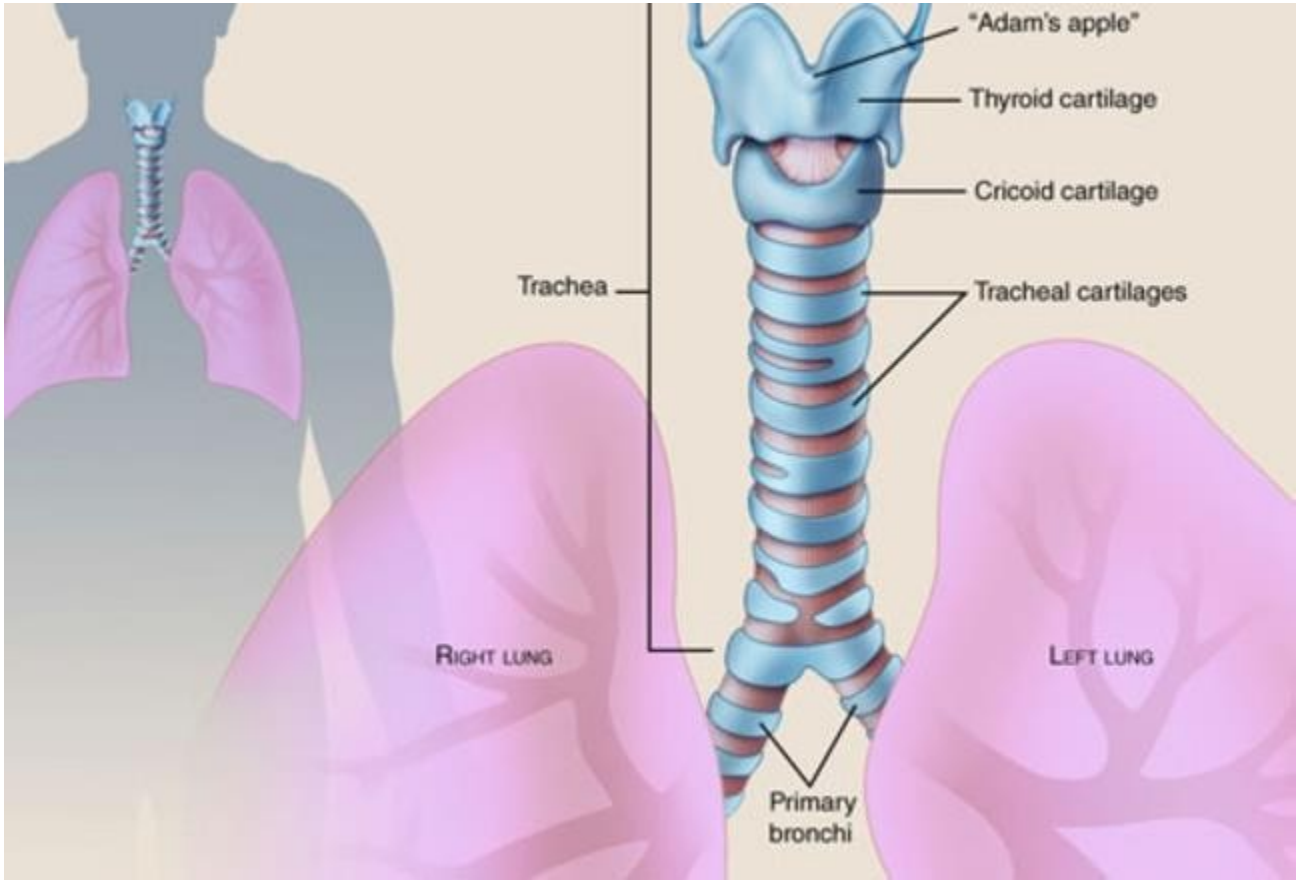
- The **larynx** contains the **vocal cords** and is surrounded by pieces of cartilage for support.
- The **thyroid cartilage** is **the largest** and in men is commonly referred to as the **Adam's apple**.
- As expelled air passes the vocal cords, they vibrate **to produce sounds**. The tension of the vocal cords determines the high or low pitch of the voice.

Larynx

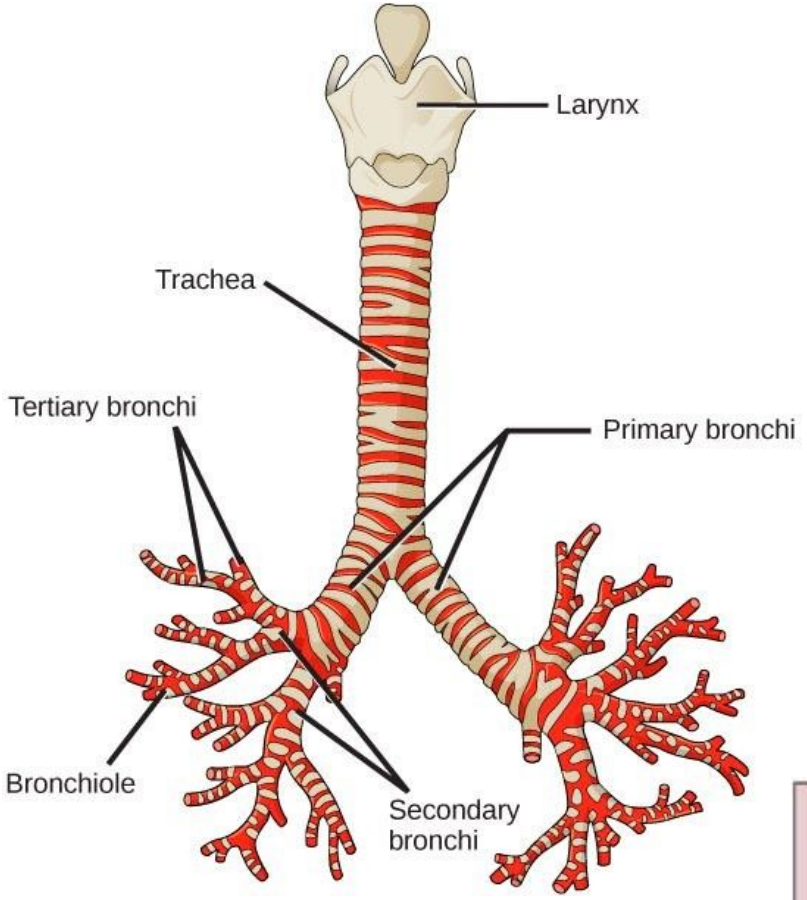

Hyoid Bone
Epiglottis
Thyroid Cartilage
Laryngeal Prominence (Adam's Apple)
Cricoid Cartilage
Tracheal Cartilages

- The **epiglottis,** a flap of cartilage attached to the root of the tongue, prevents **choking or aspiration** of food. It acts as a lid over the opening of the larynx.
- During swallowing, when food and liquid move through the throat, the epiglottis closes over the larynx, preventing material from entering the lungs.
- **Air passes through the larynx to the trachea (windpipe)**
  - **Vertical tube**
  - **4½ inches long and 1 inch in diameter**
  - **16 to 20 C-shaped rings of cartilage separated by fibrous connective tissue**

TRACHEA

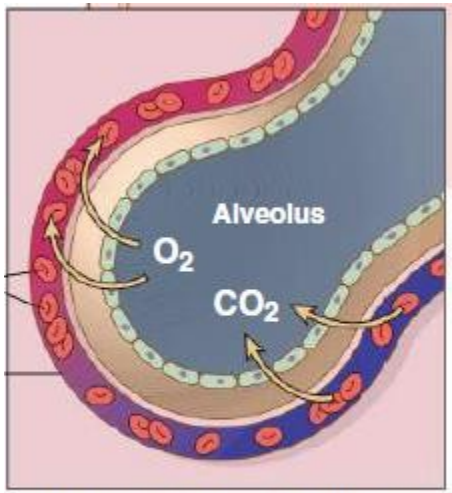

"Adam's apple"
Thyroid cartilage
Cricoid cartilage
Trachea
Tracheal cartilages
Right lung
Left lung
Primary bronchi

- In the region of the **mediastinum** - the trachea divides into two branches**, the right and left bronchial tubes, or bronchi**
- **The bronchi are tubes** composed of delicate epithelium surrounded by cartilage rings and a muscular wall.
- **Each bronchus leads to a separate lung** where it divides and subdivides into smaller and finer tubes, somewhat like the branches of a tree - called **bronchioles**.
- Each terminal bronchiole narrows **into alveolar ducts**, which end in collections of **air sacs called alveoli.**
- About 300 million alveoli are estimated to be present in both lungs.
- This very thin wall permits an **exchange of gases** between the alveolus and the capillary surrounding it. Blood flowing through the capillary accepts oxygen from the alveolus while depositing carbon dioxide into the alveolus.
- **Erythrocytes** in the blood carry oxygen away from the lungs to all parts of the body and carbon dioxide back to the lungs for exhalation

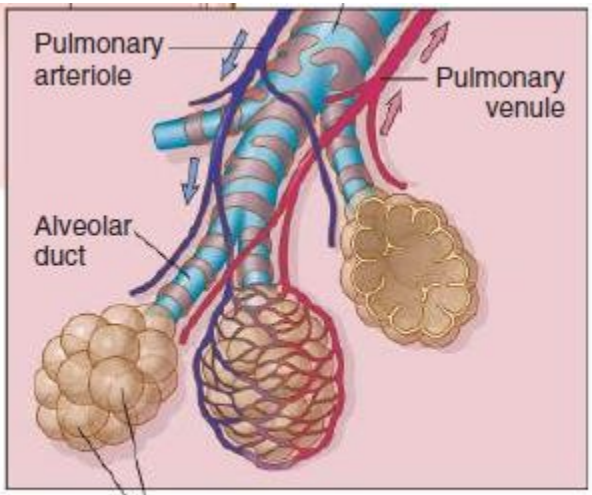


BRONCHUS AND BRONCHIOLES

ALVEOLI



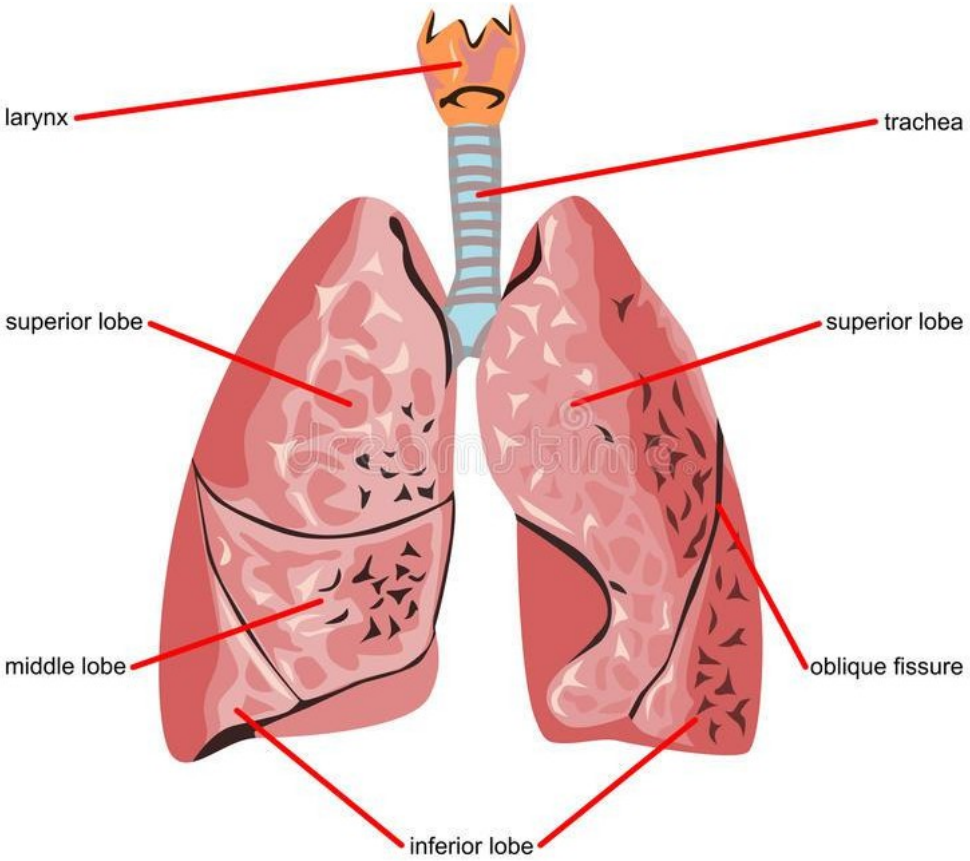
Exchange of gases between an alveolus and a lung capillary

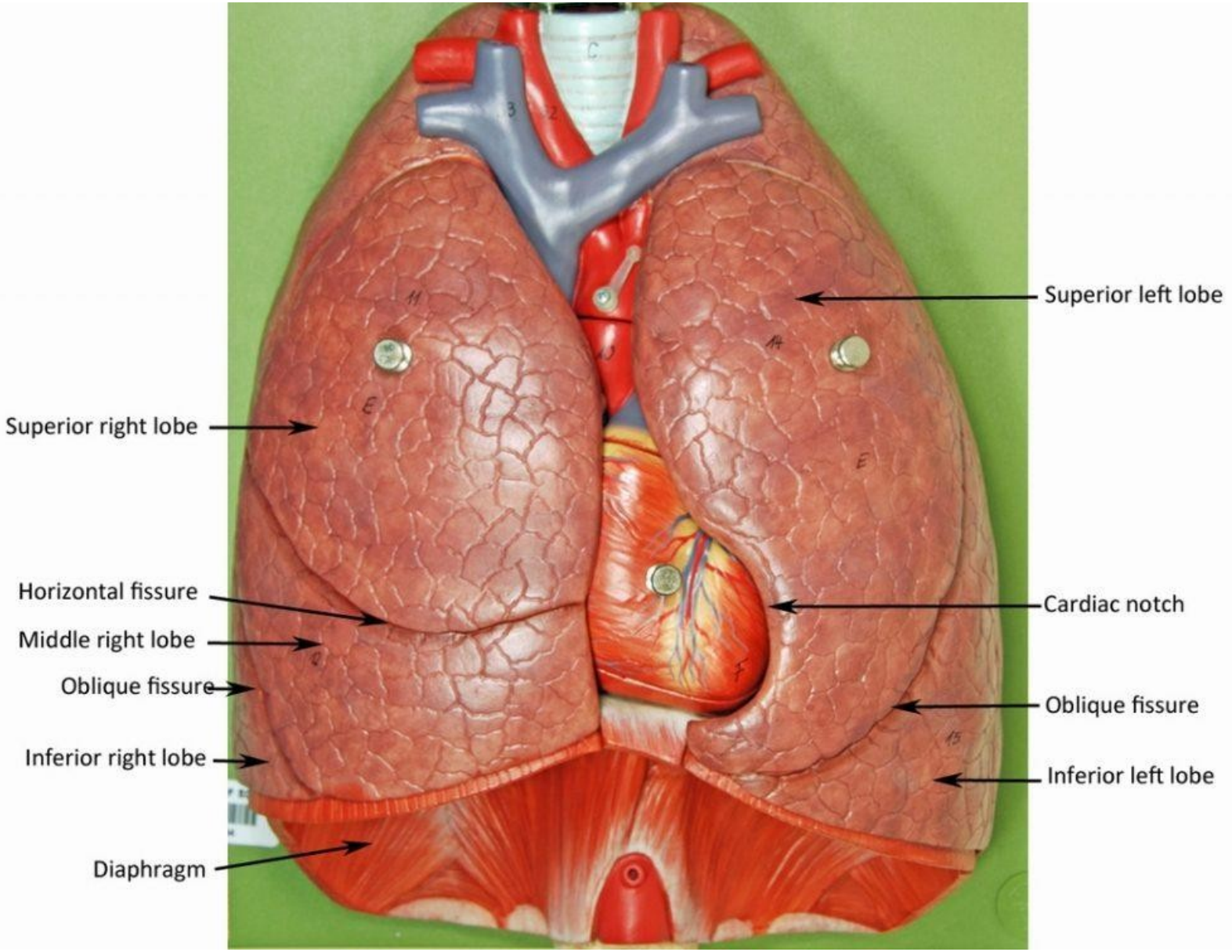


LUNGS

- The medial space between the two lungs is called the **mediastinum** and contains the heart and thoracic viscera, except for the lungs.
- Because the heart is inclined to the left in the mediastinum, the right lung is slightly larger than the left. Each lung is divided into sections called **lobes**.
- The left lung has two lobes while the right lung has three lobes.
- Each lung has an **oblique** (major) **fissure**.
- In addition, the right lung has a **horizontal** (minor) **fissure**.

FISSURES AND LOBES OF LUNG

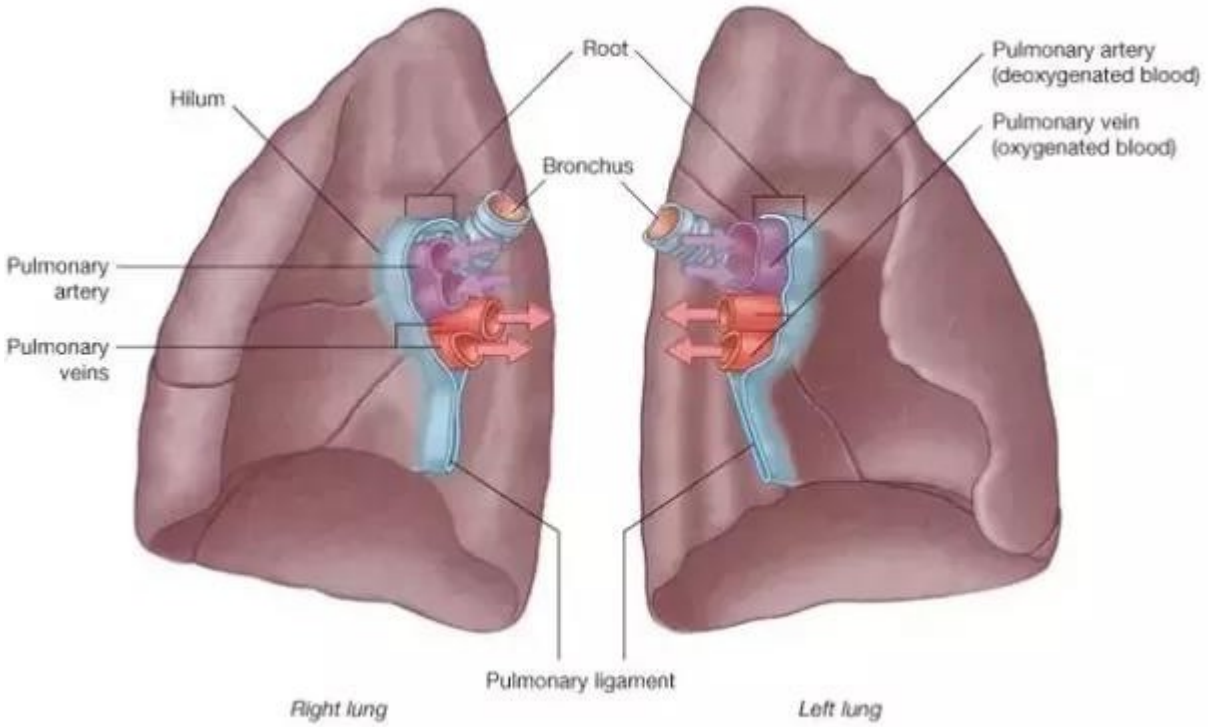



Superior left lobe
Superior right lobe
Horizontal fissure
Middle right lobe
Oblique fissure
Inferior right lobe
Diaphragm
Cardiac notch
Oblique fissure
Inferior left lobe

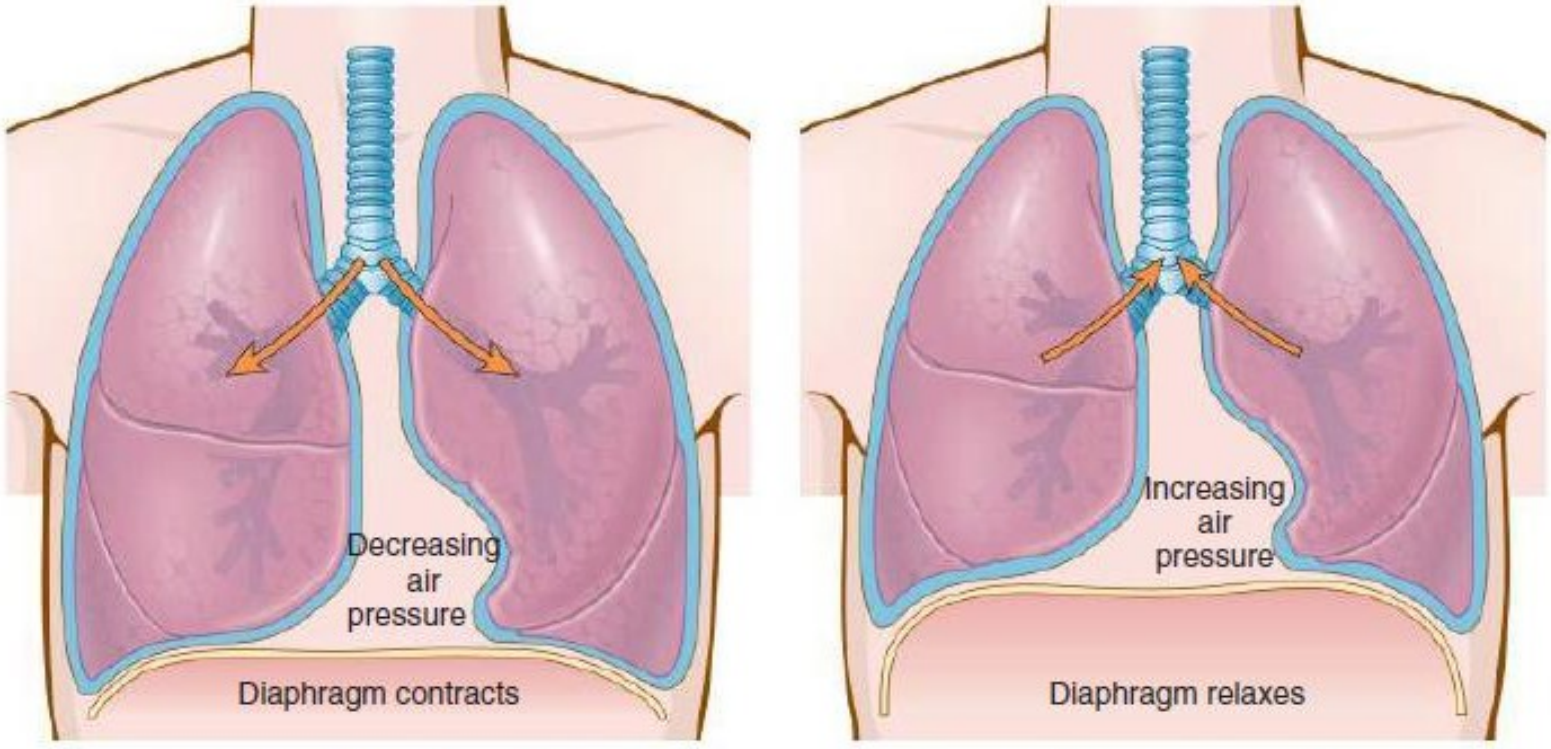
APEX, BASE, HILUM OF LUNG

- The uppermost part of the lung is **the apex**
- The lower area is the **base.**
- **The hilum of the lung** is the midline region in which blood vessels, nerves, lymphatic tissue, and bronchial tubes enter and exit.
- The lungs extend from the collarbone to the diaphragm in the thoracic cavity.
- The **diaphragm** is a muscular partition separating the thoracic from the abdominal cavity and aiding in the process of breathing.
- It contracts and descends with each inhalation (inspiration) and relaxes and ascends with each exhalation (expiration).

Hilum of lung



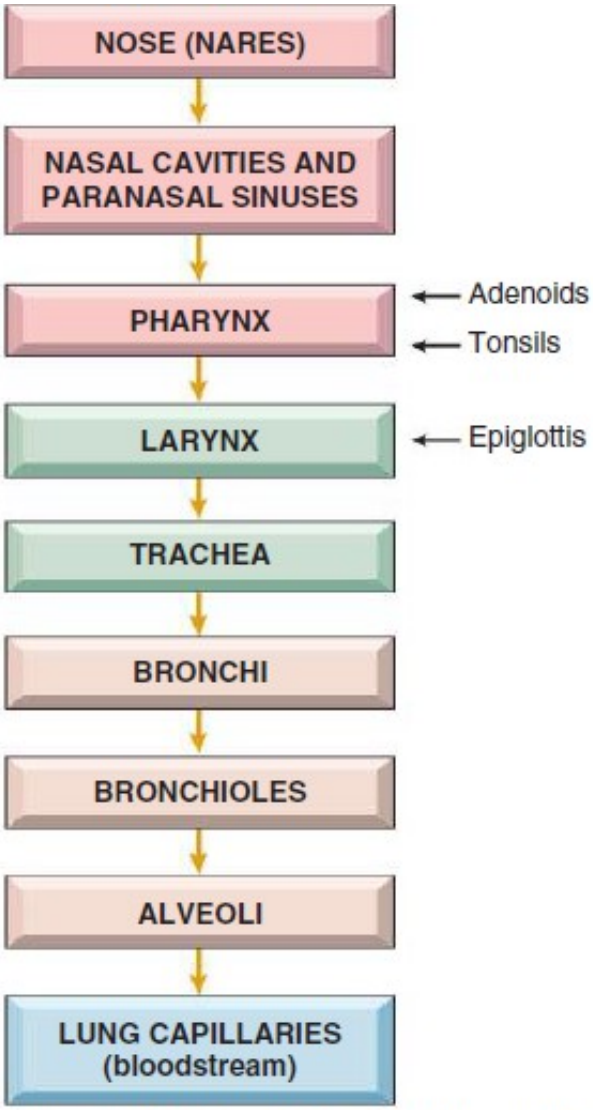
INSPIRATION /EXPIRATION



DIAPHRAGM IN INSPIRATION DIAPHRAGM IN EXPIRATION

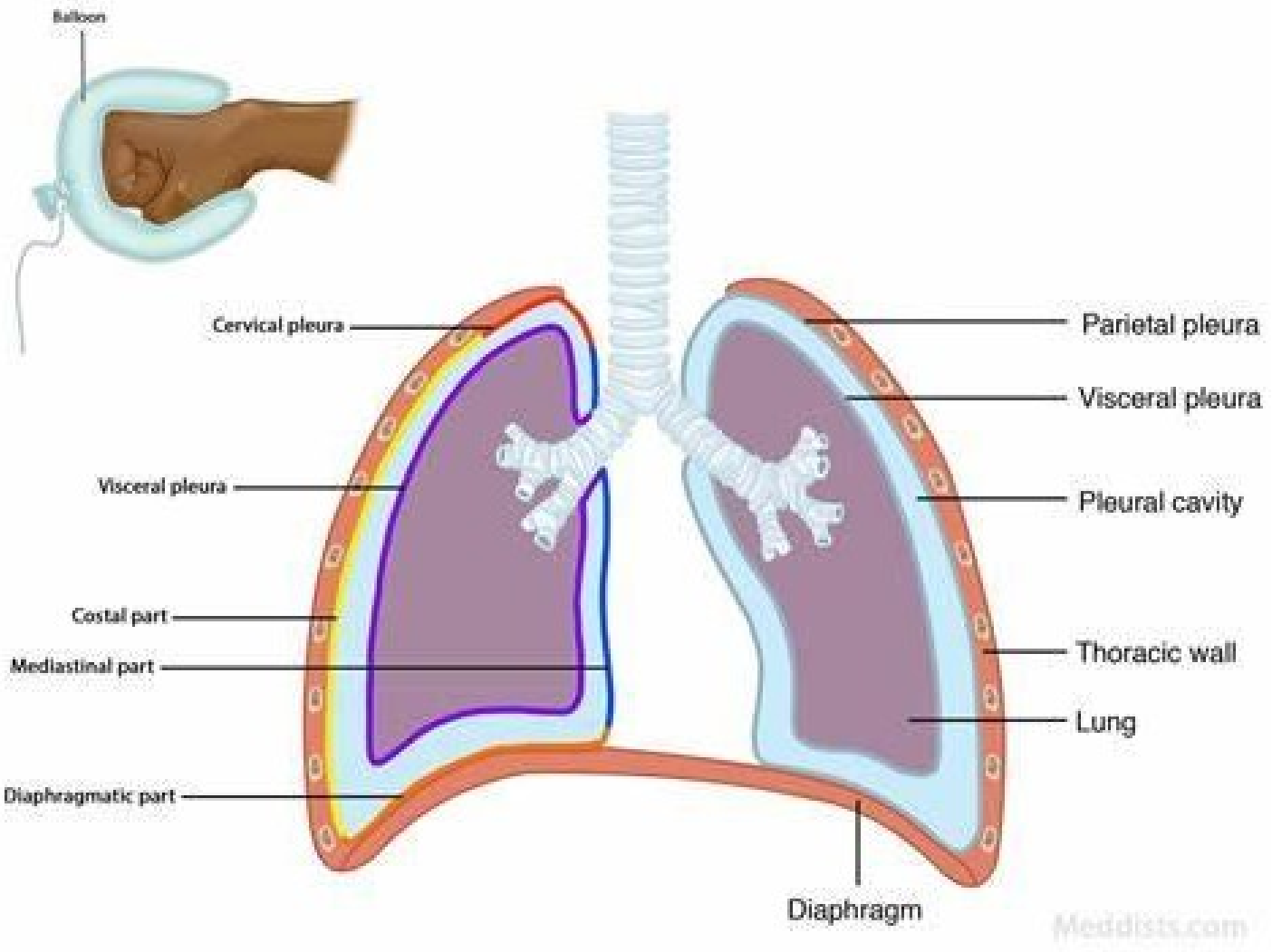
FIGURE 12-3 Position of the diaphragm during inspiration (inhalation) and expiration (exhalation).

PATHWAY



Pathway of air from the nose to the capillaries of the lungs.

PLEURA


Balloon
Cervical pleura
Visceral pleura
Costal part
Mediastinal part
Diaphragmatic part
Parietal pleura
Visceral pleura
Pleural cavity
Thoracic wall
Lung
Diaphragm

- Each lung is covered by a double membrane, called the **pleurae (**pleura)
- **The visceral** pleura adheres to the surface of the lung
- **The parietal pleura** attaches to the thoracic cavity
- The space between parietal and visceral layer is called **pleural space / pleural cavity**
- The pleural cavity is filled with **pleural fluid**.

PATHOLOGY

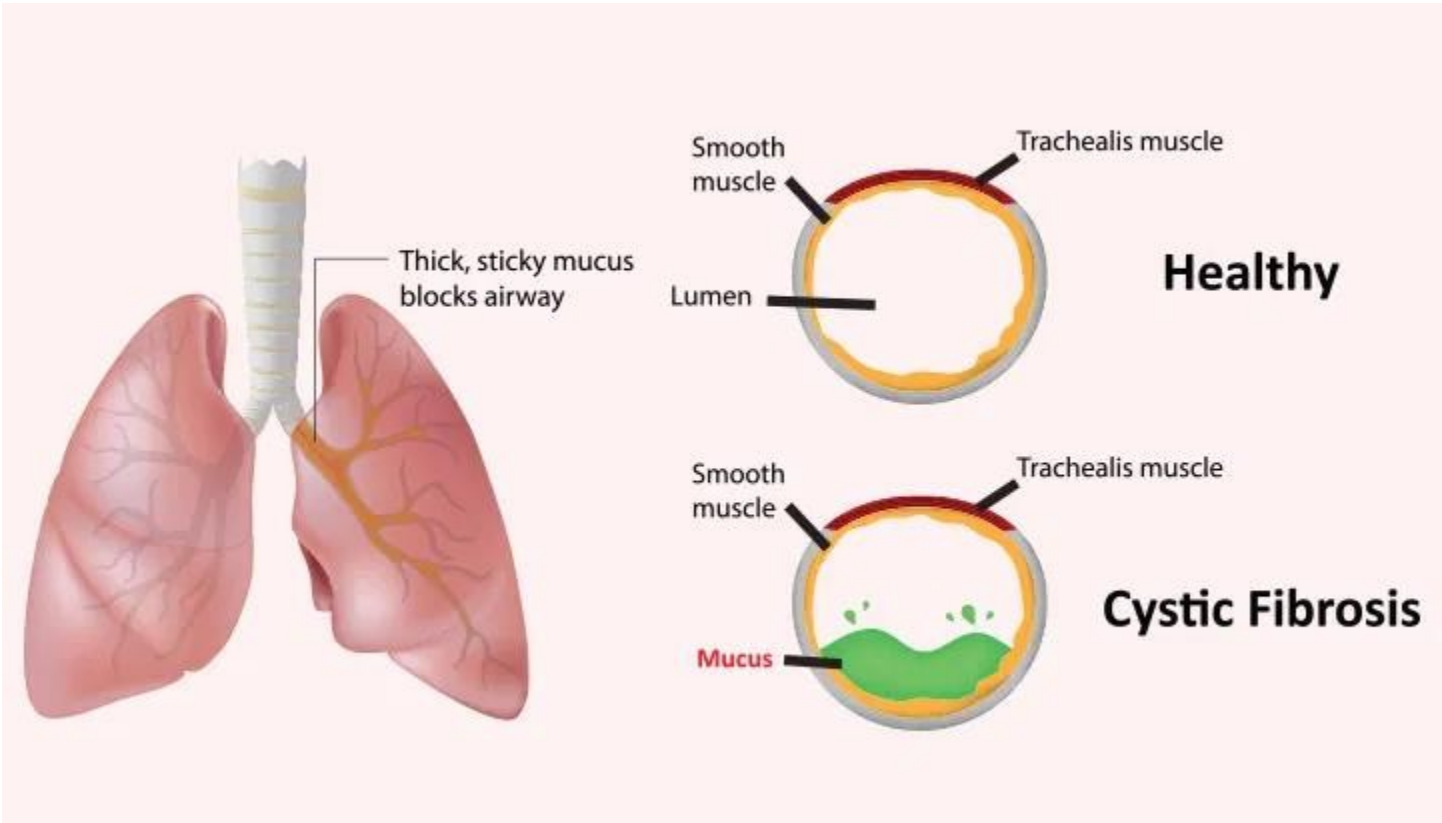
- **DIAGNOSTIC TERMS**
- **Auscultation** - Listening to sounds within the body.
- **percussion** - Tapping on a surface to determine the difference in the density of the underlying structure.
- **pleural rub** - Scratchy sound produced by pleural surfaces rubbing against each other.
- **rales** (crackles) - Fine crackling sounds heard on auscultation (during inhalation) when there is fluid in the alveoli.
- **rhonchi** (*singular*: rhonchus) - Loud rumbling sounds heard on auscultation of bronchi obstructed by sputum.
- **sputum** - Material expelled from the bronchi, lungs, or upper respiratory tract by spitting.

- **stridor** - Strained, high-pitched sound heard on inspiration caused by obstruction in the pharynx or larynx.
- **Wheezes** - Continuous high-pitched whistling sounds produced during breathing

UPPER RESPIRATORY DISORDERS

- **Croup** - Acute viral infection of infants and children with obstruction of the larynx, accompanied by barking cough and stridor.
- **Diphtheria** - Acute infection of the throat and upper respiratory tract caused by the diphtheria bacterium *(Corynebacterium)*.
- **Epistaxis** - Nosebleed.
- **pertussis - Whooping cough**; highly contagious bacterial infection of the pharynx,larynx, and trachea caused by *Bordetella pertussis*.

DIPTHERIA


Thick, sticky mucus
blocks airway
Smooth
muscle
Trachealis muscle
Lumen
Healthy
Smooth
muscle
Trachealis muscle
Mucus
Cystic Fibrosis

BRONCHIAL DISORDERS

- **asthma** - Chronic bronchial inflammatory disorder with airway obstruction due to bronchial edema and constriction and increased mucus production.
- **bronchiectasis** - Chronic dilation of a bronchus secondary to infection.
- **chronic bronchitis** - Inflammation of bronchi persisting over a long time; type of chronic obstructive pulmonary disease (COPD).
- **cystic fibrosis (CF)-** Inherited disorder of exocrine glands resulting in thick mucinous secretions in the respiratory tract that do not drain normally.

LUNG DISORDERS

- **atelectasis** - Collapsed lung; incomplete expansion of alveoli,
- **Emphysema** - Hyperinflation of air sacs with destruction of alveolar walls
- Emphysema and chronic bronchitis are both forms of COPD
- **lung cancer** - Malignant tumor arising from the lungs and bronchi
- **pneumoconiosis** - Abnormal condition caused by dust in the lungs, with chronic inflammation, infection, and bronchitis
- **pulmonary embolism (PE)** - Clot or other material lodges in vessels of the lung
- **pulmonary fibrosis** - Formation of scar tissue in the connective tissue of the lungs.
- **sarcoidosis** - Chronic inflammatory disease in which small nodules (granulomas) develop in lungs, lymph nodes, and other organs.
- **tuberculosis (TB)-** Infectious disease caused by *Mycobacterium tuberculosis*; lungs usually are involved, but any organ in the body may be affected.
- **Pneumonia** - Acute inflammation and infection of alveoli, which fill with pus or products of the inflammatory reaction.
- **pulmonary abscess** - Large collection of pus (bacterial infection) in the lungs.
- **pulmonary edema** - Fluid in the air sacs and bronchioles.

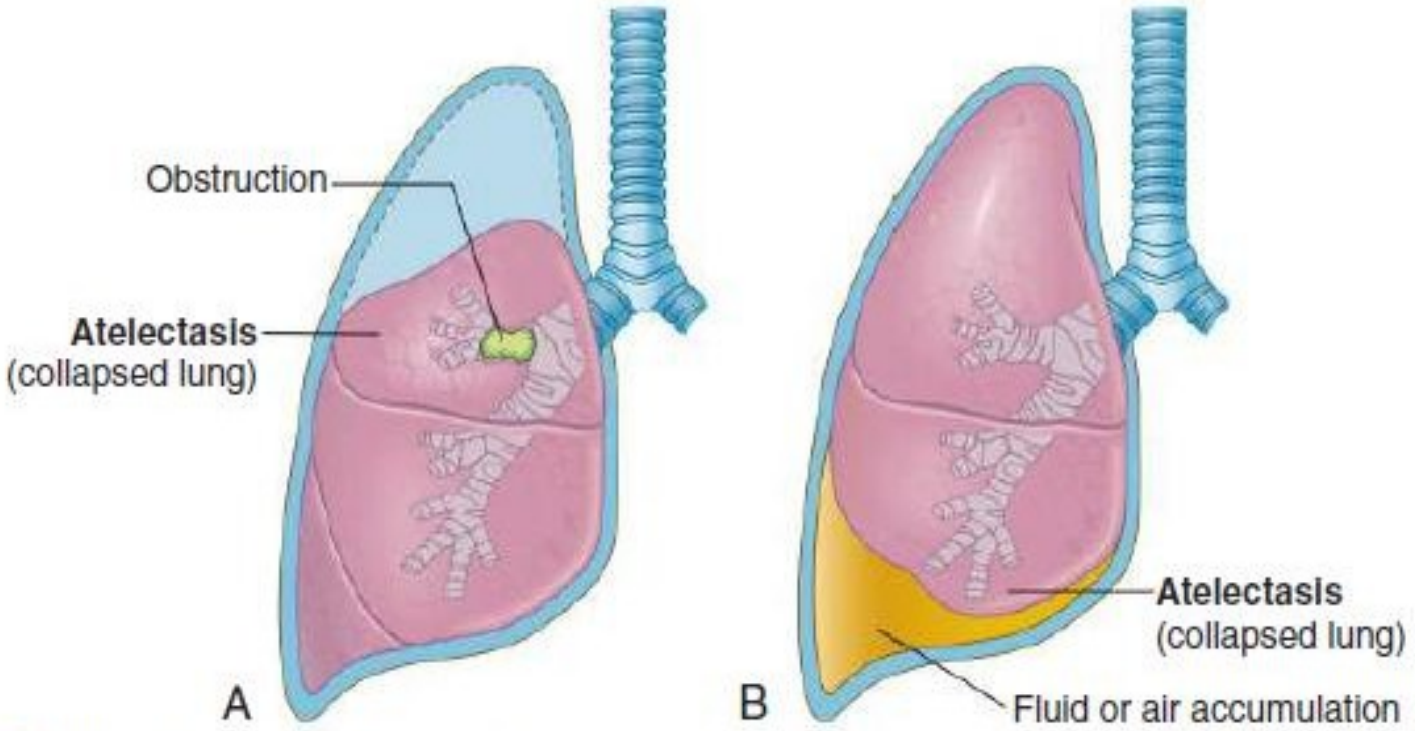
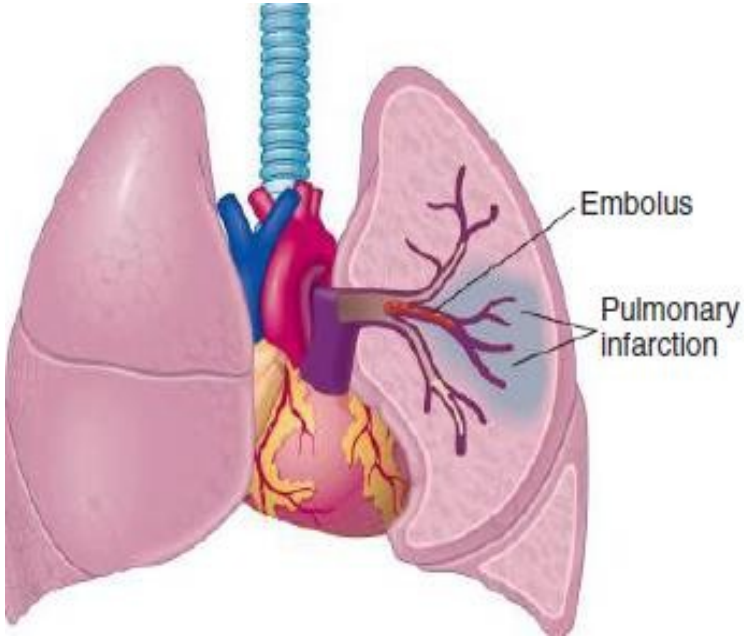
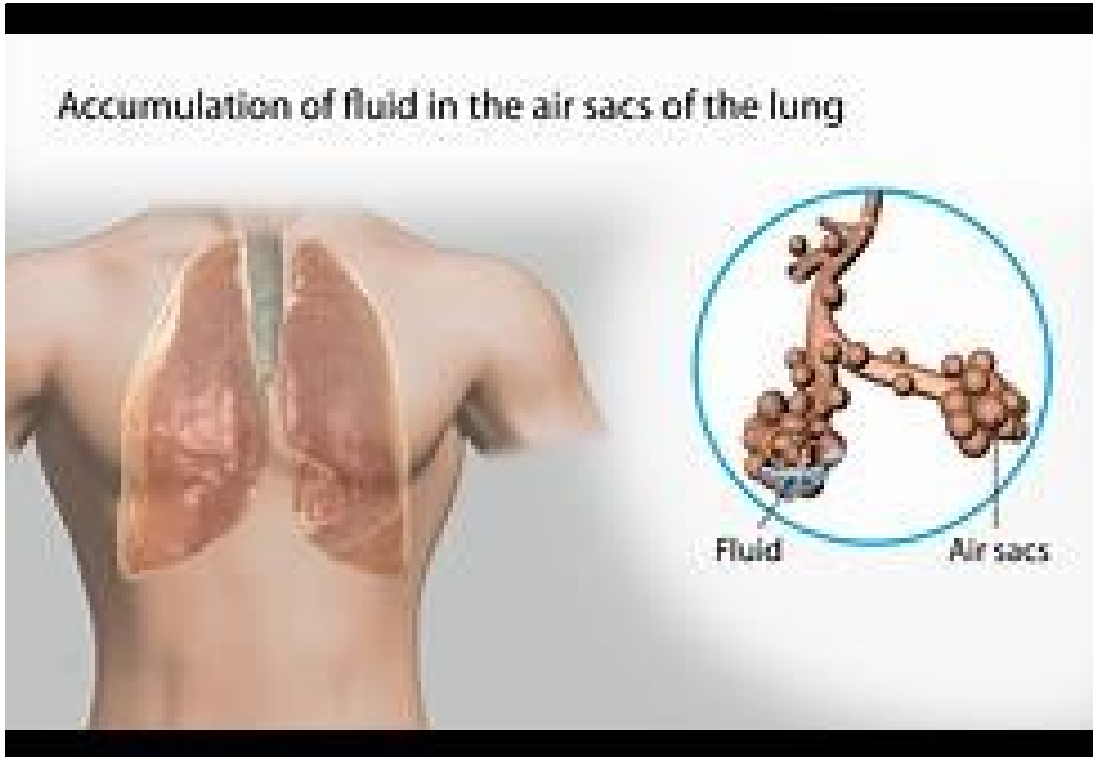


FIGURE 12-7 **Two forms of atelectasis. A,** An obstruction prevents air from reaching distal airways, and alveoli collapse. The most frequent cause is blockage of a bronchus by a mucous or mucopurulent (pus-containing) plug, as might occur postoperatively. **B,** Accumulations of fluid, blood, or air within the pleural cavity collapse the lung. This can occur with congestive heart failure (poor circulation leads to fluid buildup in the pleural cavity), pneumonia, trauma, or a pneumothorax.



PULMONARY EMBOLISM



PLEURAL DISORDERS

- **Mesothelioma**- Rare malignant tumor arising in the pleura.
- **pleural effusion** - Abnormal accumulation of fluid in the pleural space (cavity).
- **pleurisy (pleuritis**) - Inflammation of the pleura.
- **pneumothorax** - Collection of air in the pleural space.

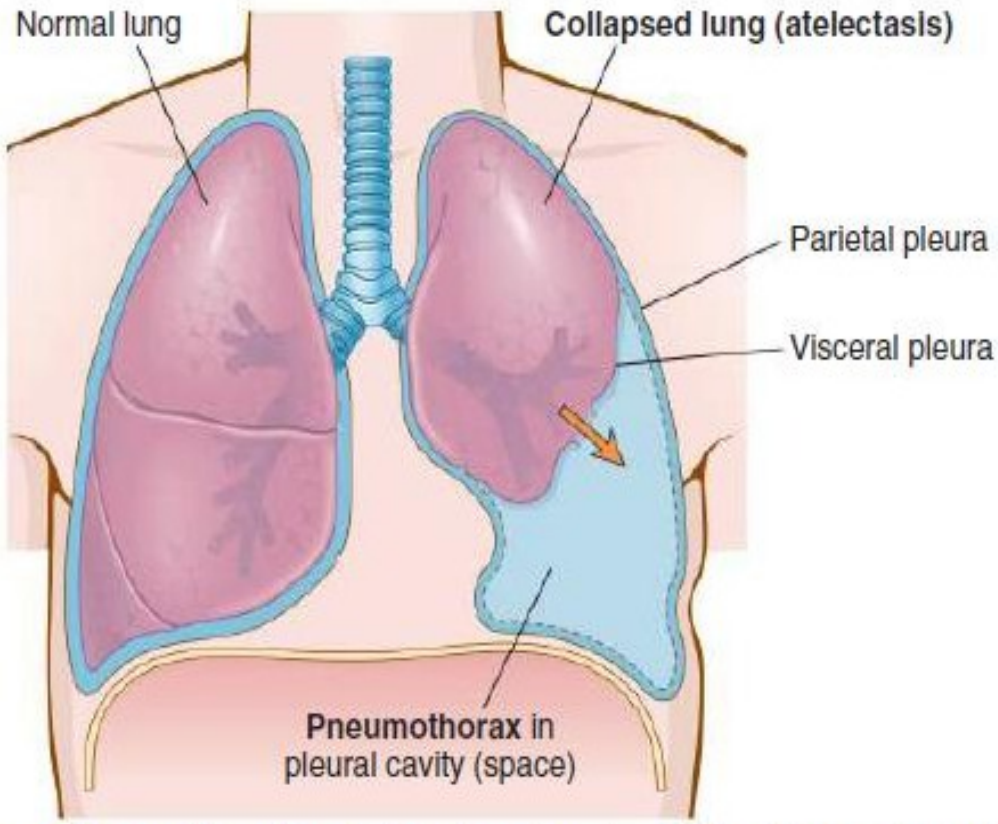


FIGURE 12-6 **Pneumothorax.** Air gathers in the pleural cavity, causing the lung to collapse. When this happens, the lung cannot fill up with air, breathing becomes more difficult, and the body gets less oxygen. Onset of pneumothorax is marked by sudden, sharp chest pain with difficulty breathing.

Condition or Disease	Description
adult respiratory distress syndrome (ARDS)	Acute respiratory failure that appears following pulmonary injury, such as direct chest trauma, sepsis, or inhalation of toxic gas. Hypoxemia, respiratory distress, and pulmonary edema are some of the signs.
anoxia	Complete or nearly complete absence of oxygen from the blood and/or tissue.
anthracosis	A type of lung disease caused by the long-term inhalation of coal dust during coal mining. A type of pneumoconiosis. Also called *coal workers pneumoconiosis* or *black lung disease*.
asbestosis	A type of lung disease caused by the long-term inhalation of asbestos dust. A type of pneumoconiosis.
asphyxia	An inadequate exchange of oxygen and carbon dioxide.
asthma	Inflammation and constriction of the airway over a relatively short period of time that can be caused by a reaction to a stimulus such as an allergen or exercise. Asthma is usually reversible.
atelectasis	An absence of air from all or part of the lungs which can lead to a collapsed lung. It can be acute (for example, when there is bronchial obstruction due to a foreign object) or chronic (such as obstruction by a tumor).
bradypnea	Breathing that is slower than normal.
bronchiectasis	Chronic dilation of bronchi or bronchioles as a result of an obstruction or an inflammatory disease. Symptoms include coughing and spitting up mucus.
bronchitis	Inflammation of the bronchi.
Bronchogenic carcinoma	Cancer that originates in a bronchus. The most common type of lung cancer. Its primary cause is tobacco smoking.
Cheyne-Stokes	Abnormal breathing characterized by periods of deep breathing

respiration	(hyperpnea) followed by periods of no breathing (apnea).
chronic bronchitis	Bronchitis that lasts at least 3 months. It can be a symptom of lung cancer, tuberculosis, or chronic heart failure.
chronic obstructive pulmonary disease(COPD)	A general term used for diseases that cause the bronchi to be either permanently or temporarily narrowed.
clubbing of the fingers	A physical finding in which the ends of the fingers are enlarged, round, and bulbous. The angle of the nailbed also changes. It can be a sign of several conditions, including chronic hypoxia and lung cancer.
cough	A sudden, explosive forcing of air out of the airways. Its primary purpose is to clear sputum and other materials from the airways.
crackles	Abnormal breath sounds heard on auscultation of the chest that are brief, sharp, and nonmusical.
croup	Any acute respiratory condition in children and infants that is characterized by rough breathing and a hoarse cough.
cyanosis	A bluish or purplish discoloration of the skin and mucous membranes due to inadequate oxygenation of the blood cells.
cystic fibrosis	A disease in which the secretions of the exocrine glands are thick, causing obstruction of various passageways in the respiratory and digestive systems It is an inherited disease in which symptoms typically first appear during childhood.
dyspnea	An unpleasant sensation of shortness of breath along with a subjective feeling of not being able to breathe normally. It can occur with diseases of the heart or lungs. It also can occur in healthy individuals during strenuous exertion or when at high altitudes.


Clubbing of fingers


cyanosis

edema	An accumulation of excessive amounts of fluid in cells, tissues, or in a body cavity.
egophony	A term used to describe an abnormal vocal sound, similar to the bleating of a goat.
emphysema	Abnormal and permanent enlargement of the alveoli with destruction of the alveolar walls. Characterized by use of the accessory muscles for breathing and pursed lips.
empyema	Pus in a body cavity. This term is most commonly used to refer to pus in a pleural cavity (pyothorax).
hemoptysis	The act of spitting blood.
hyaline membrane disease (HMD)	A condition in premature newborns caused by deficient pulmonary surfactant, the substance required for the lungs to expand, leading to respiratory distress. Also called *respiratory distress syndrome*.
hypercapnia	An abnormally excessive amount of carbon dioxide in the arterial blood.
hyperpnea	Rapid deep breathing that can be brought on by exertion, anxiety, or certain abnormal medical conditions.
hypoxemia	Below-normal oxygenation of the arterial blood. Hypoxemia is not as severe as anoxia.
hypoxia	A below-normal level of oxygen in arterial blood, tissues, or inspired gases. Hypoxia is not as severe as anoxia.
Legionnaire disease	A serious form of bacterial pneumonia caused by Legionella pneumophila.
malignant mesothelioma	A cancerous growth of the pleural lining.
orthopnea	The situation in which breathing is easier in an upright position and becomes more difficult when lying flat.

paroxysmal nocturnal dyspnea	An abnormal shortness of breath that occurs during the night, causing the patient to wake up gasping for air. It may be indicative of cardiovascular disease.
pleural effusion	Increased amount of fluid in the pleural cavity.
pleural rub	A rubbing sound caused by friction of the pleura when inflamed. Also called *pleural friction*.
pleurisy	An inflammation of the pleura that usually causes stabbing chest pain and pleural effusion. Also called *pleuritis*.
pleurodynia	Pain in the tendinous attachments of thoracic muscles. Also referred to as *pleuralgia*.
pneumoconiosis	An occupational lung disease causing inflammation of the lungs due to the inhalation of dust particles.
pneumomelanosis	Blackening of lung tissue due to the inhalation of coal dust.
pneumonia	An acute inflammation of the lung tissue, including the air spaces within the alveoli. The alveoli typically fill with pus or other materials as a result of inflammation. Pneumonia can be caused by inhalation of chemicals; trauma; or bacterial, viral, or fungal infections.
pneumonocele	The protrusion of a portion of the lung through an opening in the chest wall. Also referred to as *pleurocele* or *pneumocele*.
pneumothorax	The presence of air or gas in the pleural cavity.

pulmonary abscess	A collection of pus in the lungs as an end product of the destruction of lung tissue.
pulmonary edema	Excess fluid and swelling in the alveoli and bronchioles.
pulmonary embolism (PE)	A sudden dislodging of a blood clot in the pulmonary artery (the artery that supplies blood to the lungs), causing obstruction of blood to the lung tissue.
pyothorax	Pus in a pleural cavity.
rale	An added sound heard on auscultation of breath sounds.
rhonchus (pl. rhonchi)	Musically pitched sounds in addition to the normal sounds heard during inspiration or expiration.
silicosis	An occupational lung disease caused by the inhalation of small silica particles, such as those found in coal, copper, silver, and gold mining. A type of pneumoconiosis.
stridor	An abnormal, high-pitched breath sound, predominantly heard on inspiration. It can be heard without a stethoscope. Stridor sounds like the wind blowing.
tachypnea	Breathing that is more rapid and more shallow than normal.
tuberculosis (TB)	An infectious disease typically characterized by coughing, weight loss, chest pain, and spitting up blood. It is caused by Mycobacterium tuberculosis.
wheeze	Abnormal breath sounds that are longer than crackles and may have a whistling, puffing, or hissing quality.

CLINICAL PROCEDURES

- **X-RAY TESTS**
- chest x-ray (CXR)
- computed tomography (CT) scan of the chest
- CT pulmonary angiography (CTPA)
- **MAGNETIC IMAGING**
- magnetic resonance imaging(MRI) of the chest
- **NUCLEAR MEDICINE TESTS**
- positron emission tomography (PET) scan of the lung
- ventilation-perfusion (V/Q) scan

arterial blood gas (ABG) analysis	A measurement of the partial pressures of O2 and CO2 levels in arterial blood.

pulse oximetry	An electronic device is placed on the patient's finger to measure oxygen saturation in the blood.
spirometry	The quantity of air entering the lungs and the rate of its movement over a period of time are measured. The instrument used is a spirometer.

OTHER PROCEDURES

- **Bronchoscopy** - Fiberoptic endoscope examination of the bronchial tubes.
- **Thoracentesis** - Surgical puncture to remove fluid from the pleural space.
- **endotracheal intubation** - Placement of a tube through the mouth into the pharynx, larynx, and trachea to establish an airway
- **Laryngoscopy** - Visual examination of the voice box.
- **lung biopsy** - Removal of lung tissue followed by microscopic examination
- **Mediastinoscopy** - Endoscopic visual examination of the mediastinum.
- **pulmonary function tests (PFTs**) - Tests that measure the ventilation mechanics of the lungs:
- Airway function, lung volume, and the capacity of the lungs to exchange oxygen and carbon dioxide efficiently.
- **thoracotomy** - Large surgical incision of the chest.

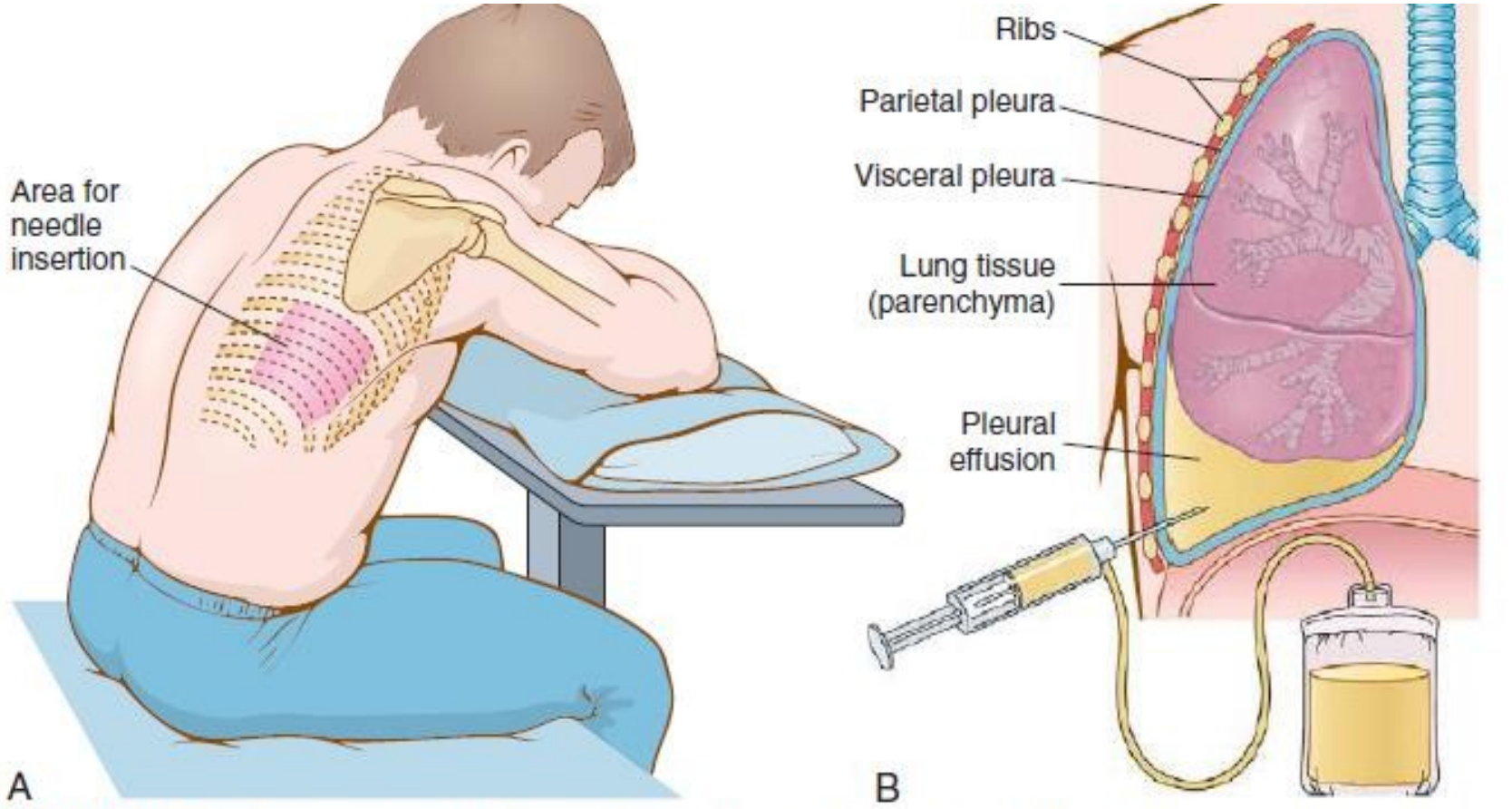


FIGURE 12-17 **Thoracentesis. A,** The patient is sitting in the correct position for the procedure; it allows the chest wall to be pulled outward in an expanded position. **B,** The needle is inserted close to the base of the effusion so that gravity can help with drainage, but it is kept as far away from the diaphragm as possible.

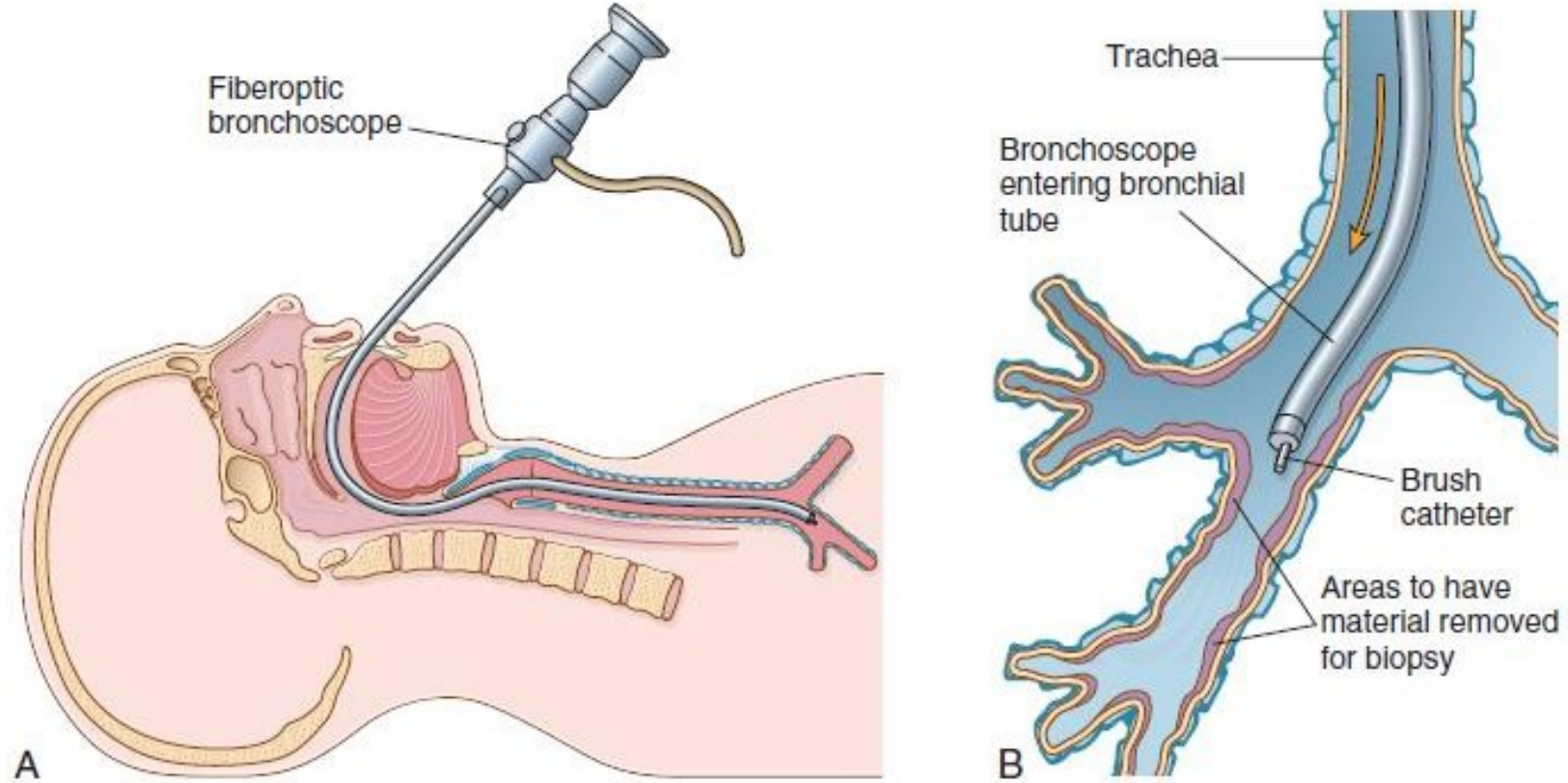


FIGURE 12-14 **A, Fiberoptic bronchoscopy.** A bronchoscope is passed through the nose, throat, larynx, and trachea into a bronchus. **B, A bronchoscope,** with brush catheter, in place in a bronchial tube.

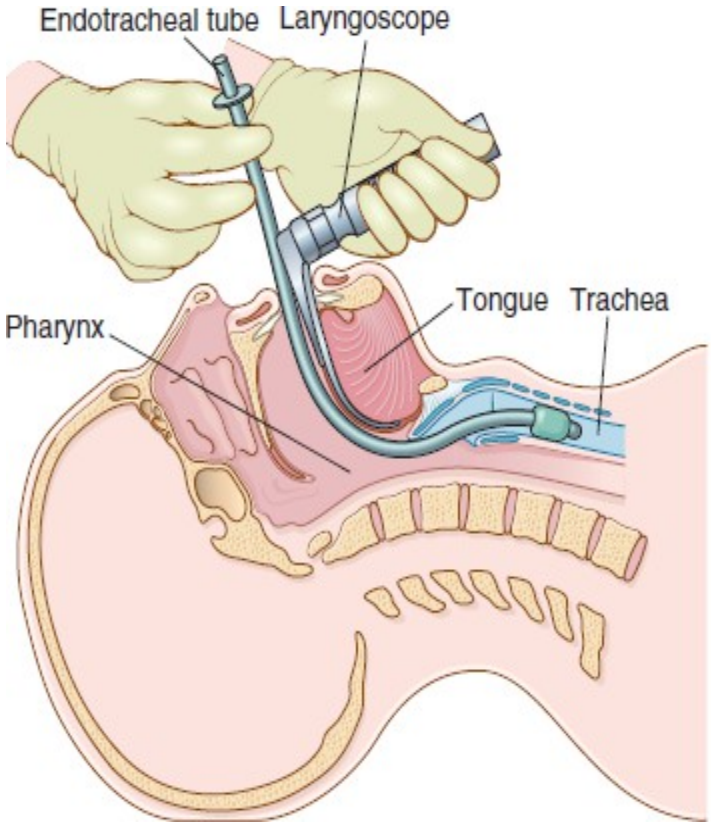


FIGURE 12-15 **Endotracheal intubation.** The patient is in a supine position; the head is hyperextended, the lower portion of the neck is flexed, and the mouth is opened. A **laryngoscope** is used to hold the airway open, to expose the vocal cords, and as a guide for placing the tube into the trachea.

- **thoracoscopy (thorascopy)** - Visual examination of the chest via small incisions and use of an endoscope. (VATS?)
- **tracheostomy** - Surgical creation of an opening into the trachea through the neck.
- **tuberculin test** - Determines past or present tuberculous infection based on a positive skin reaction.
- **tube thoracostomy** - A flexible, plastic chest tube is passed into the pleural space through an opening in the chest.

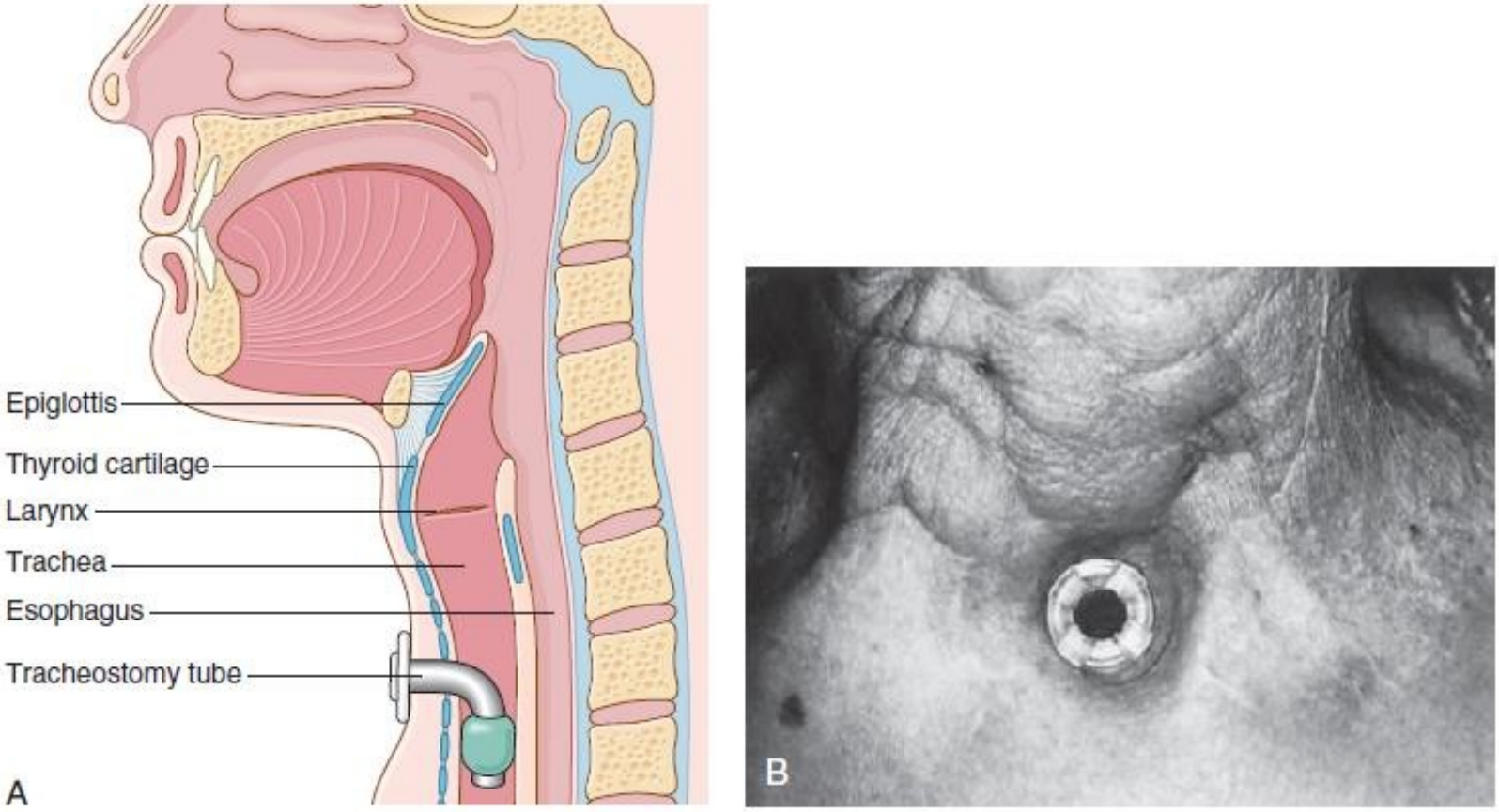


FIGURE 12-18 **A, Tracheostomy tube** in place. **B, Healed tracheostomy** after laryngectomy.

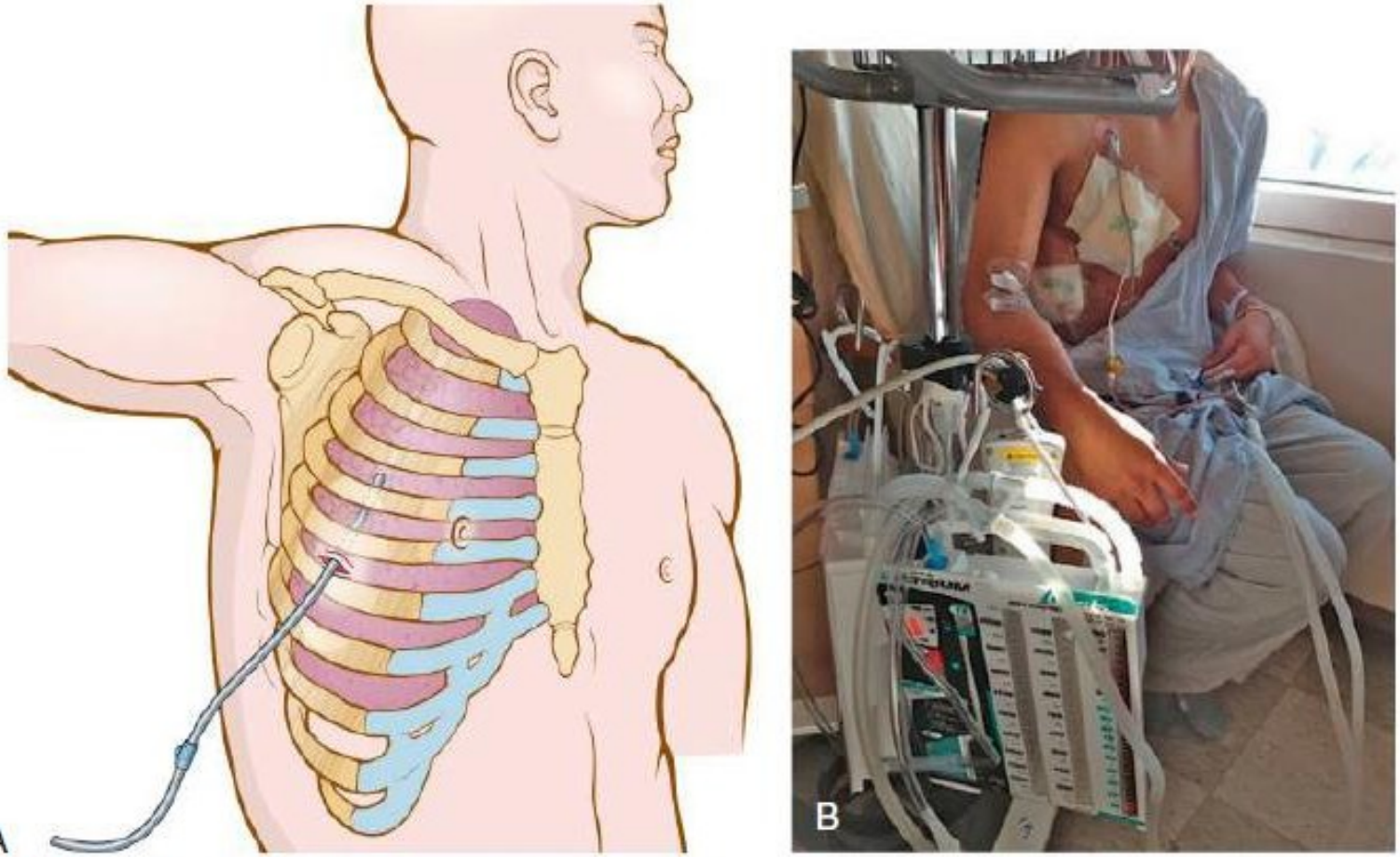


FIGURE 12-19 **A, Tube thoracostomy. B,** A patient with two **thoracostomy tubes** draining a pleural effusion in two different areas of the chest.

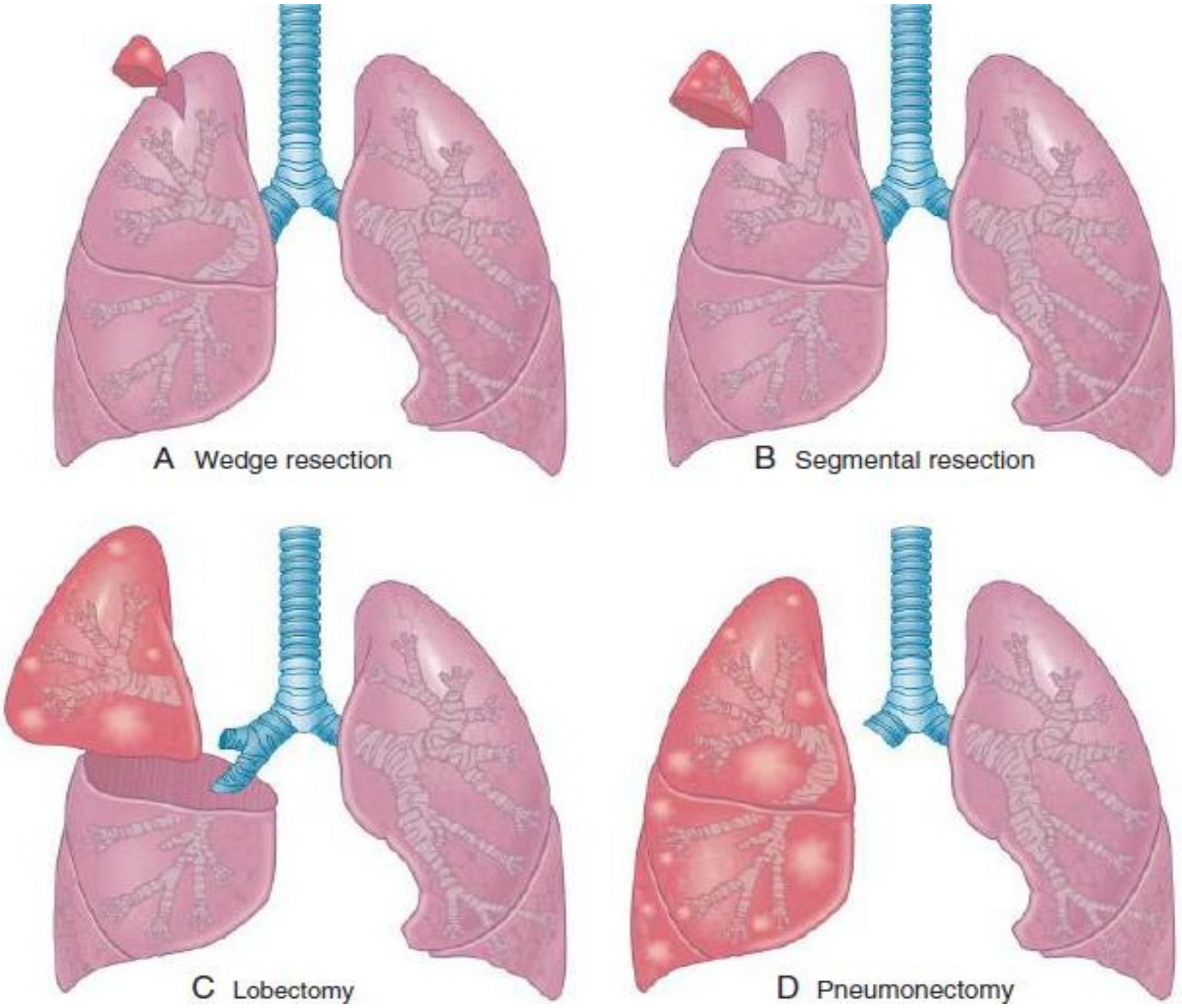

A Wedge resection
B Segmental resection
C Lobectomy
D Pneumonectomy

FIGURE 12-5 **Pulmonary resections. A, Wedge resection** is the removal of a small, localized area of diseased tissue near the surface of the lung. Pulmonary function and structure are relatively unchanged after healing. **B, Segmental resection** is the removal of a bronchiole and its alveoli (one or more lung segments). The remaining lung tissue expands to fill the previously occupied space. **C, Lobectomy** is the removal of an entire lobe of the lung. After lobectomy, the remaining lung increases in size to fill the space in the thoracic cavity. **D, Pneumonectomy** is the removal of an entire lung. Techniques such as removal of ribs and elevation of the diaphragm are used to reduce the size of the empty thoracic space.

TABLE 12-7 Therapeutic Procedures Used in Pulmonology

Procedure	Description
bronchoplasty	Surgical repair or modification of a bronchus.
cricothyrotomy	Establishment of a temporary airway by surgically creating an opening into the larynx. This opening is usually intended to be temporary. A large needle or needle catheter is inserted into the airway so that air can be supplied to the lungs. This procedure is safer to perform in an emergency situation than a tracheostomy.
laryngectomy	Partial or total surgical removal of the larynx, most commonly performed as a cancer treatment.
lobectomy	Excision of a lobe of any organ. When the term is used alone, it usually refers to the excision of a lobe of a lung.
lung transplant	Surgical replacement of one or both lungs with the healthy lungs of a donor. The lungs typically come from a brain-dead donor who is on life support. In some instances, a portion of a lung may be transplanted from a living donor. Lung transplants are performed only on individuals with severe, life-threatening lung disease.
pleurectomy	Excision of the pleura.
pneumonectomy	Excision of a lung. Also called *pulmonectomy*.
thoracentesis	Surgical puncture and drainage of the pleural cavity. This procedure can be done for diagnostic purposes or to relieve inadequate respiration that can occur with excessive pleural fluid. Also called *thoracocentesis*.

COMBINING FORMS

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
adenoid/o	adenoids	adenoidectomy _____	
		adenoid hypertrophy _____	
alveol/o	alveolus, air sac	alveolar _____	
bronch/o bronchi/o	bronchial tube, bronchus	bronchospasm _____ *This tightening of the bronchus is a chief characteristic of asthma and bronchitis.*	
		bronchiectasis _____ *Caused by weakening of the bronchial wall from infection.*	
		bronchodilator _____ *This drug causes dilation, or enlargement, of the opening of a bronchus to improve ventilation to the lungs. An example is albuterol, delivered via an inhaler.*	
		bronchopleural _____ *A **bronchopleural fistula** is an abnormal connection between the bronchial tube and the pleural cavity (space). Occurring as a result of lung disease or surgical complication, this can cause an air leak into the pleural space.*	
bronchiol/o	bronchiole, small bronchus	bronchiolitis _____ *This is an acute viral infection occurring in infants younger than 18 months of age.*	
capn/o	carbon dioxide	hypercapnia _____	
coni/o	dust	pneumoconiosis _____ *See page 472.*	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
cyan/o	blue	cyanosis _____ *Caused by deficient oxygen in the blood.*	
epiglott/o	epiglottis	epiglottitis _____ *Characterized by fever, sore throat, and an erythematous, swollen epiglottis.*	
laryng/o	larynx, voice box	laryngeal _____	
		laryngospasm _____ *Spasm of laryngeal muscles that closes the larynx.*	
		laryngitis _____	
lob/o	lobe of the lung	lobectomy _____ *Figure 12-5 shows four different types of pulmonary resections.*	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
mediastin/o	mediastinum	mediastinoscopy _____ *An endoscope is inserted through an incision in the chest.*	
nas/o	nose	paranasal sinuses _____ *Para- means near in this term.* nasogastric intubation _____	
orth/o	straight, upright	orthopnea _____ *An abnormal condition in which breathing (-pnea) is easier in the upright position. A major cause of orthopnea is congestive heart failure (the lungs fill with fluid when the patient is lying flat). Physicians assess the degree of orthopnea by the number of pillows a patient requires to sleep comfortably (e.g., two-pillow orthopnea).*	
ox/o	oxygen	hypoxia _____ *Tissues have a decreased amount of oxygen, and cyanosis can result.*	
pector/o	chest	expectoration _____ *Clearing of secretions from the airway by coughing or spitting. This sputum can contain mucus, blood, cellular debris, pus, and microorganisms.*	
pharyng/o	pharynx, throat	pharyngeal _____	
phon/o	voice	dysphonia _____ *Hoarseness or other voice impairment.*	
phren/o	diaphragm	phrenic nerve _____ *The motor nerve to the diaphragm.*	
pleur/o	pleura	pleurodynia _____ *The suffix -dynia means pain. The intercostal muscles or pleura are inflamed, causing pain during breathing.* pleural effusion _____ *An **effusion** is the escape of fluid from blood vessels or lymphatics into a cavity or into tissue spaces.*	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
pneum/o, pneumon/o	air, lung	pneumothorax _____ *The suffix -thorax means chest. Because of a hole in the lung, air accumulates in the pleural cavity, between the layers of the pleura (Figure 12-6).*	
		pneumonectomy _____	
pulmon/o	lung	pulmonary _____	
rhin/o	nose	rhinoplasty _____	
		rhinorrhea _____ *Commonly known as "runny nose."*	
sinus/o	sinus, cavity	sinusitis _____	
spir/o	breathing	spirometer _____	
		expiration _____ *Note that the s is omitted (when it's preceded by an x).*	
		respiration _____ ***Cheyne-Stokes respirations** are marked by rhythmic changes in the depth of breathing (rapid breathing and then absence of breathing). The pattern occurs every 45 seconds to 3 minutes. The cause may be heart failure or brain damage, both of which affect the respiratory center in the brain.*	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
tel/o	complete	atelectasis _____ *Collapsed lung; incomplete expansion (-ectasis) of a lung (Figure 12-7). Atelectasis may occur after surgery when a patient experiences pain and does not take deep breaths, preventing full expansion of the lungs.*	
thorac/o	chest	thoracotomy _____ thoracic _____	
tonsill/o	tonsils	tonsillectomy _____ *The oropharyngeal (palatine) tonsils are removed.*	
trache/o	trachea, windpipe	tracheotomy _____ tracheal stenosis _____ *Injury to the trachea from trauma, a burn, or serious infection can cause scarring and contraction that obstructs the flow of air. For example, having an endotracheal tube in place for a prolonged period may lead to tracheal injury or the formation of scar tissue.*	

SUFFIXES

SUFFIX	MEANING	TERMINOLOGY	MEANING
-ema	condition	empyema _____ *Em- at the beginning of this term means in. Empyema (pyothorax) is a collection of pus in the pleural cavity.*	
-osmia	smell	anosmia _____	

SUFFIX	MEANING	TERMINOLOGY	MEANING
-pnea	breathing	apnea _____ ***Sleep apnea** is sudden cessation of breathing during sleep. It can result in hypoxia, leading to cognitive impairment, hypertension, and arrhythmias. **Obstructive sleep apnea (OSA)** involves narrowing or occlusion in the upper airway. **Continuous positive airway pressure (CPAP)** is gentle ventilatory support used to keep the airways open (Figure 12-8).*	
		dyspnea _____ *Dys- means abnormal here and is associated with shortness of breath (SOB). **Paroxysmal** (sudden) **nocturnal** (at night) **dyspnea** may be experienced by patients with congestive heart failure when they recline in bed. Patients often describe the sensation as "air hunger."*	
		hyperpnea _____ *An increase in the depth of breathing, occurring normally with exercise and abnormally with any condition in which the supply of oxygen is inadequate.*	
		tachypnea _____ *Tachy- means fast. Excessively rapid and shallow breathing; hyperventilation.*	
-ptysis	spitting	hemoptysis _____ *Blood is coughed up from the bronchial tubes and lungs; occurs with bronchitis or pneumonia, but also with tuberculosis, cancer, bronchiectasis, and pulmonary embolism.*	
-sphyxia	pulse	asphyxia _____ *This condition, literally meaning lack of pulse, is severe hypoxia leading to hypoxemia, hypercapnia, loss of consciousness, and death.*	
-thorax	pleural cavity, chest	hemothorax _____	
		pyothorax _____ *Empyema of the chest.*	

ABBREVIATIONS

Abbreviation	Meaning
A&P	auscultation and percussion
ABG	arterial blood gas(es)
AP	anterior posterior
ARDS	adult respiratory distress syndrome
BAL	bronchoalveolar lavage
BOOP	bronchiolitis obliterans with organizing pneumonia
CO	carbon monoxide

CO_2	carbon dioxide
COLD	chronic obstructive lung disease
COPD	chronic obstructive pulmonary disease
CPR	cardiopulmonary resuscitation
CXR	chest x-ray (chest radiograph)
DNR	do not resuscitate
HMD	hyaline membrane disease
IPPB	intermittent positive-pressure breathing
IRDS	infant respiratory distress syndrome
PA	posterior anterior
PCP	Pneumocystis carinii pneumonia
PE	pulmonary embolism
PFT	pulmonary function test
RD	respiratory disease
RDS	respiratory distress syndrome
SOB	shortness of breath
TB	Tuberculosis

ABGs	arterial blood gases
AFB	acid-fast bacillus—the type of organism that causes tuberculosis
ARDS	acute respiratory distress syndrome—severe, sudden lung injury caused by acute illness
BAL	bronchoalveolar lavage
Bronch	bronchoscopy
CF	cystic fibrosis
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease—airway obstruction associated with emphysema and chronic bronchitis
CTPA	computed tomography pulmonary angiography
CXR	chest x-ray [film]
DL_{CO}	diffusion capacity of the lung for carbon monoxide
DOE	dyspnea on exertion
DPT	diphtheria, pertussis, tetanus—toxoids for vaccination of infants, to provide immunity to these diseases
FEV_1	forced expiratory volume in 1 second
FVC	forced vital capacity—amount of gas that can be forcibly and rapidly exhaled after a full inspiration

CPAP	continuous positive airway pressure
CPR	cardiopulmonary resuscitation—three basic steps (CAB): C, *c*irculation restored by external cardiac compression; A, *a*irway opened by tilting the head; B, *b*reathing restored by mouth-to-mouth breathing
C&S	culture and sensitivity testing (of sputum)
ICU	intensive care unit
LLL	left lower lobe (of lung)
LUL	left upper lobe (of lung)
MDI	metered-dose inhaler—used to deliver aerosolized medications to patients
NSCLC	non–small cell lung cancer
O_2	oxygen

OSA	obstructive sleep apnea
$PaCO_2$	carbon dioxide partial pressure—measure of the amount of carbon dioxide in arterial blood
PaO_2	oxygen partial pressure—a measure of the amount of oxygen in arterial blood
PCP	*Pneumocystis* pneumonia—a type of pneumonia seen in patients with AIDS or other immunosuppression
PE	pulmonary embolism
PEP	positive expiratory pressure—mechanical ventilator strategy in which the patient takes a deep breath and then exhales through a device that resists air flow (helps refill underventilated areas of the lung)
RLL	right lower lobe (of lung)
RSV	respiratory syncytial virus—common cause of bronchiolitis, broncho-pneumonia, and the common cold, especially in children (in tissue culture, forms syncytia or giant cells, so that cytoplasm flows together)
RUL	right upper lobe (of lung)
RV	residual volume—amount of air remaining in lungs at the end of maximal expiration
SABA	short-acting beta agonist (for relief of asthma symptoms)
SCLC	small cell lung cancer
SOB	shortness of breath
TB	tuberculosis

PEEP	positive end-expiratory pressure—common mechanical ventilator setting in which airway pressure is maintained above atmospheric pressure
PFTs	pulmonary function tests
PND	paroxysmal nocturnal dyspnea
PPD	purified protein derivative—substance used in a tuberculosis test
RDS	respiratory distress syndrome—in the newborn infant, condition marked by dyspnea and cyanosis and related to absence of surfactant, a substance that permits normal expansion of lungs; also called hyaline membrane disease
TLC	total lung capacity—volume of gas in the lungs at the end of maximal inspiration; equals VC plus RV
URI	upper respiratory infection
V_T	tidal volume—amount of air inhaled and exhaled during a normal ventilation
VATS	video-assisted thoracic surgery (thoracoscopy)
VC	vital capacity—equals inspiratory reserve volume plus expiratory reserve volume plus tidal volume
V/Q scan	ventilation-perfusion scan—radioactive test of lung ventilation and blood perfusion throughout the lung capillaries (lung scan)

Thank you