

Pulmonary Medicine

Section 9

Classic Respiratory Symptoms

- Dyspnea
- Cough
- Hemoptysis
- Chest pain

Dyspnea

- Three forms
 - Intense need to breath heavily and rapidly
 - Anxiety attacks, low O₂ in air, high CO₂ in blood
 - Can occur after vigorous exercise
 - Increased efforts of breathing with increased airflow resistance
 - Asthma, croup, bronchitis
 - Chest tightness
 - Asthma, croup, pneumothorax, pleural effusion, pneumonia
- Specific manifestations of dyspnea
 - Tachypnea – rapid respiratory rate
 - Hyperventilation – greater respiratory effort
 - Apnea – no breathing
 - Orthopnea – SOB when recumbent
 - PND – paroxysmal nocturnal dyspnea
 - Awakening from sleep with orthopnea
- Treatment
 - Treatment determined of what condition is causing dyspnea
- Diagnosis of dyspnea
 - Airway problems
 - Foreign body, upper airway obstruction
 - Parenchymal lung disease – interstitial lung disease
 - ARDS, pneumonia, interstitial fibrosis
 - Pulmonary vascular disease
 - Pulmonary embolism, pulmonary hypertension
 - Pleural diseases
 - Pneumothorax, pleural effusion
 - Neuromuscular or chest wall diseases
 - Myasthenia gravis, severe scoliosis
 - Cardiovascular
 - Increased respiratory drive
 - Hyperthyroidism, pregnancy
 - Psychological reasons
 - Anxiety, panic attacks, psychosomatic disorders



Cough

- Differential diagnosis of cough
 - Airway irritants – smoke, dust, atmospheric irritants
 - Aspiration of foreign bodies – food, oral secretions, gastric secretions
 - Airway disease and URI – most common cause
 - Tracheitis (croup), bronchitis, bronchiectasis, pneumonia
 - Interstitial disease within the lung tissue
 - Pneumonia, lung abscess, pulmonary fibrosis
 - Congestive heart failure
- Productive cough
 - Produces clear, mucoid or grey phlegm
- Nonproductive cough
 - Viral pneumonia, bronchitis, chest cold, flu (dry cough)



Hemoptysis

- Coughing up blood
- Differential diagnosis
 - Airway diseases
 - Bronchitis, bronchiectasis, bronchiogenic carcinoma
 - Interstitial diseases
 - Tuberculosis, lung abscess after pneumonia
 - Vascular diseases
 - Left ventricular failure, pulmonary embolism



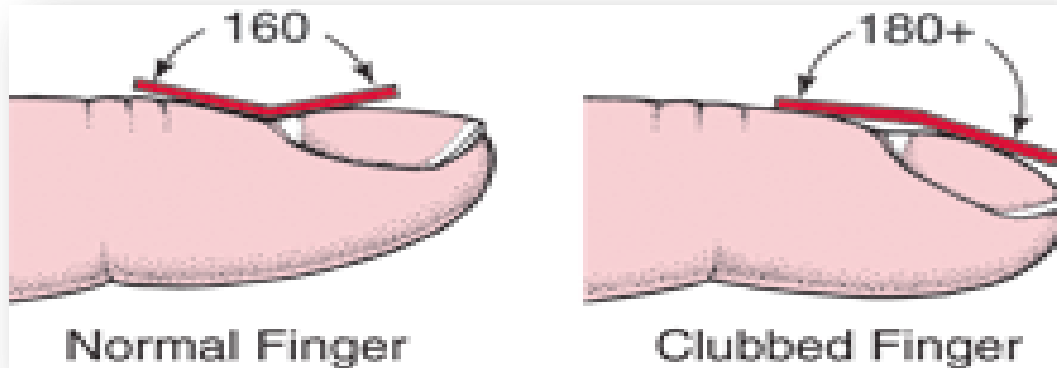
Chest pain

- Chest pain does not start in the lungs, because there is not pain fibers in the lung tissue
- Differential diagnosis
 - Pleuritis
 - Pneumothorax
 - Pleural effusion
 - Pulmonary embolism extending to the lung surface
 - Abscess or hematoma under the diaphragm
 - Ruptured appendicitis, ovarian cysts, gallbladder, tubal pregnancy
 - Lupus lung
 - Heart disease or mediastinal disease



Pulmonary Diagnostic Tools

- Physical exam
 - Inspection – chest size, shape, symmetry, strength, atrophy, ease of respiration, intercostal retraction
 - Palpation – depth of excursion, chest wall compliance
 - Percussion – top and bottom of chest bilateral
 - Auscultation – the main part of the examination
- Clubbing
 - Unknown cause, seen in pulmonary disease
 - Finger clubbing is characterized by enlarged fingertips and a loss of the normal angle at the nail bed



- Chest x-ray
- CT scans – good for interstitial diseases
- MRI scans – good for mediastinal and hilar diseases
- Lung scans
- Pulmonary angiograms
- Bronchoscopy
- Pulmonary function tests
 - Lung volumes – shows the size of various parts in the lung
 - Flow rates – if the flow in the airways is impeded or not
 - Diffusing capacity – how fast the gas transfers
 - Arterial blood gases

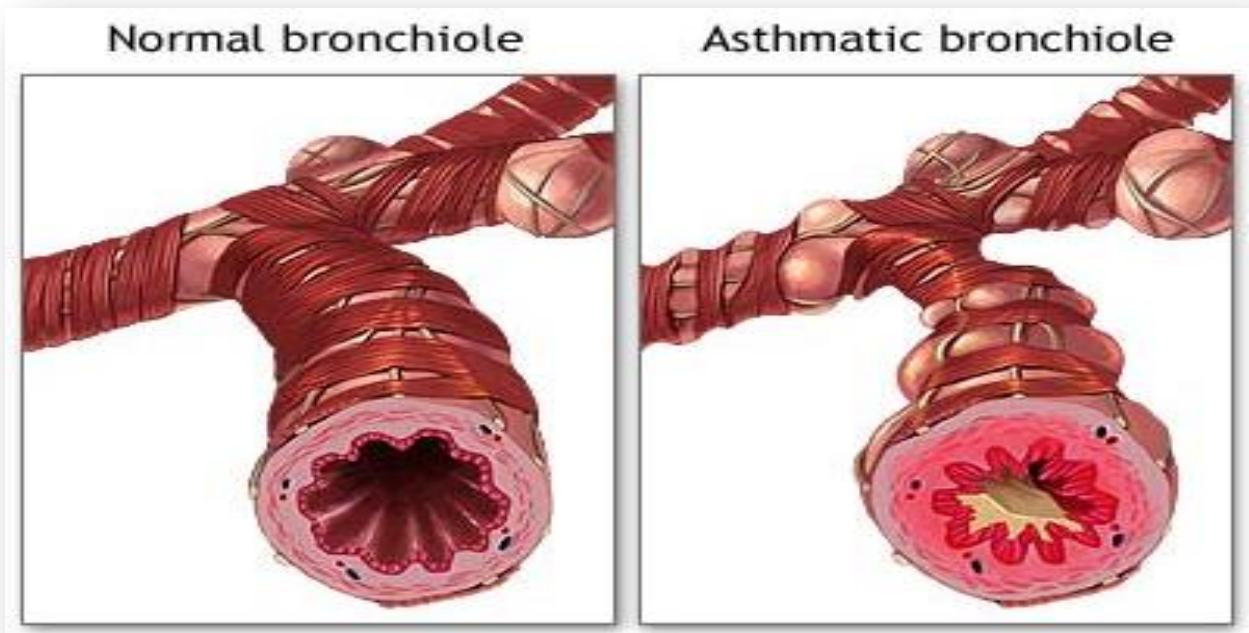


Normal Chest X-Ray



CHF Chest X-Ray

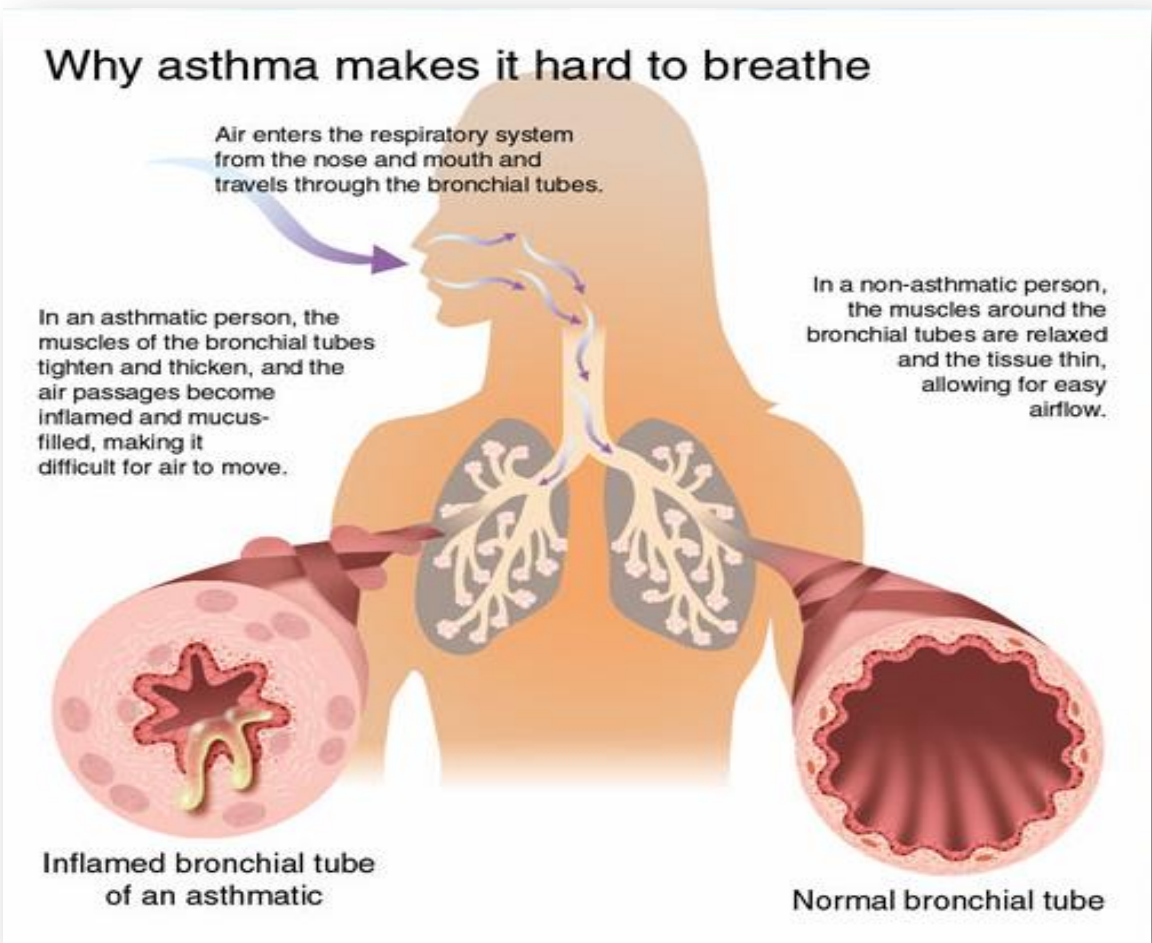
Asthma



- Incidence
 - In the last decade the incidence of asthma has increased by 1/3
 - 20 million people in the US
 - 6 million children and 14 million adults
- Children under 16 and adults over 65 are more prone
- Asthma is a process that affects the airways with excessive mucus production, bronchial muscle contraction, and swelling causing obstruction.
 - During an asthma attack, spasms in the muscles and bronchi constrict, impeding the outward passage of stale air. Sufferers can get starved for air with coughing, wheezing and chest tightness.
 - The basic cause is hyper-responsiveness of the airways to perceived noxious substances inhaled
 - Recently, asthma has been found to be a chronic inflammatory process with the prior symptoms.
 - Most of the research has been aimed at determining what might trigger asthma responses and what to avoid.
- Risk Factors and Triggers
 - It is thought that asthma starts in childhood and may be due to interaction of several factors
 - Asthma symptoms can be triggered by several factors
 - Allergies, viral or sinus infections, exercise, medications, foods, anxiety, heredity
 - Reflux disease
 - stomach acid flowing back up the esophagus
 - Air pollutants
 - tobacco, wood smoke, chemicals, and ozone

Asthma - continued

- Asthma Risk Factors and Triggers - continued
 - Occupational exposure
 - allergens, vapors, dust, gas, fumes
 - Strong odors or sprays
 - Other air borne particles
 - dust, chalk dust, talcum powder
- Signs and symptoms
 - Usually seen in childhood and teenage years - Rare in adults
 - Classic four symptoms
 - Cough
 - Dyspnea
 - Wheezing
 - Chest tightness
- Range of severity
 - Normal is 1 to 2 per week
 - Some have daily attacks
 - Persistent asthma symptoms – status asthmaticus
- Treatment
 - Allergen avoidance
 - Reduce exposure to dust mites, which are microscopic insects that live off dead skins cell flakes, and are everywhere.
 - The mites and their waste products are allergic to asthmatics.
 - To limit exposure to dust mites you should:
 - Enclose pillows & mattress with airtight plastic covers
 - Remove carpeting and curtains
 - Wash sheets and stuffed toys weekly in hot water
 - Clean bedrooms often with HEPA filter vacuum
 - Cockroaches and their feces is also a huge trigger, so cleanliness is essential
 - Desensitization allergy shots – not very effective
- Medications
 - Bronchodilators
 - Sympathomimetics
 - Epinephrine injections, inhalers
 - Xanthines – orally or injected
 - Anticholinergics
 - Anti-inflammatory drugs
 - Prednisone, Medrol, Qvar, Aristocort
 - Mast cell stabilizers
 - Cromolol oral, Tilade inhaler
 - Anti-leukotriene drugs
 - Singulair, Accolate
 - Low humidified oxygen
 - Swimming has long been used for asthma because moist air is better than cold dry air. Very effective with older patients.



COPD

- Includes chronic bronchitis and emphysema
- Bronchitis – chronic cough, sputum production and thickening of bronchial passages
- Emphysema destroys the lung and enlarges the alveoli air spaces
- Incidence
 - 16 million Americans, 110,000 death per year
- Etiology
 - Smoking
 - Genetic predisposition
 - Multiple lung infections in children
 - Heavy exposure to environmental and industrial pollution
 - Cystic fibrosis
- How COPD develops
 - Smoking causes increased mucus production and bronchial inflammation
 - Nicotine paralyzes the mucociliary escalator
 - Mucociliary escalator traps mucus, bacteria, irritants
 - Nicotine blocks protein inhibitors which will eventually dissolve the alveoli

COPD - continued

- Pathophysiology
 - Involves all four parts of the respiratory tract
 - Bronchi
 - Bronchioles
 - Alveoli
 - Parenchyma
- Specific Pathophysiology
 - Increased resistance to airflow
 - Loss of elastic recoil
 - Decreased expiratory flow rate
 - Alveolar walls frequently break because of the increased resistance of air flows
 - The hyper inflated lungs flatten the curvature of the diaphragm and enlarge the rib cage
 - The altered configuration of the chest cavity places the respiratory muscles, including the diaphragm, at a mechanical disadvantage and impairs their force-generating capacity
 - Consequently, the metabolic work of breathing increases, and dyspnea increases

Two types of COPD

- Type A – Pink Puffers
 - Have mostly emphysema
 - Need to breathe rapidly to exchange O₂ and CO₂
 - Have prominent dyspnea, the fast puffing keeps them from becoming cyanotic
 - Most of the lung is perfused with blood exchange is not efficient because of fewer alveoli

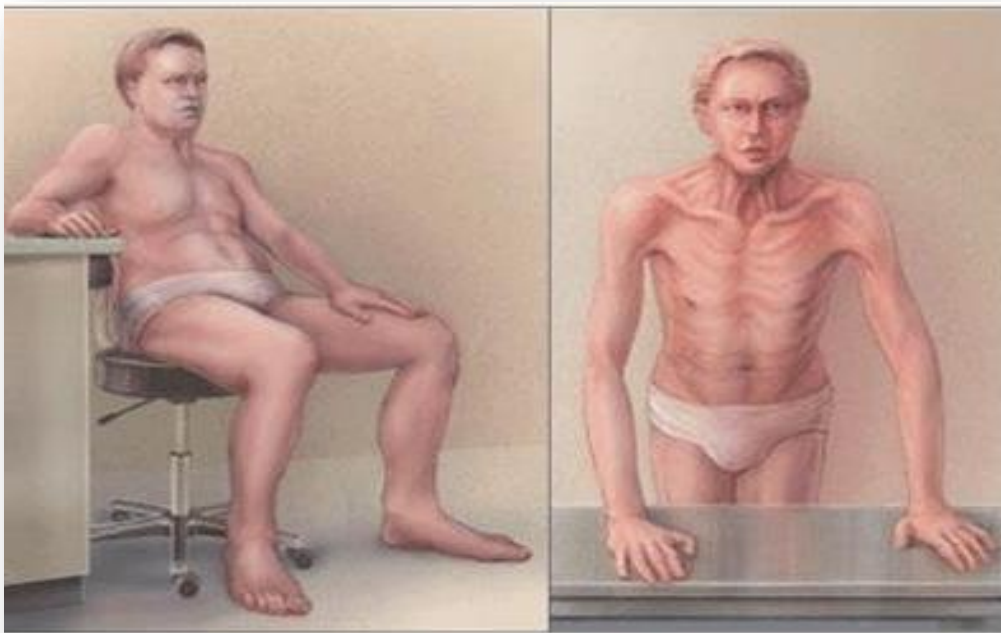
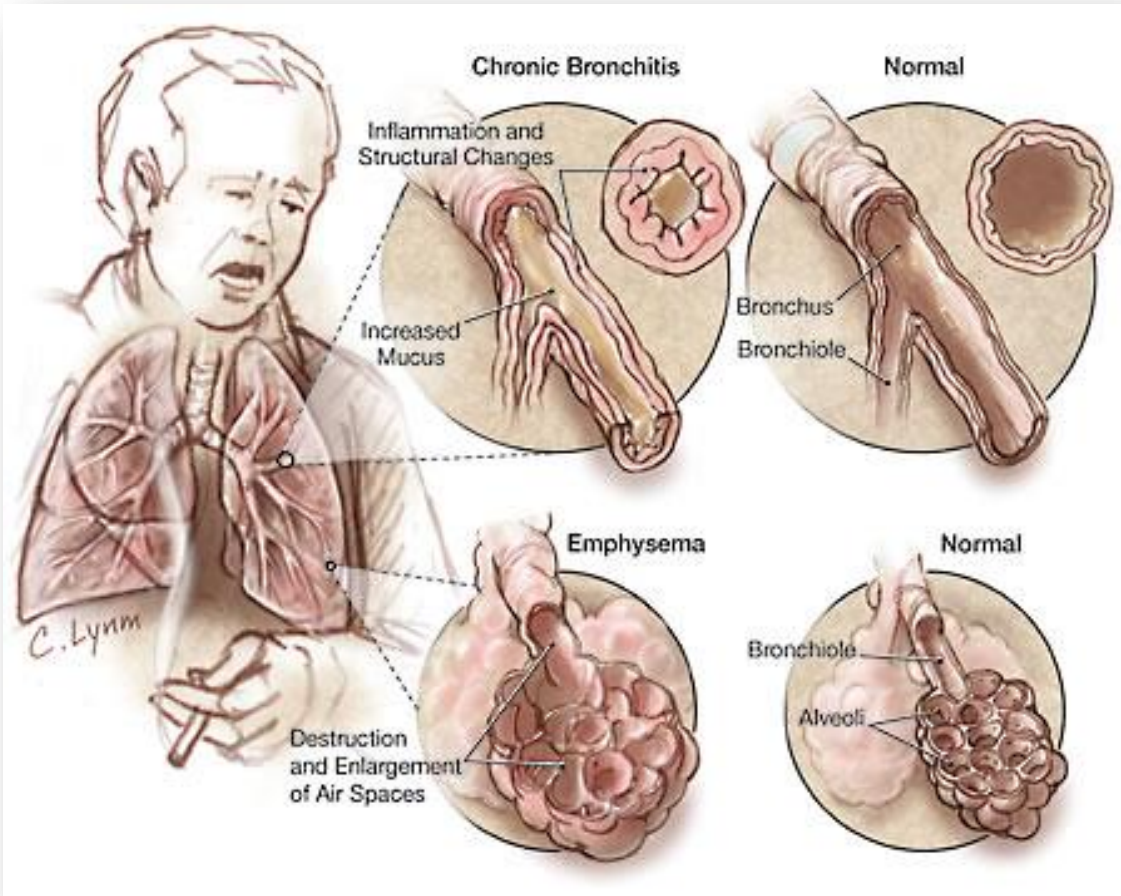


COPD - continued

- Type B – Blue Bloaters
 - Have mostly chronic bronchitis with bronchiolar obstruction and non-ventilated alveoli
 - Results in shunting of cyanotic blood away from the area where there is no air in the lungs
 - Results in pulmonary hypertension which leads to heart failure with peripheral swelling
 - Severe dyspnea with any exertion



- Diagnosis of COPD
- Smoker with hacking cough, sputum and dyspnea
- Type A – thin, dorsal kyphosis, clubbing, pigeon breast (pectus carinatum) or funnel chest (pectus excavatum)
- Type B – obese, swollen appearance, cyanotic
- X-ray findings
 - Large lung volumes hyperlucent, flat diaphragm, increased AP diameter
- Pulmonary function tests
 - Airway obstruction and decrease, air trapping
- Blood gases
 - Type A – normal blood gases
 - Type B – marked hypoxemia and CO₂ retention
- Treatment of COPD
 - Bronchodilators
 - Antibiotics
 - Corticosteroids
 - Supplemental oxygen therapy
 - Chest physiotherapy to lose secretions
 - Surgery to remove diseased lung tissue
 - Lung transplantation

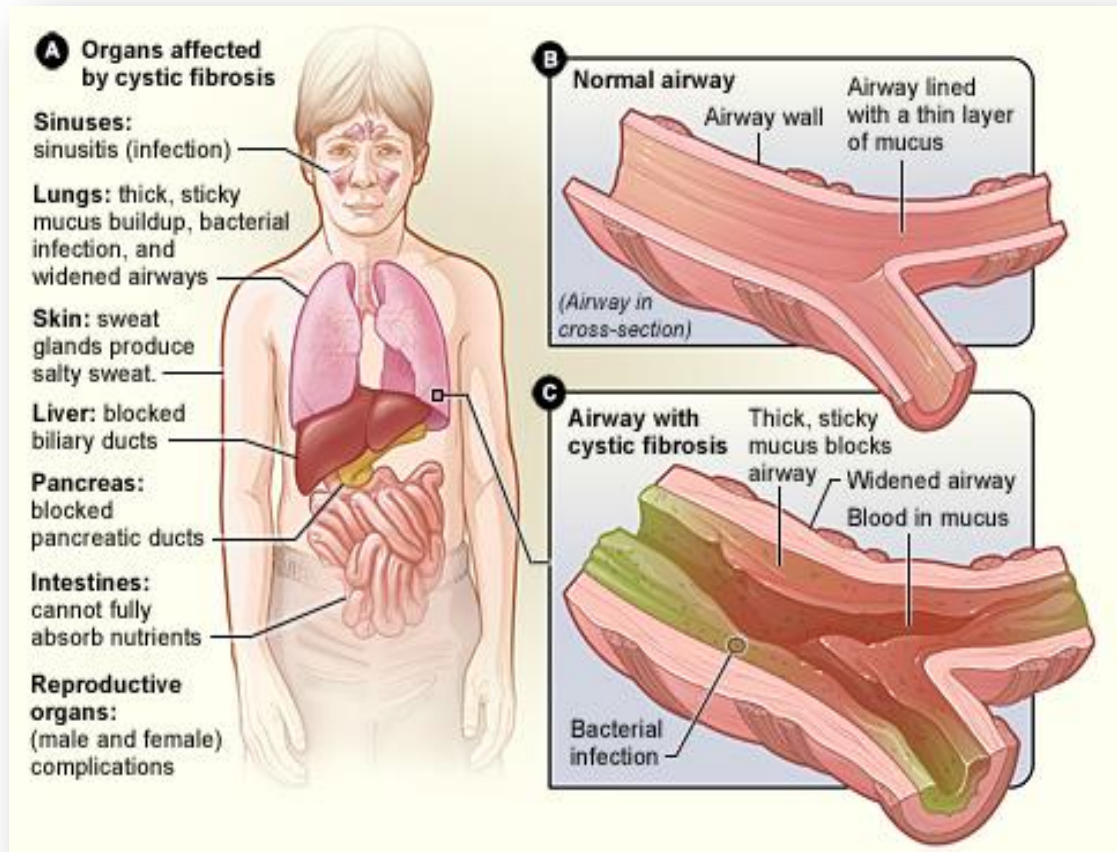


Bronchiectasis

- Pathophysiology
 - Irreversible dilation of part of the bronchial tree
 - Caused by chronic infection of bronchi & bronchioles
 - Chronic bronchial infection causes a dilatation of the air passages which are trapped with muco-purulent material
 - Caused by slow-growing bacteria and fungi
- S & S
 - Chronic deep hacking cough
 - Copious amounts of foul-smelling pus sputum
 - Frequent attacks of pneumonia
- Diagnosis
 - Localized rales and coarse ronchi
 - Appears similar to COPD with clubbing
 - Normal blood gases
 - History of chronic infection
 - CT scan confirms the diagnosis
- Treatment
 - Antibiotics – ciprofloxacin
 - Bronchopulmonary drainage
 - Bending over, almost standing on head, to get the mucus up and out
 - Bronchodilators

Cystic Fibrosis

- Inherited disease that causes thick, sticky mucus to build up in the lungs and digestive tract
- The most common type of chronic lung disease in children and young adults
 - 1 in every 3,300 – most children and teenagers
 - May result in early death
- S & S
 - Pneumonitis, bronchiectasis, lung abscesses, pancreatic insufficiency
- Diagnosis
 - Established by the sweat electrolyte test
- Treatment

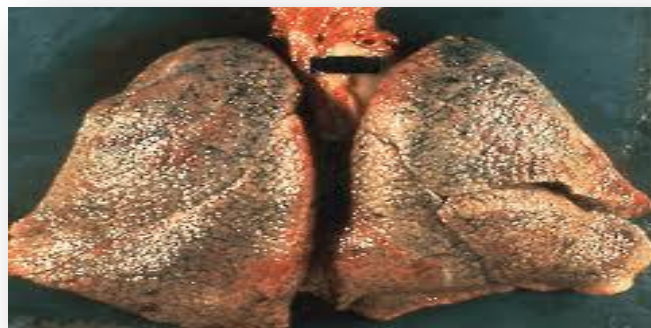
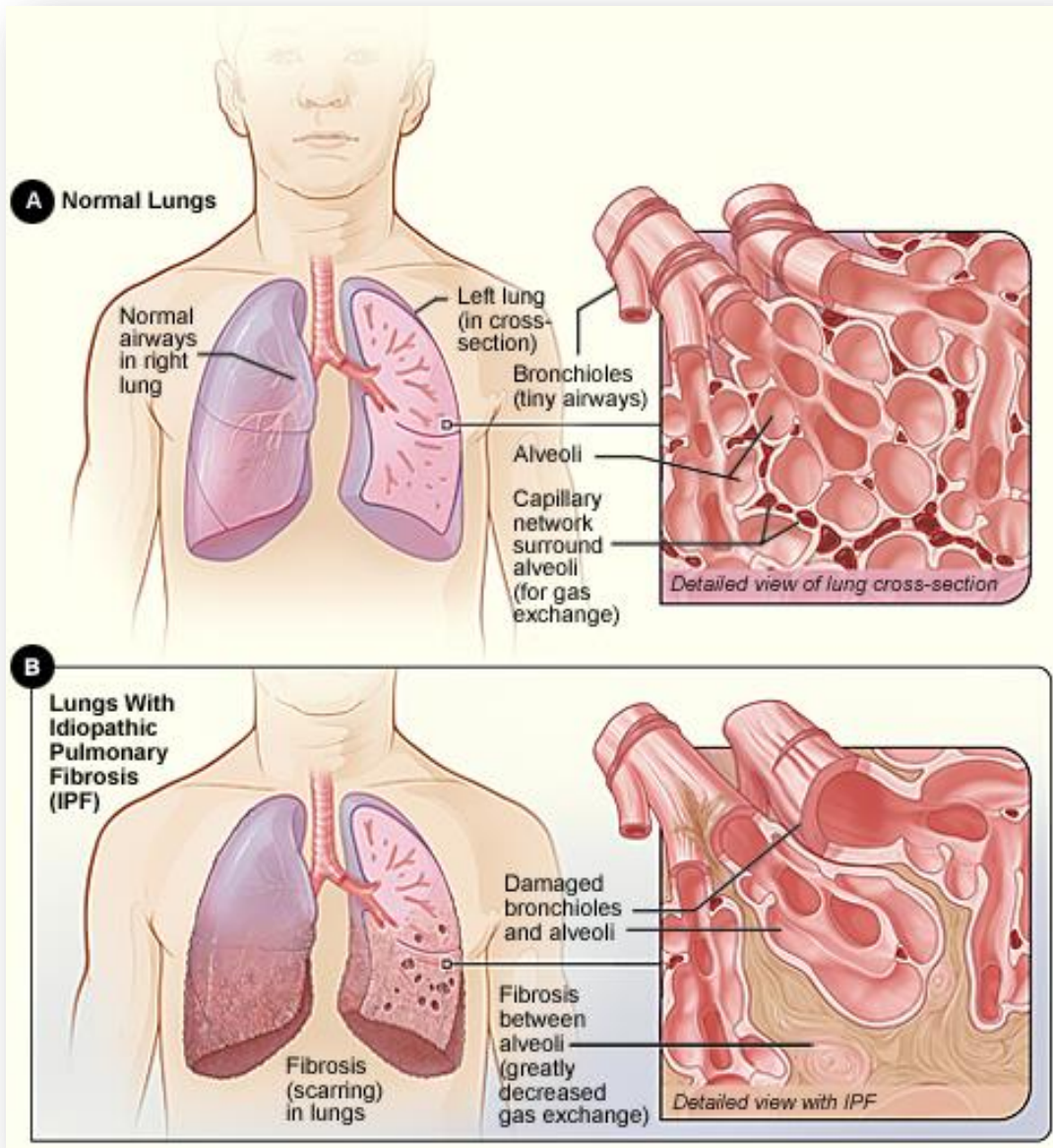


Pulmonary fibrosis

- Referred to as interstitial lung diseases
- Causes inflammation and fibrosis of the connective tissue between the alveoli
- Most common causes
 - Environmental causes – inhaled dusts, asbestosis, silicosis, glass makers, construction workers
 - Antigens – hypersensitivity pneumonitis
 - Drugs – Methotrexate
 - Radiation injury
 - Other diseases – sarcoidosis, RA
 - Mimicking disorders similar presentation but vastly different
 - CHF, pneumocystis or viral pneumonia, carcinomatosis
- Pathology of interstitial lung disease
 - Inflammation of the alveolar wall and inter-alveolar spaces
 - Fibrous scarring
 - Granuloma formation
 - End stage leads to a mass of scar tissue with contraction and the formation of cystic areas

Pulmonary fibrosis - continued

- Impairment of pulmonary function
 - Decreased lung volume
 - Decreased compliance (stiff lungs)
 - Impairment of diffusion
 - Decreased gas exchange
 - Shunting and spasm of pulmonary arteries
 - Heart failure resulting from pulmonary hypertension
- S & S of pulmonary fibrosis
 - Obvious dyspnea
 - Chronic nonproductive cough
 - Clubbing
 - Mild cyanosis
- Diagnosis of pulmonary fibrosis
 - CT scan is confirmatory
- Specific diseases that can cause pulmonary fibrosis
 - Silicosis – disease of glass makers, sand blasters, rock miners and stone cutters
 - Takes 20 years to develop
 - Pneumoconiosis – coal miner’s disease
 - Severe lung fibrosis with hypoxia
 - Asbestosis – leads to 3 distinct diseases
 - Bronchiogenic carcinoma
 - Mesothelioma of lung (cancer of lung pleura)
 - Interstitial fibrosis – takes 20 years to develop
 - Drug-induced pulmonary fibrosis – chemotherapy
- Treatment of pulmonary fibrosis
 - Very little effective care
 - Oxygen 24 / 7
 - Corticosteroids



Pulmonary Embolism

- Occurs when a blood clot is from the deep venous system travels to the lungs
 - Usually involves veins of legs, arms and pelvis (pregnancy)
- Three conditions are put you at risk
 - Increased coagulation of blood
 - Stress, surgery, injury, heart attack, severe illness
 - Stasis or stagnation of blood flow
 - Seen in conditions of immobility such as prolonged bed rest long car rides of plane flights in cramped position
 - Damage to vessel wall or venous valves
 - Stasis-induced phlebitis, soft-tissue injury, bad ankle sprain
- Pathophysiology
 - Pulmonary infarction of distal tissues occurs in a small number of cases
 - Hemorrhage and edema of tissues distal to the clot is more common
 - Vasoconstriction of pulmonary blood vessels occurs
 - This causes a release of serotonin an vasoconstrictive amines which cause more constriction
 - Low blood pH causes even more constriction
 - Right sided heart failure followed by left sided blood flow followed by syncope and sudden death
- S & S
 - Sudden dyspnea
 - Pleuritic chest pain with hemoptysis
 - Can have syncope followed by death
- Diagnosis
 - Normal chest x-ray
 - Perfusion lung scan shows absence of perfusion to involved arteries
 - Pulmonary arteriography – “gold standard”
 - Contrast CT
 - Decreased blood gases and increased pH
- Treatment
 - tPA – tissue plasminogen activator if potentially life threatening embolism
 - Complete bed rest
 - Anticoagulation with heparin in ICU
 - Coumadin anticoagulation for six months
 - Vena caval filter surgery
- PE prophylaxis
 - Most common secondary cause of hospital deaths
 - Lower extremity anti-embolism device with compression during surgery are after heart attack or sever illness
 - Low dose heparin during surgery
 - Graduated compression support hose for patients with deep venous insufficiency

Pleural effusion

- Caused by inflammation of pleura
- S & S
 - Dyspnea
 - Pleuritic chest pain
- Physical findings
 - Decreased breath sounds
 - Pleural friction rub
- Differential diagnosis
 - Pleural effusion with have exudate or transudate
 - Hemothorax from trauma will have blood
 - Empyema becomes a giant abscess of pus
- Diagnosis
 - Chest x-rays
 - Ultrasound
 - Thoracentesis – needle aspiration
- Treatment
 - Treat the cause
 - Drain off fluid
 - May need pleurodesis – surgical breakup of adhesions

Pneumothorax

- Air in the pleural space that collapses all or part of the lung
 - The pressure of the air against the lung causes it to give way, often leading to mild to severe chest pain and shortness of breath
 - Lung collapses in proportion to the amount of air that leaks into your chest cavity
 - Although the entire lung can collapse, a partial collapse is much more common
- Causes
 - Trauma
 - Growing tumor blocking a major airway
 - An infection
 - Inhaled foreign object.
- S & S
 - If a small amount of air enters the pleural space, there may be a few signs or symptoms
 - Even a minimally collapsed lung is likely to cause some chest pain
 - When the lung has collapsed 25 percent or more:
 - Sudden, sharp chest pain on the same side as the affected lung
 - Dyspnea
 - Chest tightness
 - Tachycardia
- Physical exam
 - Asymmetrical breath sounds
 - Decreased sounds over pneumothorax

Pneumothorax - continued

- Diagnosis
 - Chest x-ray is pathognomonic
- Complications of pneumothorax
 - Hypoxemia
 - Respiratory failure
 - Cardiac arrest
 - Shock
- Treatment
 - Bedrest and observation if collapse is less than 25 %
 - Chest tube if collapse over 25 %
 - Suction continued for up to 3 days
- Thoracotomy needed if lung does not re-inflate



Mediastinal Diseases

- Mediastinal masses
 - Thyoma, germ cell tumor, lymphoma, thyroid enlargement, carcinoma, pericardial cysts, neurogenic tumors
- S & S
 - Half of masses have no symptoms and the growth is found incidental on another examination
 - The other half of the patients have chest pain, dyspnea, nonproductive cough and facial edema
- Diagnosis
 - Lateral chest x-ray
 - CT scan
 - Mediastinoscopy

Disorders of Ventilatory Control

- Hyperventilation – rapid breathing
 - Occurs with neurological diseases of the cortex such as meningitis, encephalitis, strokes
 - Can also occur with panic attacks
- Hypoventilation
 - Occurs with neurological diseases of the medulla such as encephalitis
- Cheyne-Stokes breathing
 - Cyclic pattern of increasing and decreasing respiration leading to apnea
 - Seen in neurological disorders and CHF
- Sleep apnea syndrome
 - During REM sleep there is a collapse of soft tissues with periods of apnea

ARDS - Acute Respiratory Distress Syndrome

- Life threatening process with breakdown of alveolar cell membranes leading to pulmonary edema
- Causes
 - Aspiration of gastric contents or water (near drowning)
 - Toxic gas inhalation
 - Severe diffuse pneumonia
 - Sepsis, shock, severe trauma, head trauma
 - Intravascular coagulation
 - Fat embolism
 - Multiple transfusions
 - Pancreatitis
 - Drug reactions
 - Called heroin pulmonary edema
- ARDS pathology
 - Damage to alveolar epithelial cells leads to a buildup of interstitial and alveolar fluid leading to alveolar collapse
 - This leads to increased vascular resistance, decreased lung compliance and buildup of hyaline membranes
 - The thickening of the membranes leads to pulmonary fibrosis
- S & S
 - Dyspnea, tachypnea, tachycardia, rales, hypoxia
- Treatment
 - Aggressive treatment of the cause (sepsis, shock, etc.)
 - Corticosteroids
 - Support of impaired gas exchange
- Prognosis
 - Mortality 50 %

Pulmonary Red Flags

- Severe asthma attacks
- New onset of dyspnea or worsening dyspnea
- All cases of chest pain
- Upper airway disease
- Pulmonary embolism
- Pneumothorax
- Pleural effusion with dyspnea
- Pneumonitis
- Cheyne-Stokes breathing
- Acute onset of any breathing problems
- Acute respiratory distress



Pulmonary sub-acute red flags

- New onset of asthma
- New cough lasting for more than one week
- Hemoptysis
- COPD if not currently under care
- Bronchiectasis
- Cystic fibrosis
- Pulmonary fibrosis
- Pulmonary effusion
- History or S & S of mediastinal disease
- Sleep apnea