RESPIRAPTORY SYSTEM

CHEST DRAINAGE

Pleural drainage

- Thoracic cavity is a closed space
- Negative pressure keeps the lungs inflated
- When the cavity is damaged, the pressure becomes (+) and lungs collapse
  - Chest tubes establish (-) pressure by removing air or fluid
- Uses → after cardiac surgery → prevent tamponade

Chest drains

- there are 3 chambers
  - collection chamber
  - water seal chamber
  - suction control chamber
- types of fluids inside can be
  - blood
  - serosanguineous
  - pleural fluid
- **water chamber should NOT have bubbles (leak!)**
- water level should go up and down as pt breath (swing is okay)
- The level of water is what determines the (-) suction NOT the value on the suction regulator!

Assessment steps for ICCs

- Check the dressing
- No dependent loops
- No striping or milking
- Check the drainage rate
- Check for bubbles
- Check water level in water and suction chambers
- Adjust bubbles – gentle bubbling
- Check vacuumed unit

ICC documentation

- Respiratory assessment
- Amount of suction
- Amount of drainage
- Swing
- Bubbles

Chest drain chart

- Pain relief
- Pt education

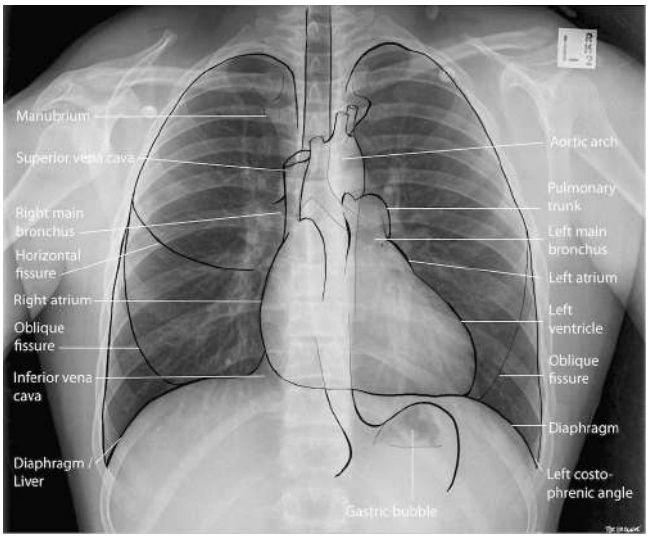
Progress notes

CHEST X-RAY

Assess for technical quality!

Then check for ABCDEF …
A = airways
B = bones and soft tissue
C = cardiac silhouette (mediastinum)
D = diaphragm (gastric bubble)
E = effusions (pleura)
F = fields (lung fields)

Also check for lines, tubes, devices and past surgeries.



VENTILATORY DISORDERS

Acute bronchitis

Bronchitis is the inflammation of the bronchi. (inflammation of the larger airways of the lungs)

- Causes
  - Smoking
  - Impaired immunity
- Infectious bronchitis is commonly caused by bacteria and virus that damage the mucosa
- Inflammatory bronchitis is caused by inhalation of toxic gases or chemicals.
  - The inflammatory response to infection or tissue damage from inhaled substances cause
    - Capillary dilation
    - Oedema of mucosal lining
- This leads to excessive mucus formation
- Capillary epithelium damaged
- Immune responses of leukocytes and macrophages inhibited by the bacterial activity
  - High risk of infection
- Mucosal irritation, mucus and coughs
  - Bronchospasms
- Acute bronchitis evidenced when a non-productive cough becomes productive.

Manifestations

- Productive cough
- Paroxysms – sudden recurrence /attacks
- Pleuritic pain
- Fever
- General malaise

Diagnosis

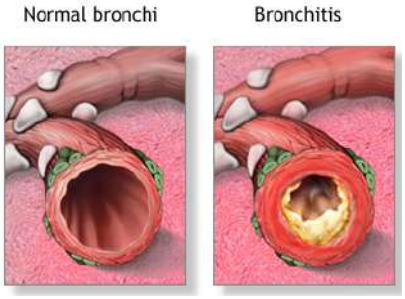
- History and clinical presentation
- Chest X ray

Treatments

- Symptom relief
- Antibiotics
- Codeine (cough)
- Increase fluid intake
- Paracetamol
- Bronchodilators

Nursing care

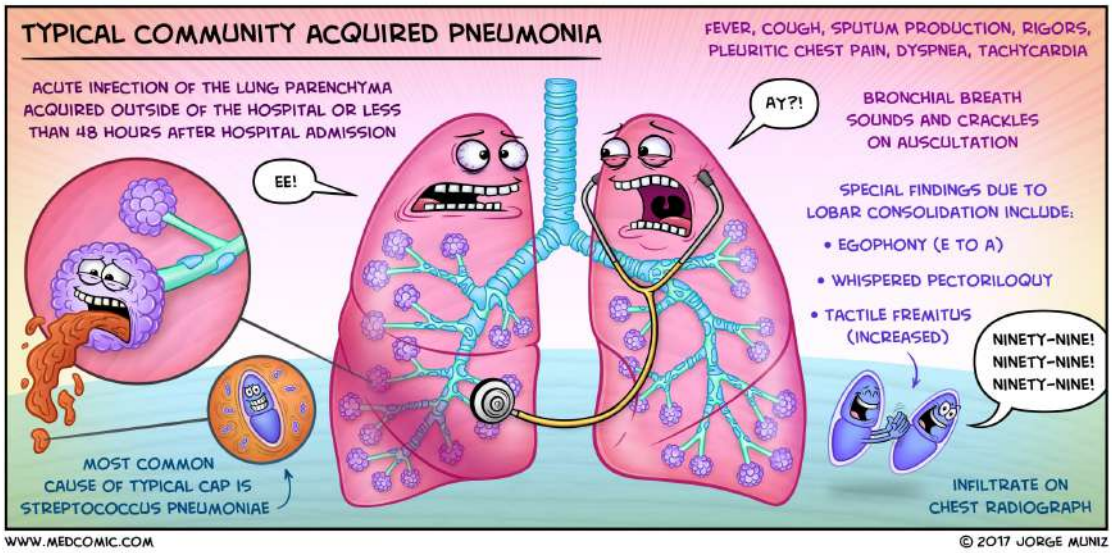
- Increased fluid intake
- OTC analgesia
- Cough precautions
- Look out for medication overdose!
- Reduce stress



Pneumonia

The inflammation of the lung parenchyma (respiratory bronchioles and alveoli).

- Can be infectious or not infectious.
- Infectious → bacteria, virus or protozoa
- Non-infectious
  - Aspiration of gastric contents
  - Inhalation of toxic substances
- There are many ways of getting this disease
  - Hospital acquired
  - Healthcare associated
  - Community acquired
  - Opportunistic infections



"Streptococcus pneumoniae"

- Found in upper respiratory tract
- Spread by droplet contamination
- Infection results from aspiration of resident bacteria
- In lower respiratory tract, these organisms cause exudate and Oedema

Respiratory bronchi and alveoli fill with serous exudate, RBC, Fibrin and bacteria → consolidation

Lower lobes are mostly affected → because of gravity
Consolidation of the large portion of lung lobe → lobar pneumonia
Patchy consolidation involving several lobes → bronchopneumonia

Manifestations

- Bacterial pneumonia
    - Rapid onset chills
    - Fever
    - Productive cough (purulent sputum)
    - Pleuritic pain
    - Limited breath sounds
    - Fine crackles / pleural rub
    - Dyspnea
    - Cyanosis
- Bronchopneumonia
    - Fever
    - Cough
    - Scattered crackles
    - Dyspnea (less common)
    - Tachypnea

Complications

- Lung Abscess
    - Local area of lung necrosis
    - Pus formation
    - Weight loss and night sweats
    - Foul smelling sputum
- Emphysema
    - Accumulation of purulent exudate in pleural cavity
    - Need chest X ray or CT
    - Thoracentesis → to remove exudate
    - Bacterial infection in the exudate can cause endocarditis, peritonitis or meningitis

Viral pneumonia

- More common in children
- Secondary to bacterial pneumonia
- Herpes and measles virus can cause this
- Mild disease
- Seen in older people and pts with chronic conditions too
- Community epidemics
- Headache, fever, fatigue, malaise, muscle aches and dry cough

Aspiration pneumonia

- Aspiration of gastric contents
- Emergency surgery, obstetric surgery, impaired swallowing
- Depressed cough and gag reflexes
- Common in old people
- Gastric contents (acidic) may cause inflammation, edema and respiratory failure
- Take precautions for old people

Diagnosis of pneumonia

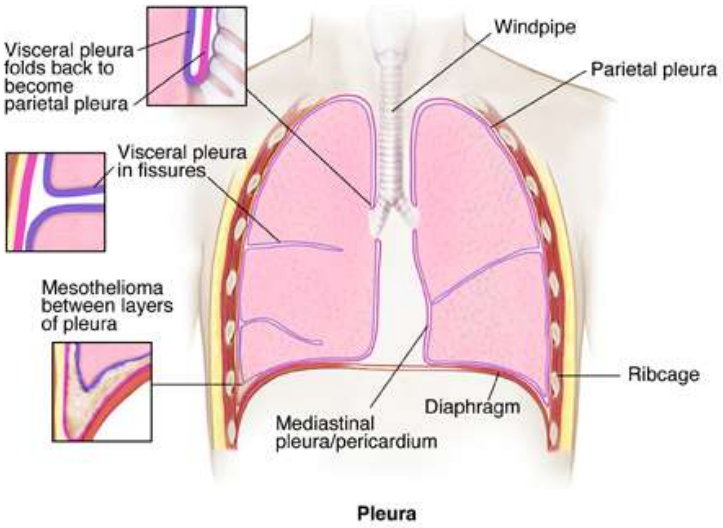
- Chest XR
- Sputum gram stain
- Sputum culture and sensitivity
    - When this test comes out negative → try serology testing

- FBC → elevated WBC
- Pulse oximetry → oxygen would be less than 95%
- ABG → less oxygen below 75-80mmHg)
- Fiber optic bronchoscopy

Medications
- Broad spectrum antibiotics
- Bronchodilators
  - Salbutamol
  - Ventolin
  - Atrovent
- Mucolytic agents (breaks up mucus)
  - Acetylcysteine

Pleural effusions

Pleural space contains 10-20ml of serous fluid.
PE is a collection of excess fluid in the pleural space.
Can be caused by,
- Systemic disorders
  - Heart failure
  - Liver and kidney disease
  - Rheumatoid arthritis
- Local disorders
  - Pneumonia
  - Cancer
  - Trauma



Pleura

Excess fluid can be,
- Transudate – high capillary pressure
- Exudate – high capillary permeability

Manifestations
- Dyspnea
- Pleuritic pain
- Limited chest movements
- Diminished breath sounds

Treatments
- Thoracentesis (draw out with needle)
- Treat underlying condition
- Repeated drainage
- Thoracotomy surgery (rare)
- Parenteral antibiotics
- Install irritant (talc)
- Water seal chest tube drainage

Nursing care
- Support respiratory function
  - Maintain oxygen stats
- Impaired gas exchange
  - Oxygen therapy
- Activity tolerance
- Teaching home care

Pneumothorax

Accumulation of air in the pleural space.

Spontaneous pneumothorax

- Air filled blister on the lung surface rupture and air fills the pleural space
- Can be primary or secondary
  - Primary
    - smokers
    - Mostly effect tall, slender 18-40yo men
    - Cause is unknown
    - High altitude flying
    - Rapid decompression in scuba diving
  - Secondary
    - More serious
    - Overdistension and rupture of alveoli
    - Older people
    - Underlying Lung diseases – COPD
- Manifestations
  - Depend on size, extent and disease
  - Pleuritic chest pain
  - Shortness of breath
  - RR↑ and HR ↑
  - Asymmetric chest wall movement
  - Absent lung sounds on affected side
  - Hypoxemia

A secondary spontaneous pneumothorax (SSP) is defined as a pneumothorax that occurs as a complication of underlying lung disease. In contrast, primary spontaneous pneumothorax occurs without a precipitating event in the absence of clinical lung disease.

Traumatic pneumothorax

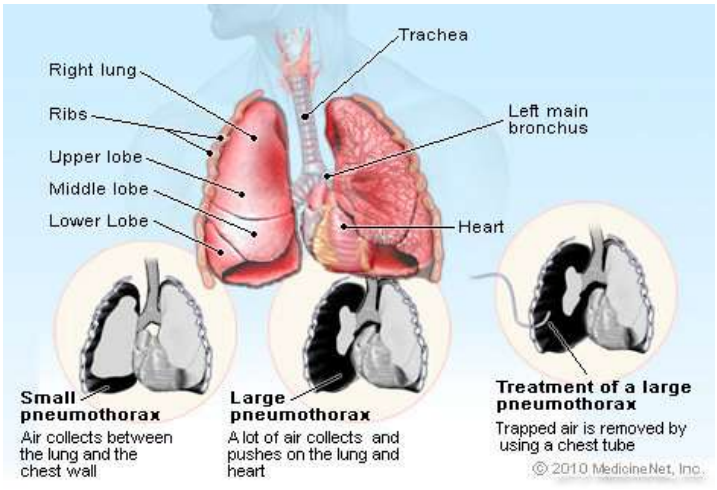
Blunt, penetrating chest trauma

Open pneumothorax

- Penetrating chest trauma
- Stabbing, gunshot
- Air move freely between pleural space and atmosphere
- Rapid lung collapse
- Hypoventilation

Closed pneumothorax

- Motor accidents
- Falls
- CPR
- Ruptured trachea or bronchus
- Ruptured esophagus



Iatrogenic pneumothorax

- Puncture or laceration of visceral pleura
- Central line placement
- Thoracentesis
- Bronchoscopy or biopsy

Manifestations

- Pain
- Dyspnea
- Tachypnea
- Tachycardia
- Diminished lung sounds
- Asymmetric chest movements

- Hemothorax

Tension pneumothorax

When injury to chest wall or lungs allows air to come into the pleural space but prevents it from escaping back out.

This causes the lungs to collapse → the pressure goes into the mediastinum, opposite lung or other organs.

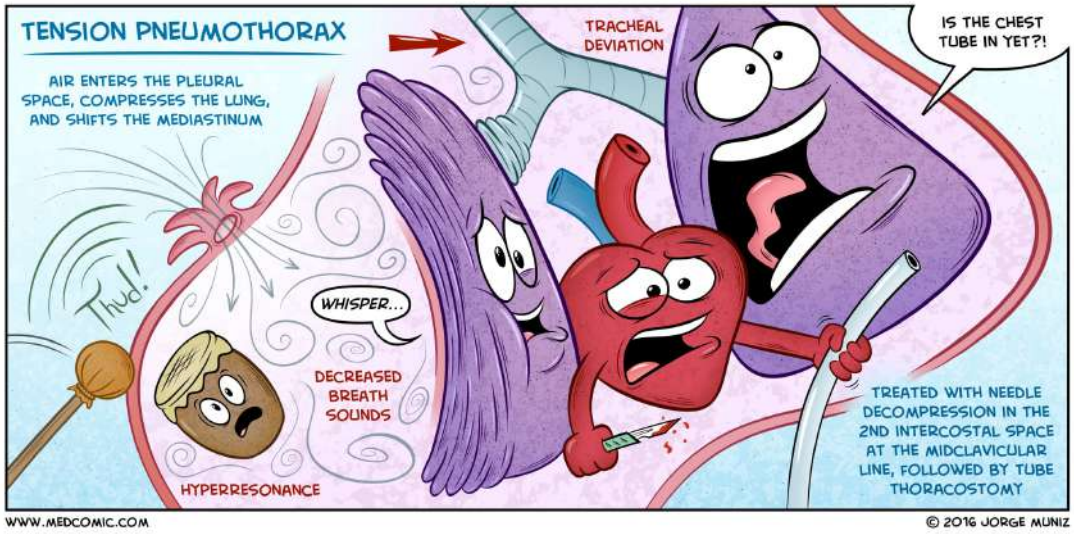
This is a MEDICAL EMERGANCY!!!

Manifestations

- Severely impaired ventilation
- Impaired venous return to heart
- Other pneumothorax symptoms
- Hypotension
- Distended neck veins
- Displaced trachea (to the unaffected side)
- Shock

Nursing care

- Vital signs and respiratory status
- Fowlers or semi-fowlers position for ease of breathing
- Oxygen therapy
- Chest tubes
- Rest
- Drainage



Haemothorax

Blood in the pleural space

- Chest trauma, surgery, diagnostic procedures
- Tumors, pulmonary infarction, infection

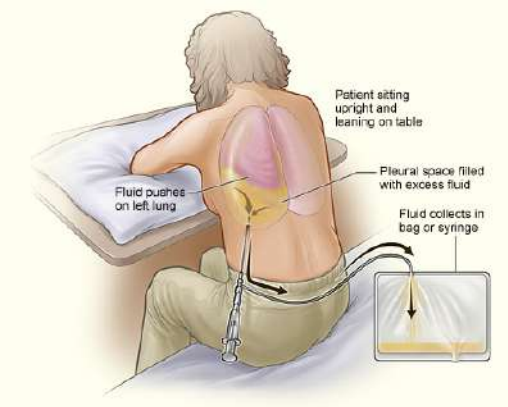
Manifestations

- Diminished lung sounds
- Symptoms similar to pneumothorax and PE

Treatments

- Thoracentesis – put a needle in and get the stuff out

- Thoracotomy - surgical opening → put a drain tube
- Chest tube drainage
- Blood transfusion



Nursing care

- Maintain respiratory function
- Maintain cardiac output
- Impaired gas exchange
- Fluid deficits
- No smoking

GAS EXCHANGE DISORDERS

Asthma

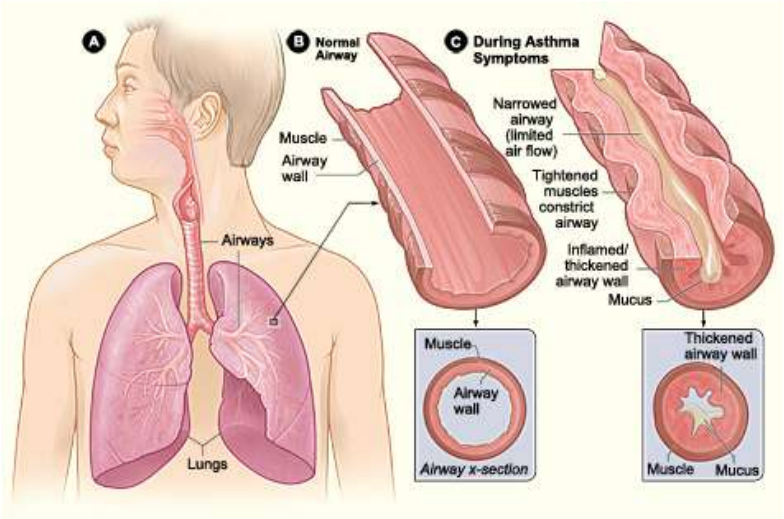
Chronic inflammatory disorder. A condition in which a person's airways become inflamed, narrow and swell and produce extra mucus, which makes it difficult to breathe.

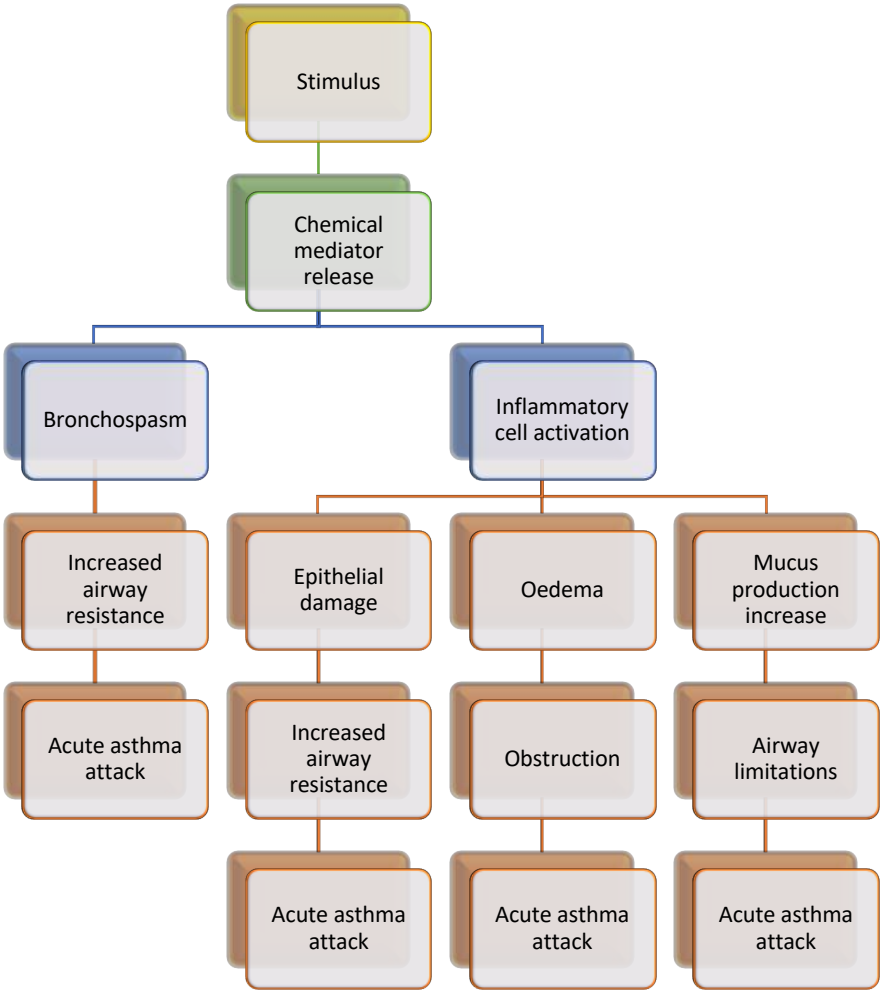
Wheezing, breathlessness, chest tightness and coughing often seen.

- Risk factors
  - Allergies
  - Genetics
  - Exercise
  - Pollution
  - Workplace exposure
  - Infections
  - Stress
  - Cold air
- Manifestations
  - Dyspnea
  - Tachypnea
  - Tachycardia
  - Chest tightness
  - Wheezing
  - Cough
  - Anxiety
  - Lung crackles

Status asmaticus is the prolonged, severe asthma that does not respond to routine treatment.

- Endotracheal intubation
- Mechanical ventilation
- Aggressive drugs





Diagnosis

- Respiratory function test
  - Residual volume ↑
  - Vital capacity ↓
- Bronchial provocation test
- ABG
  - might should hypoxemia
  - low PaO_2 and low $PaCO_2$
  - mild respiratory alkalosis
  - pH ↑
- skin testing for allergies

Medications

- bronchodilators
- leukotriene receptor agonists
- adrenergic stimulants
- anticholinergic drugs
- methylxanthines

Nursing care

- Skin colour and temperature
- Level of consciousness
- Cyanosis
- Assess ABG results
- Oxygen therapy
- Fowlers or semi-fowlers position
- Nebulizer
- Chest physiotherapy
- Increase fluid intake
- Provide endotracheal suctioning
- Vital signs
- Medications on time!
- Reduce stress and anxiety
- Pt education
- Asthma management plan

Mild to moderate attack	Severe attack	Life-threatening attack

Give salbutamol 4-12 puffs via pMDI and spacer Repeat every 20-30 min for the first hour if needed. (sooner if needed to relieve breathlessness)	Give salbutamol 12 puffs via pMDI and spacer If pt is unable to breathe through the spacer, give 5mg nebule via nebuliser. Start oxygen therapy if oxygen saturation is below 95%. Adults: 92%-95% Children: 95% or higher Repeat salbutamol as needed. Give at least every 20 min for the first hour.	Give salbutamol 2x5mg nebules via continuous nebulisation driven by oxygen. Maintain oxygen saturations Adult: 92% or higher Children: 95% or higher Arrange immediate transfer to higher level care. When dyspnoea improves, consider changing to salbutamol via pMDI plus spacer or intermittent nebuliser (doses as for severe acute asthma)

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Chronic Obstructive Pulmonary Disease (COPD) is an umbrella term for a group of progressive lung conditions including: Emphysema, Chronic bronchitis and Chronic asthma which causes chronic airflow obstructions.

Risk factors – middle aged and smokers

Chronic bronchitis

Disorder of excessive bronchial mucus secretion. Chronic bronchitis specifically refers to chronic cough and daily mucus production for at least three months of two or more consecutive years.

Manifestations

- Vasodilation
- Congestion
- Oedema
- Impaired ciliary action
- Goblet cells increase in size and number
- Thick tenacious mucus
- Recurrent infections
- Hypoxemia
- Hypercapnia
- Hypertension
- Productive cough
- Cyanosis
- Right sided heart failure
- Distended neck veins
- Enlarged liver and heart
- Wheezing lung sounds

Emphysema

Destruction of the alveoli walls, with resulting enlargement of air spaces.

Surface area of the lungs are reduced

Elastic recoil ↓ therefore passive expiration air volume ↓

Common to chronic bronchitis and emphysema

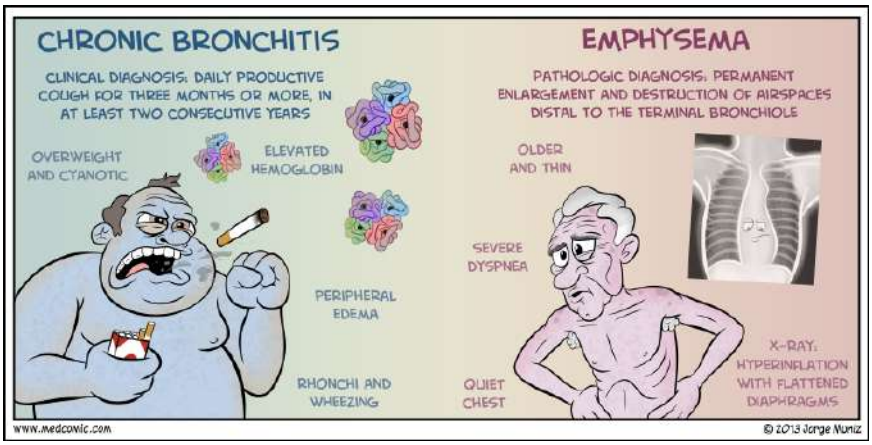
- Productive cough
- Dyspnea
- Exercise intolerance
- Smokers cough (in the morning)

Manifestations

- Dyspnea
- Barrell chest
- Thin body
- Tachypneic
- Tripod position
- Use accessary muscles to breath
- Diminished lung sounds
- Prolonged expiration

Diagnosis

- Respiratory function test
- Ventilation – perfusion scanning
- Serum α_1 – antitrypin levels
- ABG
- Pulse oximetry
- Exhaled carbon dioxide levels
- FBC
- CXR

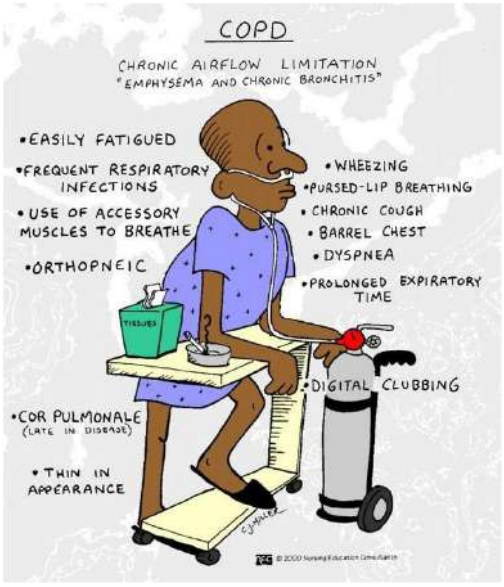


Medications

- Antibiotics
- Bronchodilators
- Corticosteroids
- Oxygen therapy

Nursing care

- Assess respiratory status
  - Rate, pattern, cough etc.
- Monitor ABG
- Daily weight
- Increase fluid intake (2000-2500ml)
- Fowlers and semi-fowlers
- Coughing and deep breathing exercises
- Sputum removal – self removal or suction
- Rest
- Administer expectorant and bronchodilators
- Oxygen therapy
- Diet and nutrition
- Quit smoking



TRACHEOSTOMY CARE

A Tracheostomy is the formation of an opening into the trachea.

- 2nd and 3rd rings of cartilage

Used for

- Providing long term mechanical ventilation on cases of neuro-muscular disease
- Facilitate weaning of mechanical ventilation (COPD)
- Bypass obstruction (larynx cancer)
- Maintain open airway (coma)

Temporary trachy

- Upper and lower airways still connected if removed.

Permanent trachy

- No connection if removed

<u>Potential short-term complications</u>

- Subcutaneous emphysema
- Tube dislodgement

<u>Potential long-term complications</u>

- Thinning of trachea (trachemalacia)
- Development of tissue granulation
- Narrowing of airway
- Once removed, opening might not close on its own
- Dysphagia
- Tracheal ischemia and necrosis

<u>Cuffed tracheostomy tube</u>

Contain 3 parts

1. Outer cannula (inflatable cuff, plot tube)
2. Inner cannula
3. Obturator

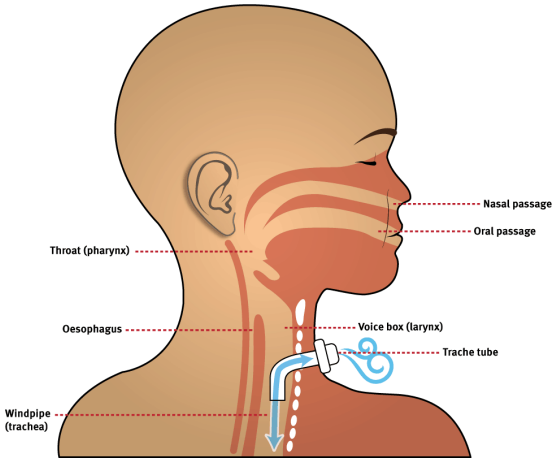
<u>Fenestrated tube</u>
Hole in the outer cannula

- Allow speaking
- Used in weaning process

More suitable for long term ventilation.
Pts should have effective cough and gag reflex to pervert aspiration.

<u>Nursing care</u>

- Find out when and why the trachy was inserted before taking over patient!
- Size and type of tube
- Check for,
  - Hypoxia
  - Infection
  - Pain
- Auscultate breath sounds
- Examine tube and stoma site
  - Redness
  - Bleeding
  - Purulent discharge
- Help thin and mobilize secretions
  - Frequent repositioning
  - Deep breath and cough exercise



- Chest physiotherapy
- Oral and parenteral hydration
- Supplemental humidification

DRUGS ACTING ON THE LOWER RESPIRATORY TRACT

Preventative and treatment measure for COPD

- Reduce environmental exposure to irritants
- Stop smoking
- Filter allergens from the air
- Avoid exposure to known irritants and allergens
- Open the conducting airways through muscular bronchodilation

Drug type	Actions	Indications & Contraindications	Pharmacokinetics	Adverse effects	Drug-drug interactions
Drugs that affect the Lower respiratory tract					
Xanthines (Aminophylline)	Direct effect on the smooth muscles of the respiratory system, both in the bronchi and blood vessels.	**Indications** Symptomatic relief or prevention of bronchial asthma and for reversal of bronchospasm associated with COPD **Contraindications** GI problems Coronary disease Respiratory dysfunction Renal and hepatic disease Alcoholism Hyperthyroidism	Narrow therapeutic margin. Quickly absorbed by the GI tract. Metabolized in the liver. Excreted by urine.	Related to theophylline levels in the blood. GI upsets Nausea Irritability Tachycardia Seizures Brain damage Even death	Many drugs interact xanthines. Nicotine increase metabolism.
Sympathomimetics (Adrenaline)	Beta2 selective adrenergic agonist	**Indications** Acute asthma attacks. Bronchospasm in acute or chronic asthma. Prevention of exercise induced asthma. **Contraindications** Depends of the severity of underlying condition	Rapidly distributed after injection. Transformed in the liver to metabolites that are excreted in urine.	Sympathomimetic stimulation. CNS stimulation GI upsets Arrhythmias Hypertension Bronchospasm Sweating Pallor Flushing	General anaesthetics

Anticholinergic bronchodilators (Ipratropium)	Blocks vagally medicated reflexes by antagonising the action of acetylcholine	**Indications** Maintenance of bronchospasm associated with COPD **Contraindications** Any condition that would be aggravated by cholinergic drugs.	Onset of action is 15min when inhaled. Peaks in 1-2 hours. Duration of action is 3-4 hours.	Related to anticholinergic effect of the drug. Dizziness Headache Fatigue Nervousness Dry mouth Sore throat Palpitations Urinary retention	-
Inhaled steroids (Budesonide)	Decrease the inflammatory response of the airway.	**Indications** Prevention and treatment of asthma. Treating chronic steroid dependent bronchial asthma. **Contraindications** Not used for emergency during an acute attack or status asthmatics. Pregnancy or breastfeeding.	Well absorbed from respiratory tract. Metabolised in natural systems, mostly within the liver and excreted in urine.	Sore throat Hoarseness Coughing Dry mouth Pharyngeal or laryngeal fungal infections.	-
Leukotriene receptor agonists (Zafirlukast)	Selectively and competitively block or antagonise receptors for the production of leukotriene.	**Indications** Prophylaxis and chronic treatment of bronchial asthma in adults and in individuals younger than 12 years of age. **Contraindications** Hepatic and renal impairment. Pregnancy or breastfeeding.	Rapidly absorbed from the GI tract, extensively metabolised in the live and primarily excreted in faeces.	Headache Dizziness Myalgia Nausea Diarrhoea Abdominal pain Vomiting Elevated liver enzyme concentration Generalized pain	Propranolol Theophylline Warfarin Calcium channel blockers Cyclosporine Aspirin
Mast cell stabilisers (Sodium cromoglicate)	Works at the cellular level to inhibit the release of histamines and inhibits the release of SRSA.	**Indications** Treatment of chronic bronchial asthma. Exercise induced asthma. Allergic rhinitis.	Absorption is largely from the respiratory tract. Normally inhaled – more puffs more absorption.	Cough Runny nose Throat irritation Unpleasant taste Headache	isoprenaline
Drugs that affect the upper respiratory tract					
Antitussives (Dextromethorphan)	Block the cough reflex by acting on the medullary cough centre	**Indications** Control non-productive cough **Contraindications**	Rapidly absorbed Metabolised in the liver Excreted in urine.	Drying effect in the mucus membrane. CNS adverse effects. GI upset	-

		People who need to cough to maintain airway. Head injury and impaired CNS. Hypersensitivity or history of narcotic addiction.			
Topical nasal decongestants (Ephedrine)	Sympathomimetic Affects sympathetic NS to cause vasodilation. Causing less inflammation of the nasal membrane.	**Indications** Relieve the discomfort of nasal congestion that accompanies the common cold, sinusitis and allergic rhinitis. **Contraindications** Lesions and erosions in the mucus membrane. Any condition that can be exacerbated by sympathetic activity.	Generally, not absorbed systemically. Any portion of these medication that is absorbed in metabolised in the liver and excreted in urine.	Local stinging and burning. Rebound congestion. Sympathomimetic Effect.	Cyclopropane halothane
Oral decongestants	Shrink the nasal mucus membrane by stimulating the alpha-adrenergic receptors in the nasal mucus membrane	**Indications** Promotion of drainage of the sinuses and improving air flow. **Contraindications** Any condition that might be exacerbated by sympathetic activity.	Well absorbed and widely distributed in the body. Metabolised in the liver and excreted in urine.	Rebound congestion Sympathetic effect	OTC products that contain Pseudo-Ephedrine. Taking together can cause serious side effects.
Topical nasal steroid decongestant	Exact mechanism is not known.	**Indications** Seasonal allergic rhinitis. Inflammation after the removal of nasal polyps. **Contraindications** Acute infection Active infection Avoid exposure to airborne infections.	Generally, not absorbed systemically.	Local burning Irritation Stinging Dry mucosa Headache Suppression of healing can occur in a person who has had nasal surgery or trauma	-
Antihistamines (Diphenhydramine)	Selectively block the effect of histamine at the receptor sites,	**Indications** Seasonal and perennial allergic rhinitis.	Well absorbed Metabolised in the liver	Drowsiness Sedation	Vary based on drug.

	decreasing the allergic reaction.	Allergic congestivitis. Uncomplicated urticaria Angio-oedema **Contraindications** Pregnancy or breastfeeding. Renal and hepatic impairment. History of arrhythmias.	Excreted in urine and faeces.		
Expectorants (Guaifenesin)	Enhances the output of respiratory tract fluids by reducing the adhesiveness and surface tension of these fluids, allowing easier movement of the less viscous secretions.	**Indications** Symptomatic relief from respiratory conditions characterised by dry, non-productive cough.	Rapidly absorbed. Metabolism and excretion have not been reported.	GI symptoms Headache Dizziness Mild rash Prolonged use may be masking a serious underlying condition.	-
Mucolytics (Acetylcysteine)	Work to break down mucus in order to aid the high-risk respiratory patient in coughing up thick tenacious mucus.	**Indications** People who have difficulty coughing out secretions. People who develop atelectasis People undergoing diagnostic bronchoscopy. Post-op patients. People in tracheostomies. **Caution** Acute bronchospasm Peptic ulcer Oesophageal varices	Nebulisation or direct inhalation into the trachea	GI upset Stomatitis Rhinorrhoea Bronchospasm Rash	-