NUR 201

I believe…

- **we are responsible for preparing and learning.**
- **we learn best by interacting & discussing collegially.**
- **we must respect everyone.**
- **we are continually learning – building on previously learned concepts.**
- **in an open environment in which questions & observations are welcome.**
- **I do not have all of the answers**
- **I will always find the answer, rationale, reason**
- **everyone has potential to become more than they are today**

Interferences with Ventilation Objectives

- Discuss assessment—breath sounds
- Describe diagnostic tests for pulmonary function
- Discuss acid-base balance
- Examine signs, symptoms, pathophysiology, treatments, and nursing care of respiratory distress syndromes
- Discuss nursing interventions – mechanical ventilation, tracheostomy, postural drainage
- Discuss pulmonary accidents—chest trauma, aspiration

Content Approach

- Anatomy & Physiology Review
- Demographics/occurrence
- Pathophysiology
- Clinical Picture
- Medical Management
- Nursing Process (APIE)

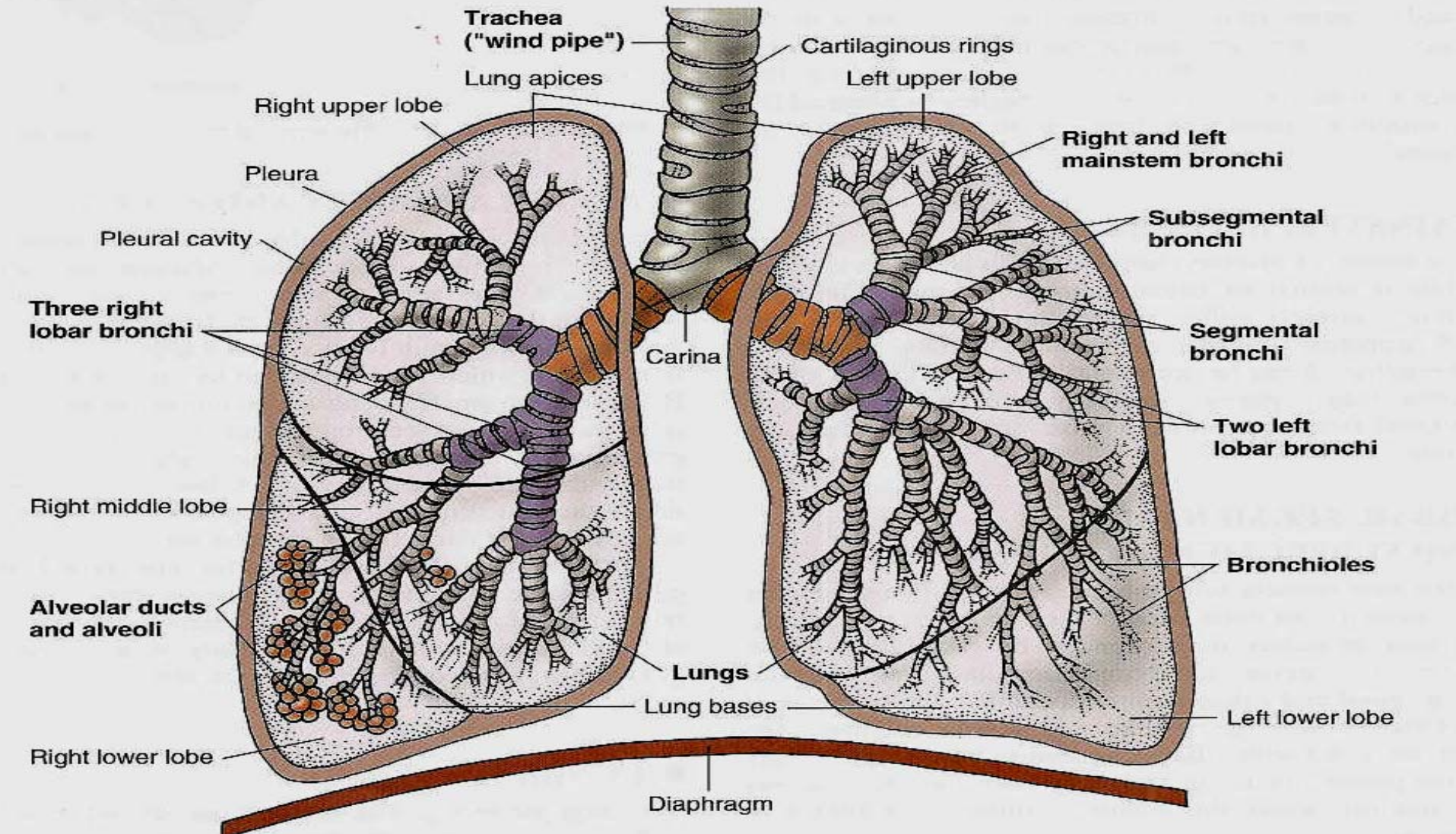
  Assessment - Nursing Actions - Education

Interferences with Ventilation
Respiratory Anatomy & Physiology

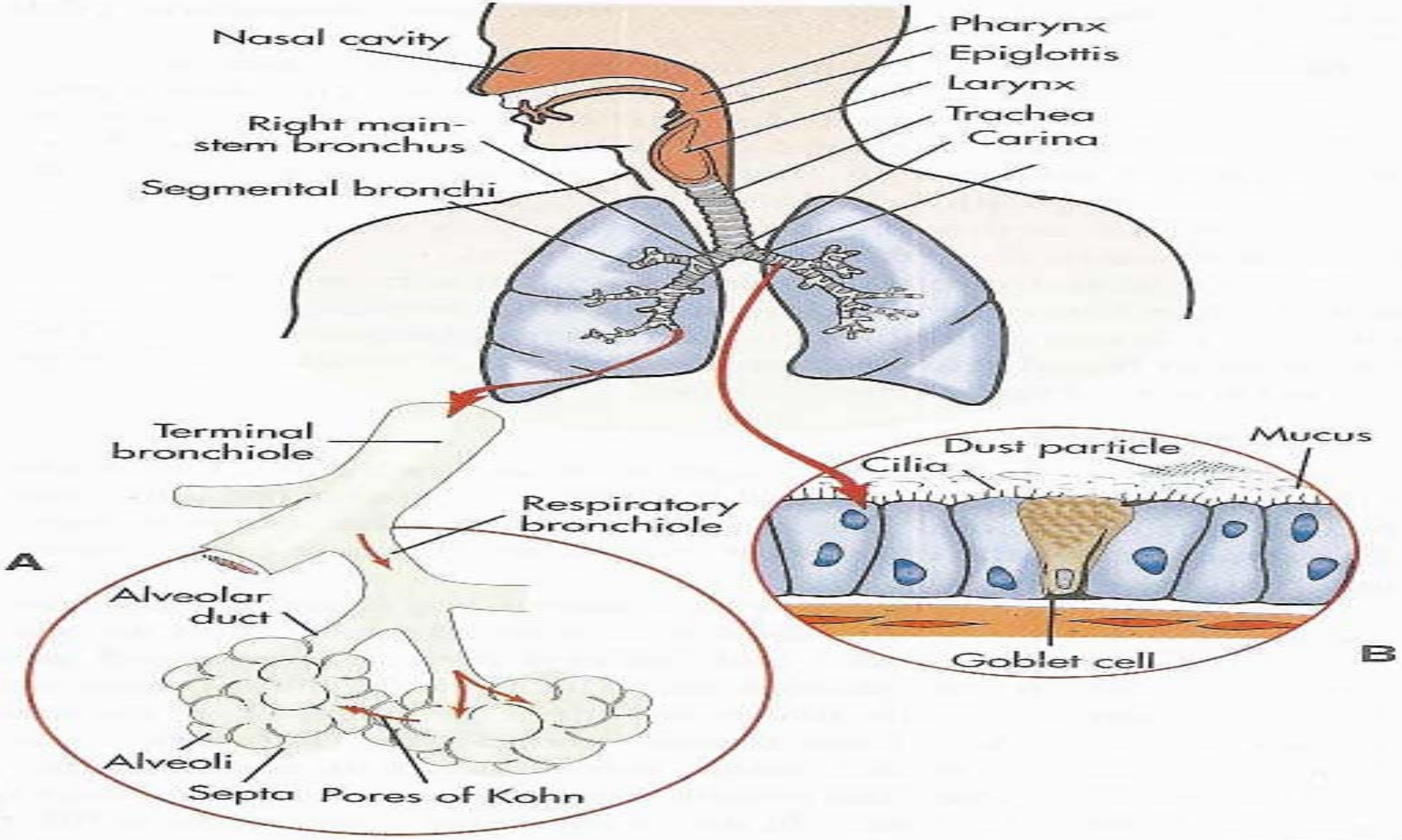
- **Anatomy**
  - **Structure of the Chest Wall**: Ribs, pleura, muscles of respiration
  - **Upper Respiratory**: nose, pharynx, adenoids, tonsils, epiglottis, larynx, and trachea
  - **Lower Respiratory**: bronchi, bronchioles, alveolar ducts, and alveoli

- **Physiology**
  - **Ventilation**: inspiration and expiration
  - **Elastic Recoil**: elastin fibers that recoil after expansion
  - **Diffusion**: Exchange of oxygen and carbon dioxide
  - Arterial Blood Gases / Oximetry

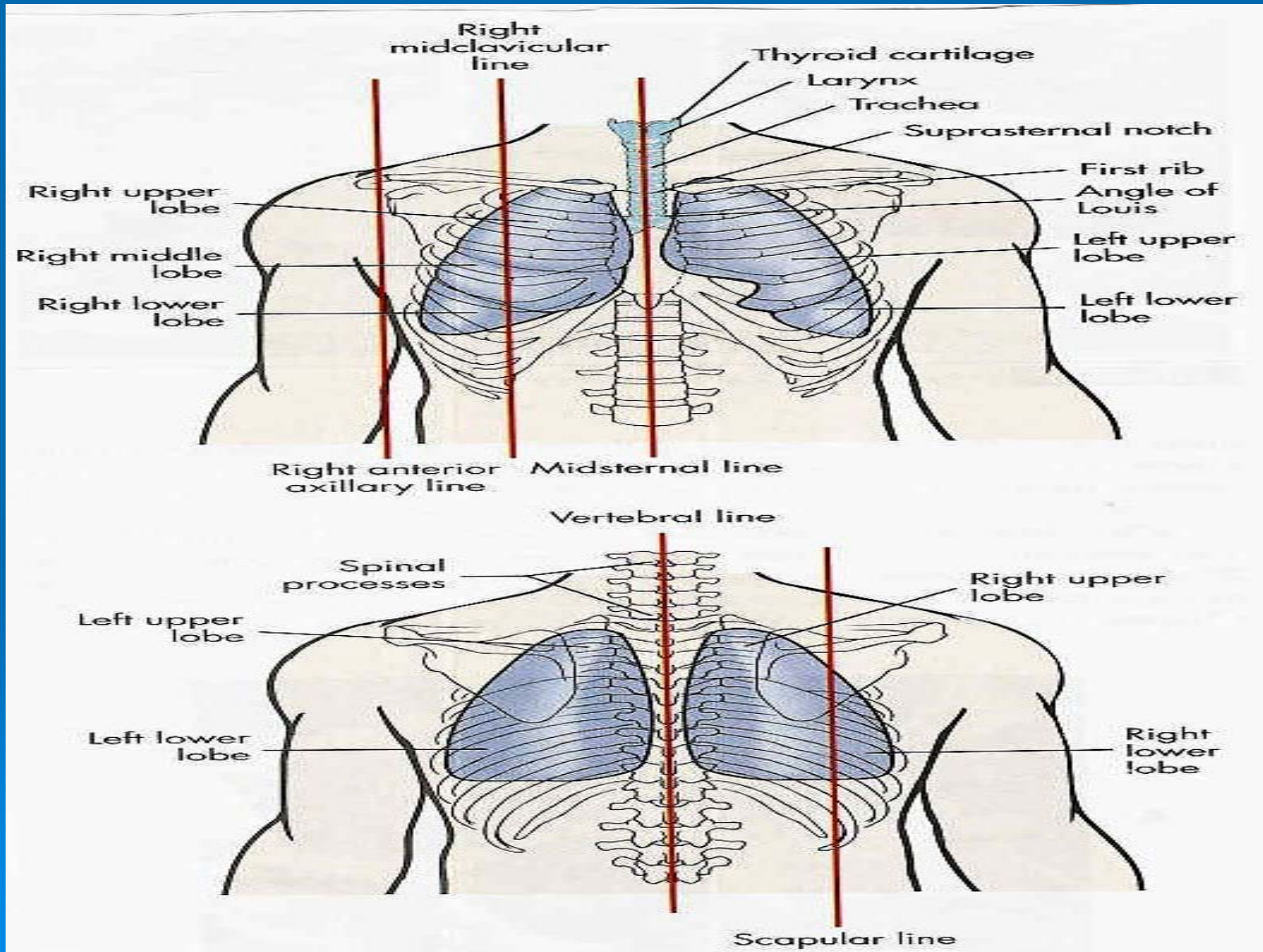
Lungs
A & P Review



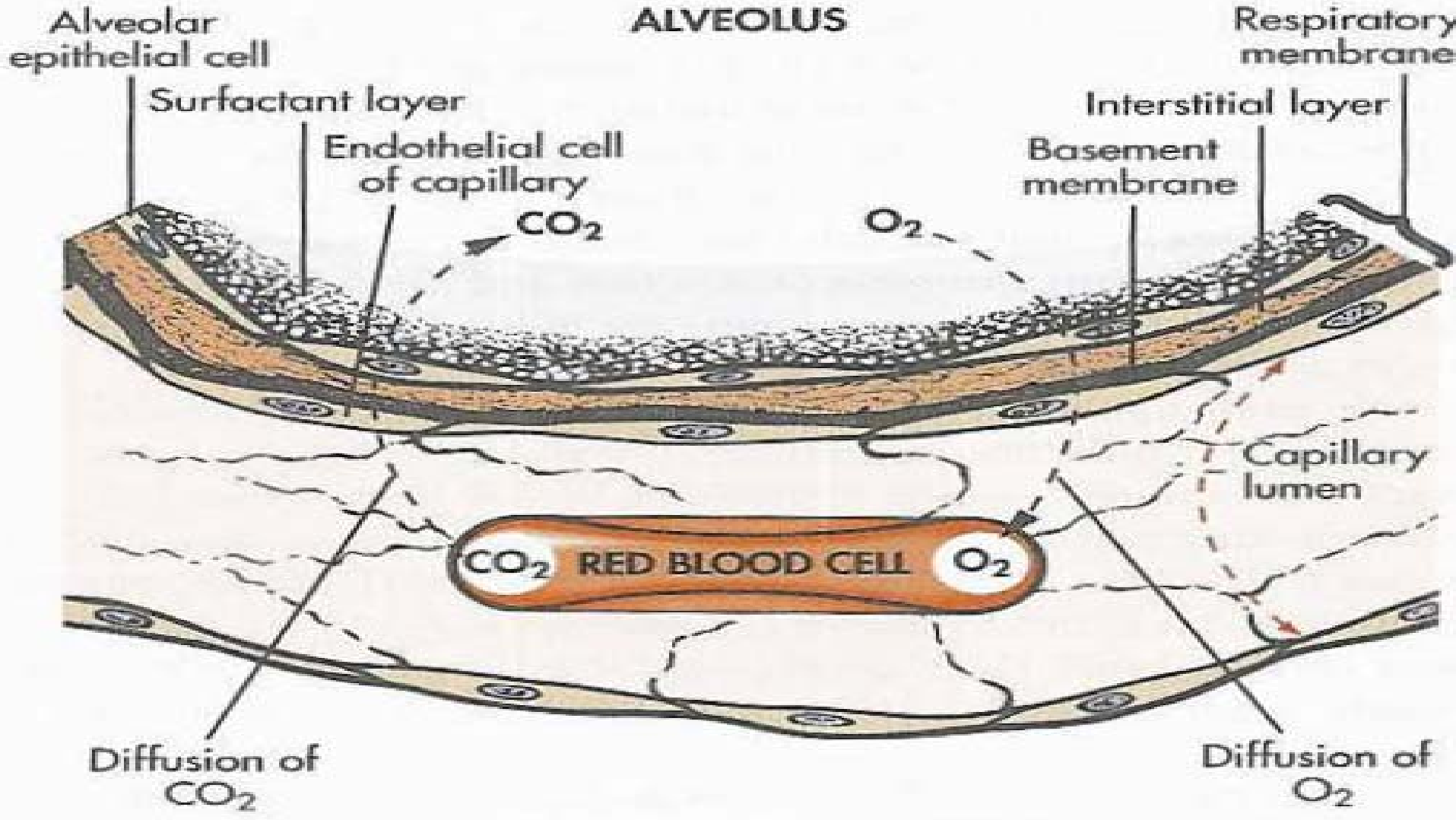
Respiratory Assessment
A&P Review



Thorax
Anatomical Landmarks



Interferences with Ventilation
Alveolar Gas Exchange



Interferences with Ventilation Assessment

- History
- Cues to Respiratory Problems:
  - Shortness of breath – dyspnea
    - Orthopnea / Nocturnal dyspnea
  - Wheezing
  - Cough / sputum production
  - Hemoptysis
  - Voice change
  - Fatigue

Interferences with Ventilation Assessment

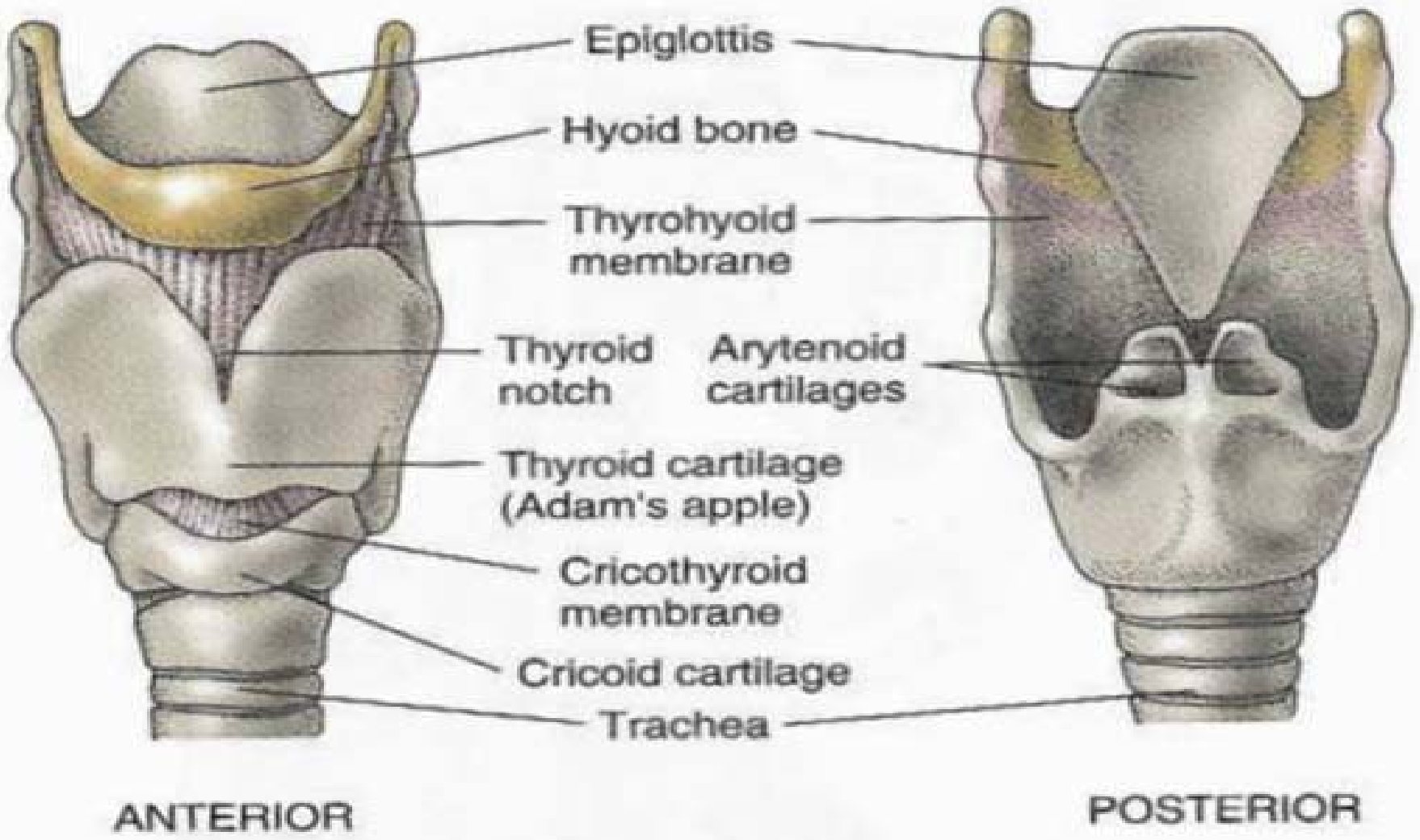
Thorax & Lungs

- **Inspection:**
  - Posture, chest movement, abnormalities of sternum
  - Respiratory rate, depth, rhythm
- **Palpation:**
  - Equality of chest expansion
  - Tactile Fremitus
- **Percussion:**
  - Hyperresonance
  - Dullness
- **Auscultation:**
  - Discontinuous: fine crackles/rales / coarse crackles / rales
  - Continuous: Wheeze, Rhonchi
  - Pleural friction rub

Respiratory Assessment
Percussion

Resonance	Low-pitched sound heard over normal lungs
Hyperresonance	Loud, lower-pitched sound than normal resonance heard over hyperinflated lungs, such as in chronic obstructive lung disease and acute asthma
Tympany	Drumlike, loud, empty quality heard over gas-filled stomach or intestine, or pneumothorax
Dull	Medium-intensity pitch and duration heard over areas of "mixed" solid and lung tissue, such as over the top area of the liver, partially consolidated lung tissue (pneumonia), or fluid-filled pleural space
Flat	Soft, high-pitched sound of short duration heard over very dense tissue where air is not present

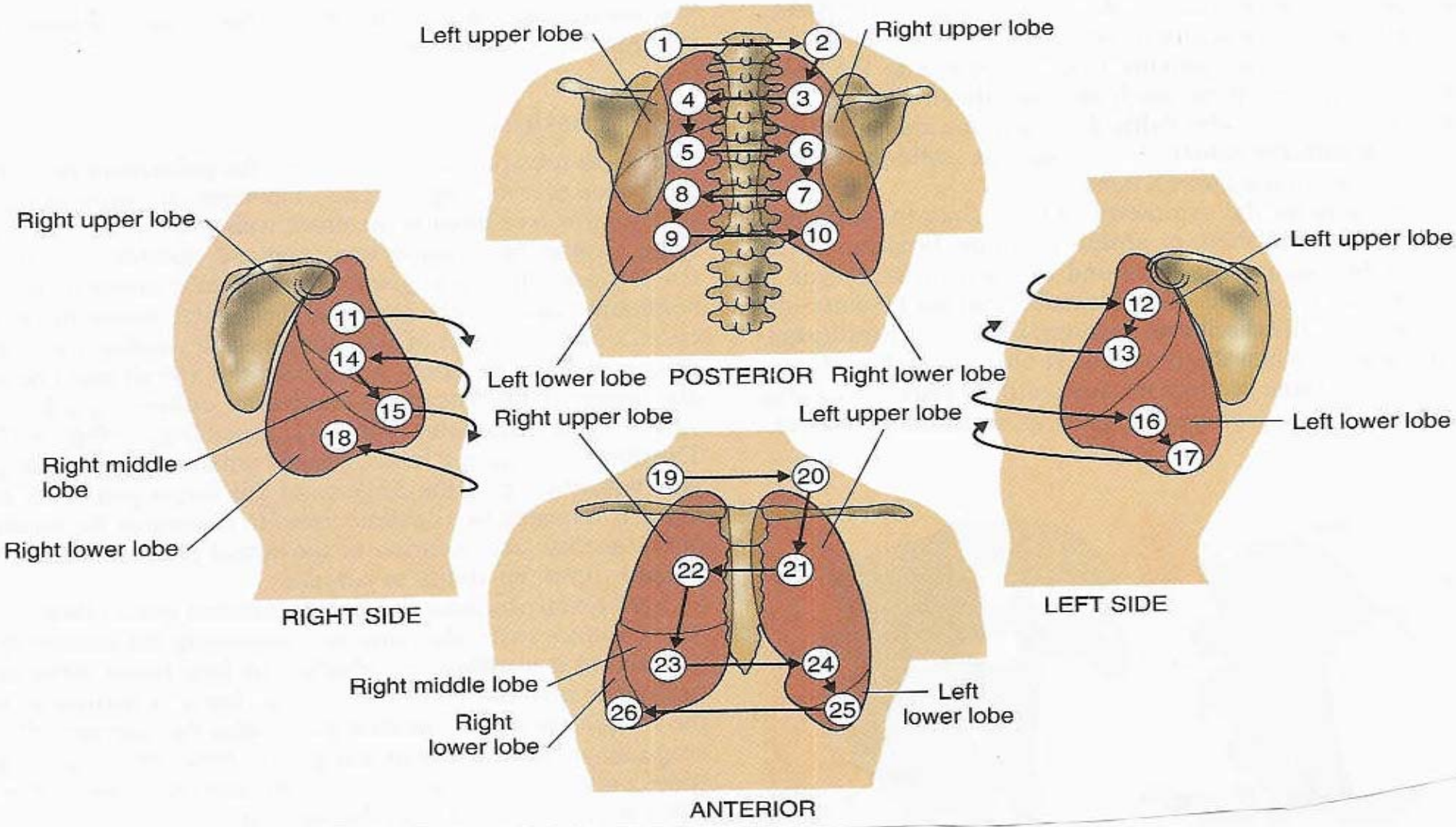
Larynx
Anatomical Landmarks



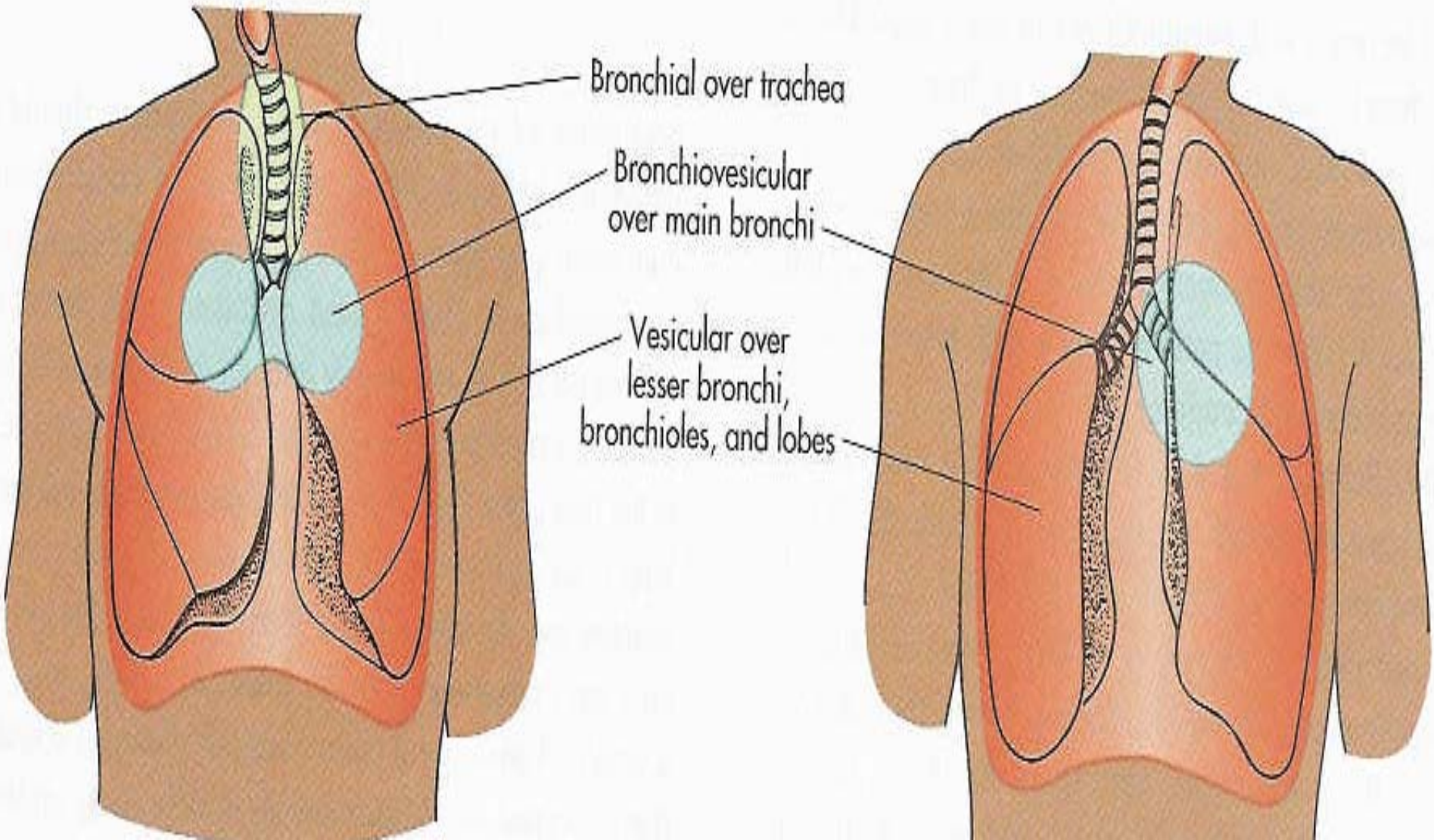
Respiratory Assessment

PROBLEM	INSPECTION	PALPATION	PERCUSSION	AUSCULTATION
Chronic bronchitis	Barrel chest; cyanosis	↓ Movement ↑ Fremitus	Hyperresonant or dull if consolidation	Crackles; rhonchi; wheezes
Emphysema	Barrel chest; tripod position; use of accessory muscles	↓ Movement	Hyperresonant or dull if consolidation	Crackles; rhonchi; diminished if no exacerbation
Asthma In exacerbation	Prolonged expiration; tripod position; pursed lips	↓ Movement ↓ Fremitus if hyperinflation	Hyperresonance	Wheezes; ↓ breath sounds ominous sign if no improvement (severely diminished air movement)
Not in exacerbation	Normal	Normal	Normal	Normal
Pneumonia	Tachypnea; use of accessory muscles; duskiness or cyanosis	Unequal movement if lobar involvement; ↑ fremitus over affected area	Dull over affected areas	Early: Bronchial sounds Later: Crackles; rhonchi
Atelectasis	No change unless involves entire segment, lobe	If small, no change If large, ↓ movement; ↑ fremitus	Dull over affected areas	Crackles (may disappear with deep breaths); absent sounds if large
Pulmonary edema	Tachypnea; labored respirations; cyanosis	↓ Movement or normal movement	Dull or normal depending on amount of fluid	Fine or coarse crackles
Pleural effusion	Tachypnea; use of accessory muscles	↓ Movement ↑ Fremitus above effusion; absent fremitus over effusion	Dull	Diminished or absent over effusion; egophony over effusion

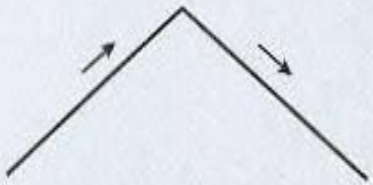
Respiratory Assessment
Ascultation Landmarks



Respiratory Assessment
Breath Sounds



Respiratory Assessment
Normal Breath Sounds

	Pitch	Amplitude	Duration	Quality	Normal Location
Bronchial (tubular, tracheal) 	High	Loud	Inspiration < Expiration	Harsh, hollow, tubular, blowing	Trachea and larynx
Bronchovesicular 	Moderate	Moderate	Inspiration = Expiration	Mixed	Over major bronchi where fewer alveoli are located: posterior, between scapulae (especially on right); anterior, around upper sternum in first and second intercostal spaces
Vesicular 	Low	Soft	Inspiration > Expiration	Rustling, like the sound of the wind in the trees	Over peripheral lung fields where air flows through smaller bronchioles and alveoli

Respiratory Assessment
Adventitious Breath Sounds

Adventitious Sound	Occurrence in the Respiratory Cycle	Character	Association
DISCONTINUOUS			
Fine crackles Fine rales High-pitched rales	Either early or late inspiration	Popping, discontinuous sounds caused by air moving into previously deflated airways; sounds like hair being rolled between fingers near the ear "Velcro" sounds late in inspiration usually associated with restrictive disorders	Asbestosis Atelectasis Interstitial fibrosis Bronchitis Pneumonia Chronic pulmonary diseases
Coarse crackles Low-pitched crackles	More common on expiration but may be present early in inspiration	Lower pitched, coarse, discontinuous rattling sounds caused by fluid or secretions in large airways; likely to change with coughing or suctioning	Bronchitis Pneumonia Tumors Pulmonary edema
CONTINUOUS			
Wheeze	Audible during either inspiration, expiration, or both	Squeaky, musical, continuous sounds associated with air rushing through narrowed airways; may be heard without a stethoscope Arise from the small airways Usually do not clear with coughing	Inflammation Bronchospasm Edema Secretions Pulmonary vessel engorgement (as in cardiac "asthma")
Rhonchus (rhonchi)	Audible during both inspiration and expiration, but commonly more prominent on expiration	Lower-pitched, coarse, continuous snoring sounds Arise from the large airways	Thick, tenacious secretions Sputum production Obstruction by foreign body Tumors
PLEURAL FRICTION RUB	Heard during both inspiration and expiration, generally at the end of inspiration and the beginning of	Loud, rough, grating, scratching sounds caused by the inflamed surfaces of the pleura rubbing together; often associated with pain on deep inspirations	Pleurisy Tuberculosis Pulmonary infarction Pneumonia

Respiratory Assessment

Assessment	Definition	Clinical Picture
Inspection		
• Pursed-lip breathing	Exhalation through mouth with lips pursed together to slow exhalation.	COPD, asthma. Suggests ↑ breathlessness. Strategy taught to slow expiration, ↓ dyspnea.
• Tripod position; inability to lie flat	Learning forward with arms and elbows supported on overbed table.	COPD, asthma in exacerbation, pulmonary edema. Indicates moderate to severe respiratory distress.
• Accessory muscle use; intercostal retractions	Neck and shoulder muscles used to assist breathing. Muscles between ribs pull in during inspiration.	COPD, asthma in exacerbation, secretion retention. Indicates severe respiratory distress, hypoxemia.
• Splinting	Voluntary ↓ in tidal volume to ↓ pain on chest expansion.	Thoracic or abdominal incision. Chest trauma, pleurisy.
• ↑ AP diameter	AP chest diameter equal to lateral. Slope of ribs more horizontal (90 degrees) to spine.	COPD, asthma, cystic fibrosis. Lung hyperinflation. Advanced age.
• Tachypnea	Rate >20 breaths/min; >25 breaths/min in elderly.	Fever, anxiety, hypoxemia, restrictive lung disease. Magnitude of ↑ above normal rate reflects increased work of breathing.
• Kussmaul's respirations	Regular, rapid, and deep respirations.	Metabolic acidosis; ↑ in rate aids body in ↑ CO_2 excretion.
• Cyanosis	Bluish color of skin best seen in earlobes, under the eyelids, or nail beds.	↓ Oxygen transfer in lungs, ↓ cardiac output. Nonspecific, unreliable indicator.
• Clubbing of fingers	↑ Depth, bulk, sponginess of distal digit of finger.	Chronic hypoxemia. Cystic fibrosis, lung cancer, bronchiectasis.
• Abdominal paradox	Inward (rather than normal outward) movement of abdomen during inspiration.	Inefficient and ineffective breathing pattern. Nonspecific indicator of severe respiratory distress.
Palpation		
• Tracheal deviation	Leftward or rightward movement of trachea from normal midline position.	Nonspecific indicator of change in position of mediastinal structures. Medical emergency if

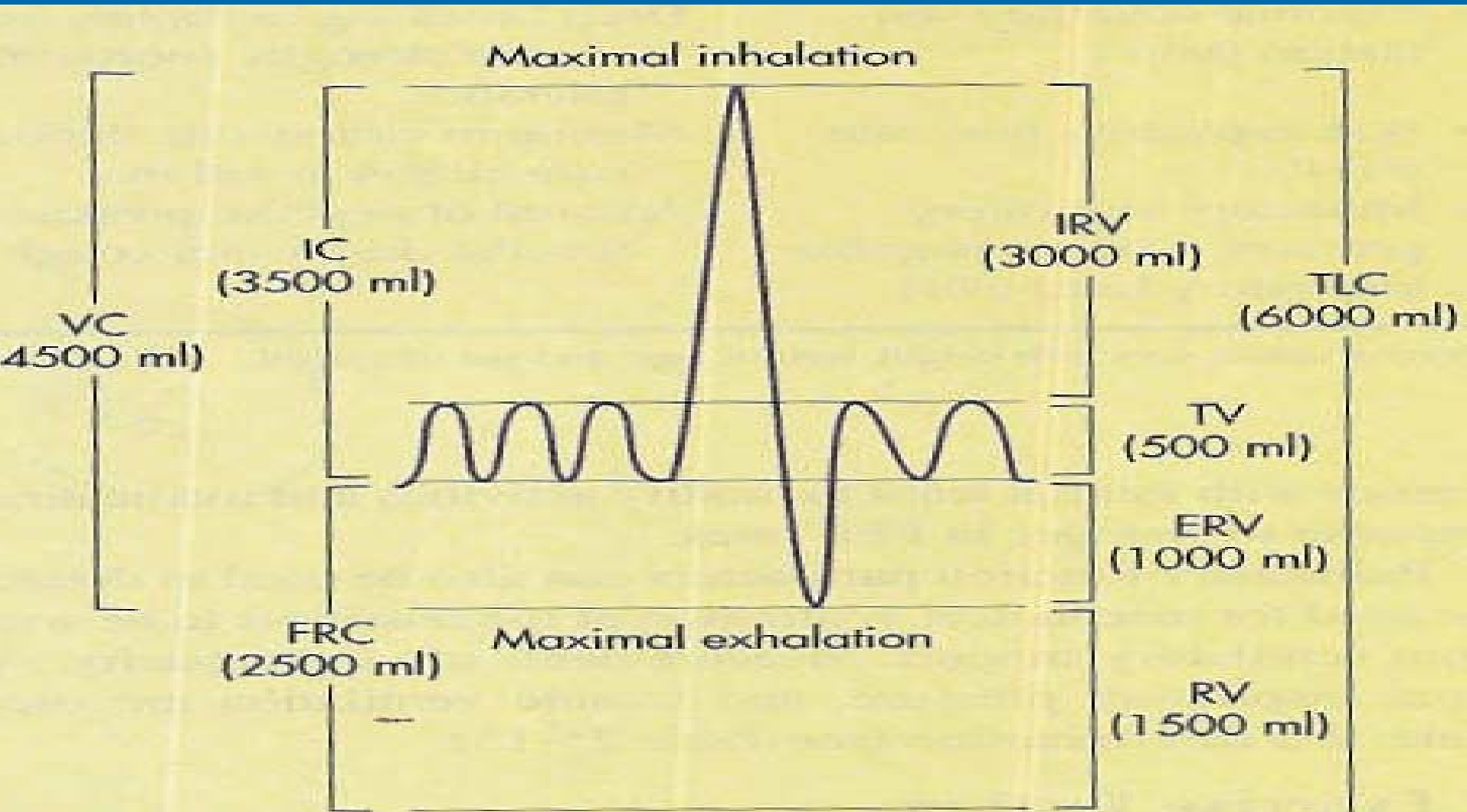
Interferences with Ventilation
Diagnostic Studies

- **Blood Studies**: Hgb, Hct, ABGs
- **Sputum Studies**: C&S, Gram Stain, Acid-fast smear; Cytology
- **Radiology**:
  - Chest x-ray-- posterior-anterior / lateral
  - Computed tomography (CT) – cross sections of the lung with and without contrast – used often
  - Magnetic resonance imaging (MRI) – images of pulmonary structures – limited use
  - Pulmonary angiogram – x-rays after injection of radiopaque dye– used to dx pulmonary embolism
  - Positron emission tomography (PET) – IV glucose administration – malignant tumors show increased uptake of glucose
  - Ventilation-Perfusion Scan – Perfusion: isotope administration which outlines pulmonary vasculature; Vent: inhalation of radioactive gas which outlines the alveoli – dx pulmonary emboli

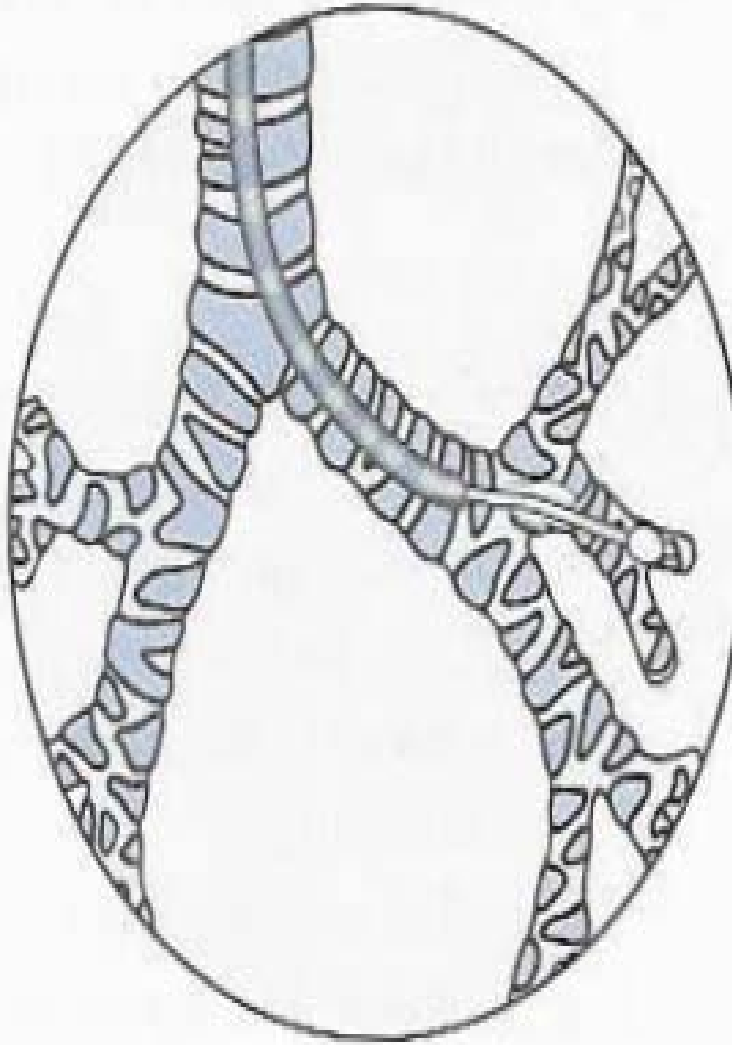
Interferences with Ventilation
Diagnostic Studies

- **Endoscopic Exams (done in x-ray or OR):**
  - Bronchoscopy – fiberoptic visualization of bronchi – biopsy; also used to remove mucous plugs, foreign bodies, obstructions
  - Mediastinoscopy – scope through a small incision n the suprasternal notch – visualize mediastinum for tumors, lymph nodes, infections, sarcoidosis
- **Biopsy**: Transbronchial or open lung biopsy – done in x-ray or OR
- **Thoracentesis** – insertion of a needle into the pleural space – pleural fluid, install medication - done at bedside
- **Pulmonary Function Testing** – tests to measure lung volumes and used to dx pulmonary disease, monitor progress, evaluate disability, evaluate response to bronchodilators – done in pulmonary lab
- **Skin Testing** – intradermal planning of test dose to assess skin reaction by measuring mm induration – TB, various lung diseases

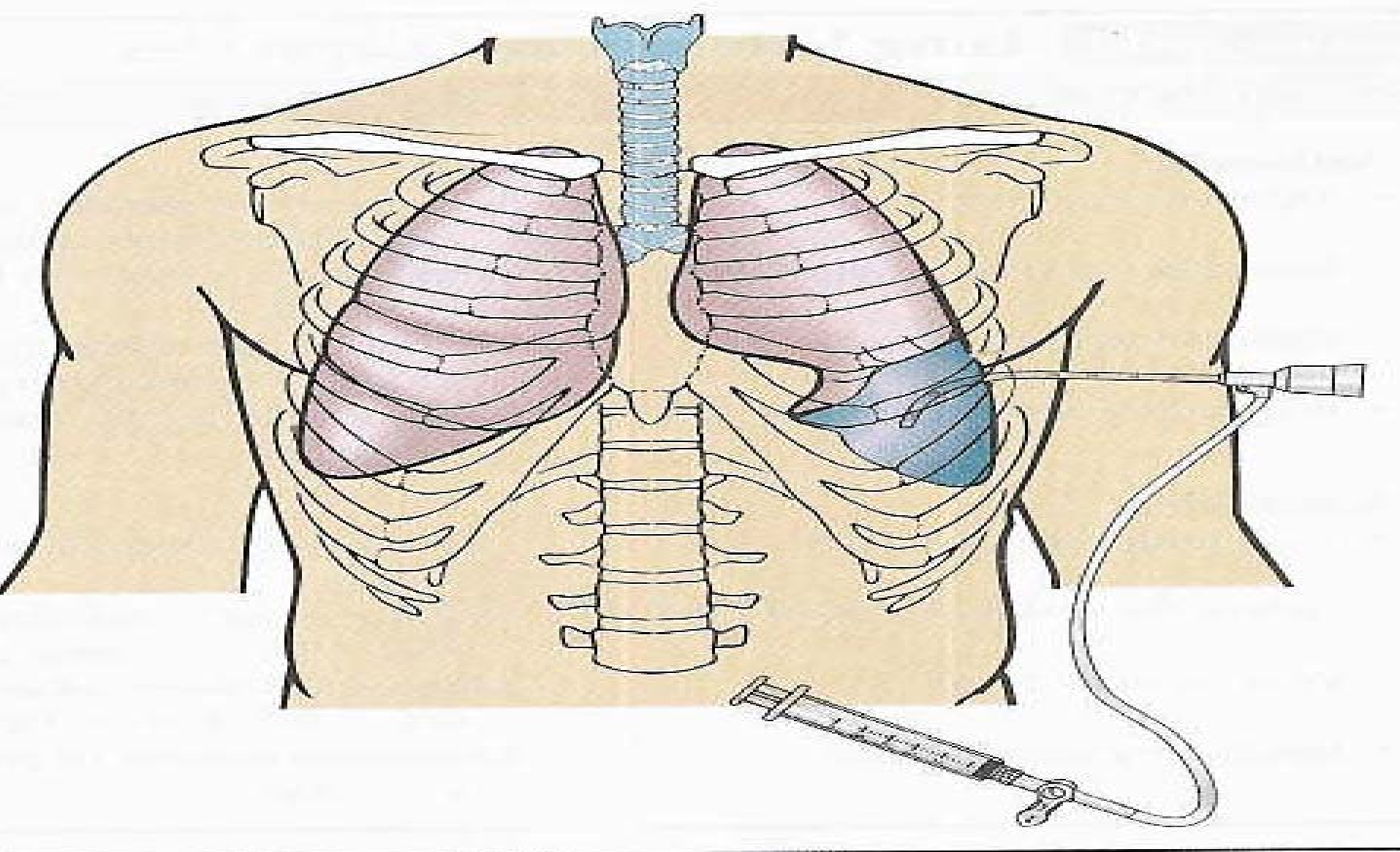
Pulmonary Function Test
Relationship of Lung Volumes & Capacities



Respiratory Diagnostic Testing
Fiberoptic Bronchoscopy



Diagnostic Lung Tests
Thoracentesis



Pair Share – Critical Thinking

- Upon performing a lung sound assessment of the anterior chest, the nurse hears moderately loud sounds on inspiration that are equal in length with expiration. Where in the airway would this lung sound be considered normal?

a. Trachea
b. Primary bronchi
c. Lung fields
d. Larynx

Pair Share – Critical Thinking

- **The name that describes the particular lung sound in the previous questions is which of the following?**

- a. Bronchial
- b. Bronchovesicular
- c. Vesicular
- d. Basilar

Interferences with Ventilation Regulation of Acid-Base Balance Review

- **Acid – contributes hydrogen ion**
  - Two types:
    - Volatile respiratory acid
      - Dehydrates and excreted in the form of a gas
    - Nonvolatile metabolic acid
      - Metabolized and excreted in the form of body fluids

Interferences with Ventilation Regulation of Acid-Base Balance Review

- **Base** – accepts or removes hydrogen ion
  - **Buffer**- controls the hydrogen ion concentration:
    - Absorbing hydrogen ions when an acid is added OR
    - Releasing hydrogen ions when base is added.

- **Three Buffer Systems:**
  - Bicarbonate – operates in lungs & kidneys
  - Phosphate – renal tubules
  - Protein – Hgb, plasma proteins, & intracellular protein

Interferences with Ventilation
Regulation of Acid-Base Balance

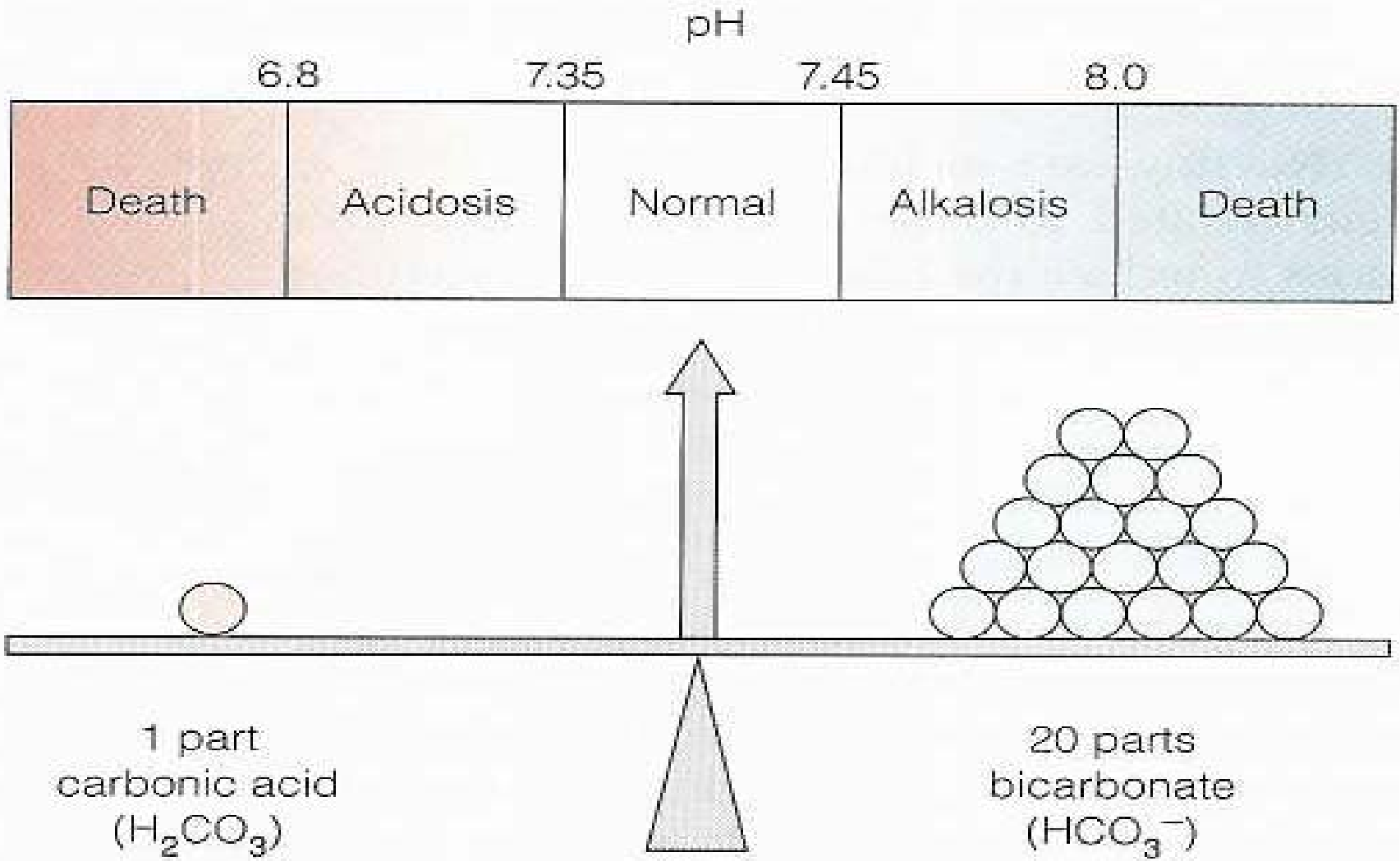
- **Factors to remember:**
  - Lungs – Eliminate or retain carbon dioxide **C02**
  - Kidneys – excrete or form bicarbonate **HC03**

Food – converted by the body – H20 + CO2 + energy

Lung Kidney

C02 + H20 = H2CO3 = HCO3- + H+

Interferences with Ventilation
Normal Acid-Base Balance



Interferences with Ventilation Regulation of Acid-Base Balance

- **Lungs/Respiratory System**
  - Increase or decrease hydrogen ion concentration
    - Through respiratory rate and depth
    - Result: C02 is either retained or eliminated
  - Changes can occur within minutes
  - Controlled in the medulla oblongata—respiratory center

> = increased; < = decreased

- <pH causes > respirations = <C02 + correcting pH
- >pH causes < respirations = >C02 + correcting pH

Interferences with Ventilation Regulation of Acid-Base Balance

- **Renal System**
  - Reabsorb and conserve bicarbonate
  - Can generate additional bicarbonate and eliminate excess hydrogen ions as compensation for acidosis
  - Three mechanisms:
    - Secretion of small amounts of free hydrogen into the renal tubule
    - Combination of hydrogen ions with ammonium to form ammonium
    - Excretion of weak acids
    - Urine pH 4 – 8

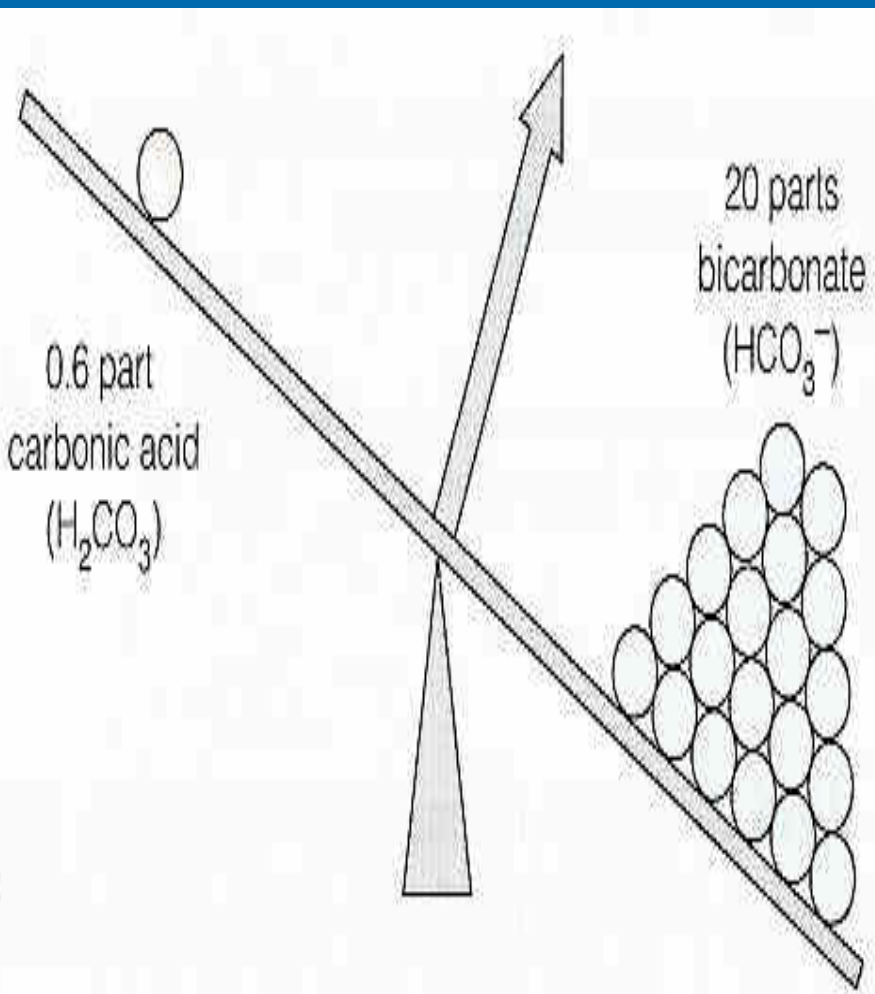
Interferences with Ventilation Regulation of Acid-Base Balance

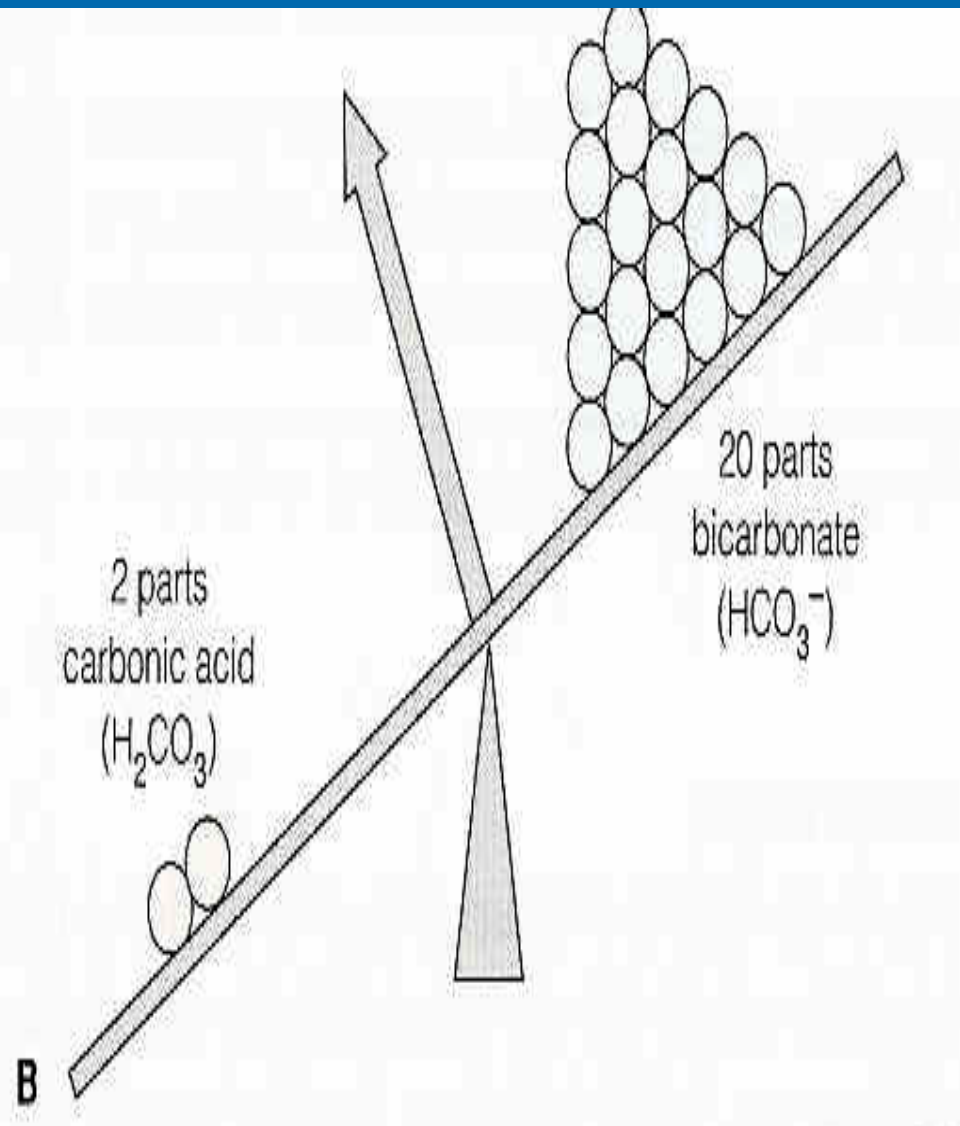
> = increased; < = decreased

ABG	Condition	Respiratory process
>PCO2	Respiratory acidosis	< PC02 elimination by the lungs -- hypoventilation
<PC02	Respiratory Alkalosis	>PC02 elimination by the lungs - hyperventilation

Respiratory Alkalosis

Respiratory Acidosis





Acid-Base Imbalance
Respiratory Acidosis

- **Hypoventilation from primary lung problem**
  - Atelectasis
  - Pneumonia
  - Respiratory failure
  - Airway obstruction
  - Chest wall injury
  - Cystic fibrosis

- **Hypoventilation from other factors**
  - Drug overdose
  - Head injury
  - Paralysis of respiratory muscles
  - Obesity

Acid-Base Imbalance
Respiratory Alkalosis

- **Hyperventilation from primary lung problem**
  - Asthma
  - Pneumonia
  - Inappropriate ventilator settings
- **Hyperventilation from other factors**
  - Anxiety
  - Disorders of the central nervous system
  - Salicylate overdose

Interferences with Ventilation Regulation of Acid-Base Balance Respiratory Function

pH	PC02		Condition
Decreased	Increased		Respiratory acidosis
Increased	Decreased		Respiratory alkalosis

Pair Share – Critical Thinking

- What acid-base imbalance would you suspect for the patient having respiratory problems with respiratory rate: 28/min and expiratory wheezing?

Pair Share – Critical Thinking

- What acid-base imbalance would you suspect for the post-operative patient with respiratory rate 10/min, difficulty to arouse, but arouses with verbal stimuli

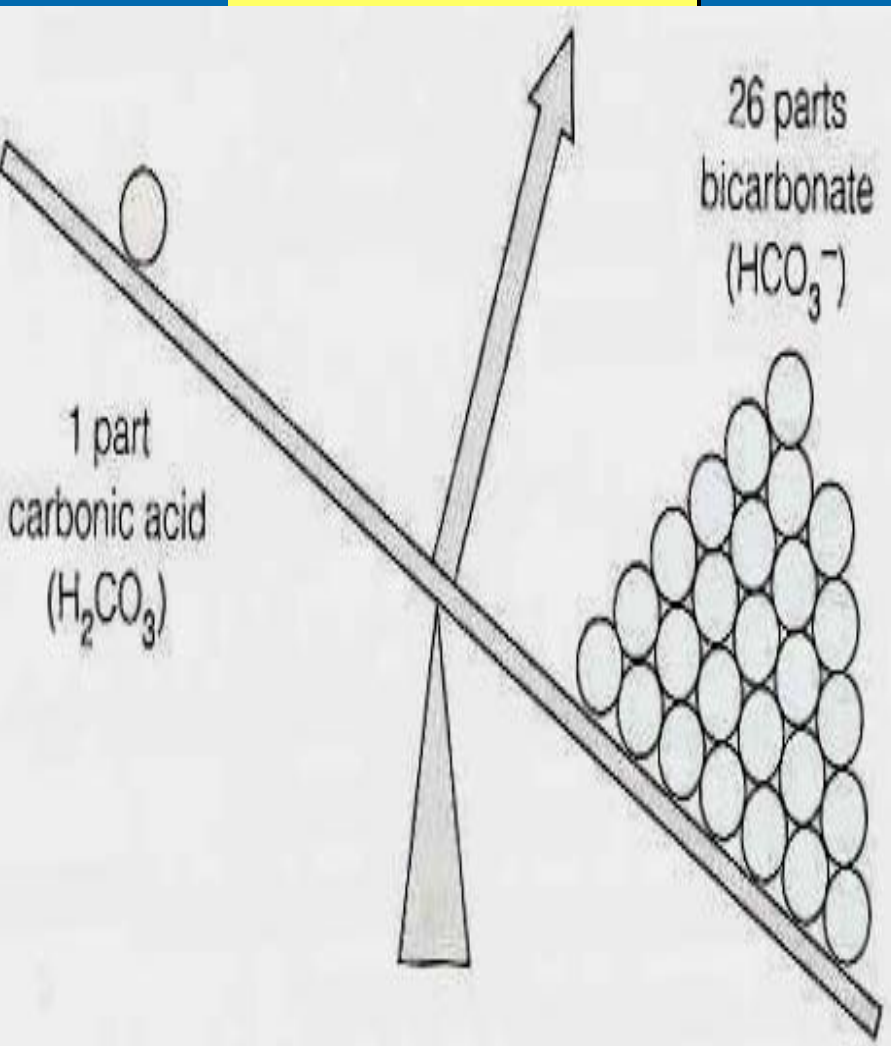
Interferences with Ventilation Regulation of Acid-Base Balance

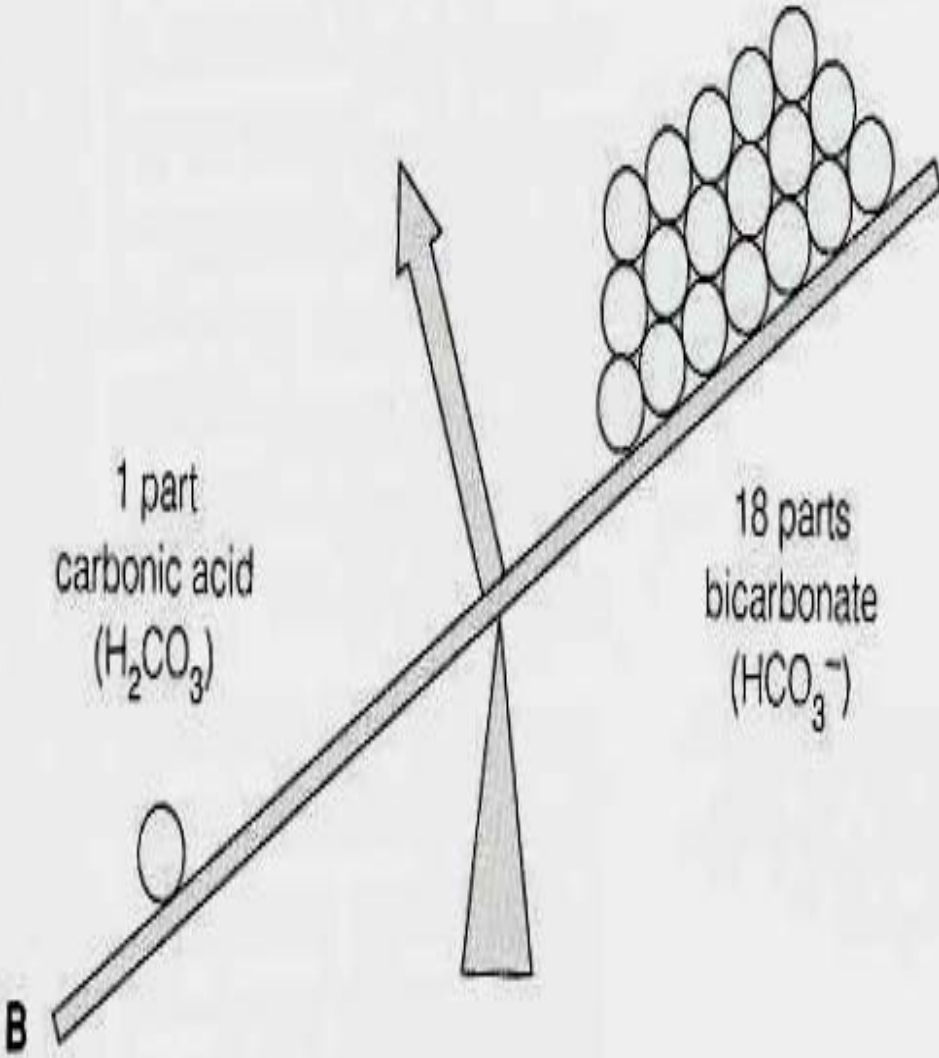
> = increased; < = decreased

ABG	Condition	Metabolic process
>PCO2	Metabolic acidosis	< HCO3- elimination by the kidneys – increased acid
<PC02	Metabolic Alkalosis	>HCO3- elimination by the kidneys –increased base

Metabolic Alkalosis

Metabolic Acidosis





Acid-Base Imbalance
Metabolic Acidosis

- Starvation
- Diabetic ketoacidosis
- Renal failure
- Lactic acidosis from heavy exercise
- Use of drugs (ASA, methanol, ethanol)
- Acute renal tubular necrosis
- Diarrhea

Acid-Base Imbalance
Metabolic Alkalosis

- Excessive vomiting
- Prolonged nasogastric suctioning
- Hypokalemia or hypercalcemia
- Excess aldosterone
- Use of drugs (steroids, sodium bicarbonate, diuretics)

Interferences with Ventilation
Regulation of Acid-Base Balance
Metabolic Function

pH	HC03		Condition
Decreased	Decreased		Metabolic acidosis
Increased	Increased		Metabolic alkalosis

Interferences with Ventilation
Regulation of Acid-Base Balance

- **Normal Values:**

pH	PCO2	HCO3
7.35 – 7.45	35 – 45 mm Hg	22 – 26 mEq / L

Interferences with Ventilation Regulation of Acid-Base Balance Arterial Blood Gas Intrepretation

> = increased; < = decreased

- **Step 1: Evaluate the pH**
  - pH <7.35 = acidosis
  - pH >7.45 = alkalosis

- **Step 2: Evaluate Respiratory Function**
  - Paco2 >45 mm HG = ventilatory failure & respiratory acidosis
  - Paco2 <35 mm HG = hyperventilation & respiratory alkalosis

Interferences with Ventilation Regulation of Acid-Base Balance Arterial Blood Gas Intrepretation

> = increased; < = decreased

- **Step 3: Evaluate Metabolic Processes**
  - Serum bicarbonate HCO3 <22 mEq/L = metabolic acidosis
  - Serum bicarbonate HCO3 >26 mEq/L = metabolic alkalosis

- **Step 4: Determine the Primary Disorder**
  - When Paco2 & HCO3 are both abnormal:
    - Determine which follows the deviation from the pH
      and
    - Deviates the most from normal

Interferences with Ventilation Regulation of Acid-Base Balance Arterial Blood Gas Interpretation

- Respiratory Acidosis:

Normal Values	pH 7.35–7.45	HCO3- 22-26 mEq/L	Paco2 35-45mm HG
Respiratory Acidosis	7.15	25	50
Compensated	7.37	34	66

Interferences with Ventilation Regulation of Acid-Base Balance Arterial Blood Gas Interpretation

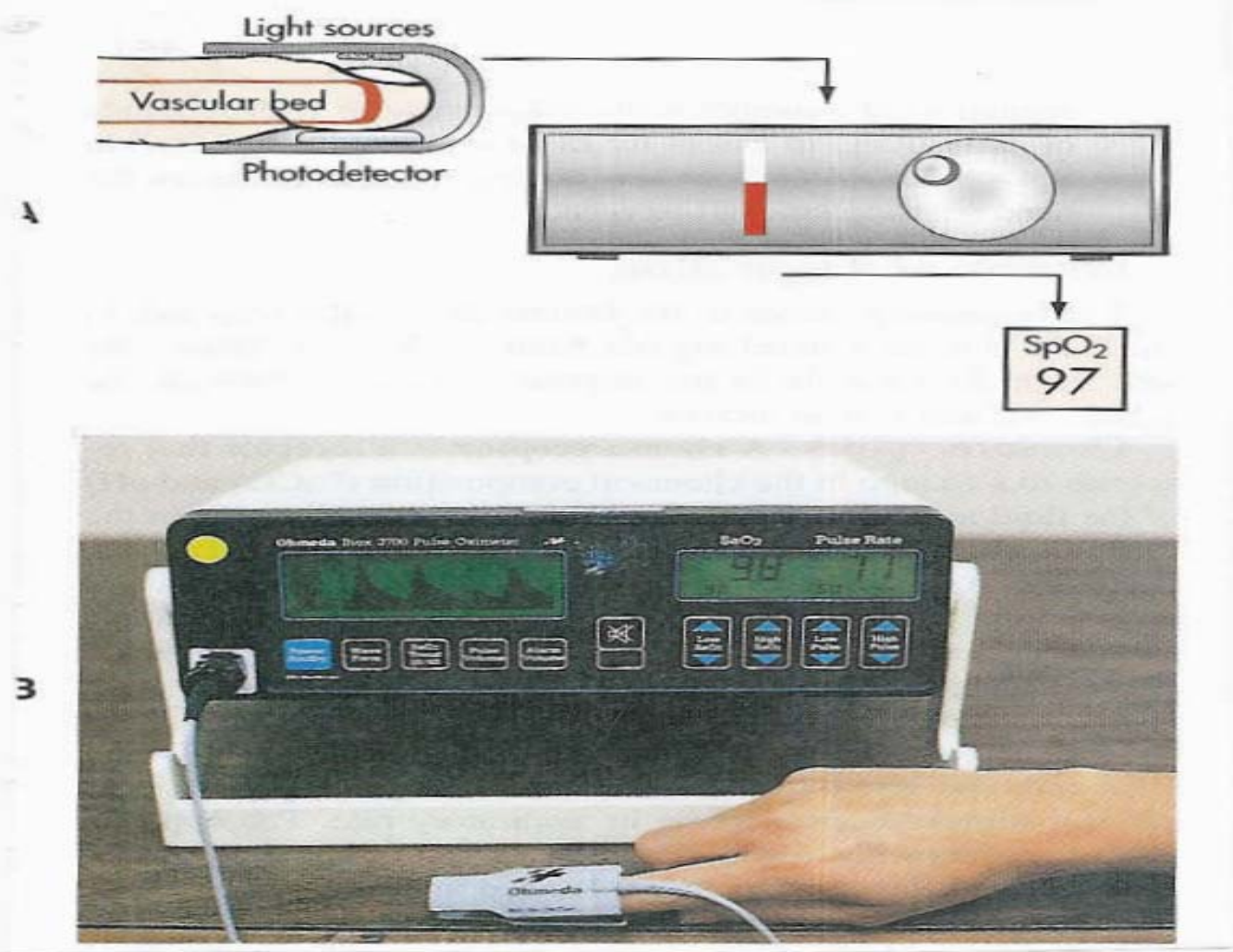
- Respiratory Alkalosis:

Normal Values	pH 7.35-7.45	HCO3- 22-26 mEq/L	Paco2 35-45mm HG
Respiratory Alkalosis	7.6	24	25
Compensated	7.54	21	25

Respiratory Assessment
Relationship between PaO2 & SpO2

PaO_2 (%)	SpO_2 (%)	CONSIDERATIONS
≥70	≥94	Adequate unless patient is hemodynamically unstable or has O_2-unloading problem. With a low cardiac output, arrhythmias, a leftward shift of the oxyhemoglobin dissociation curve, or carbon monoxide inhalation, higher values may be desired. Benefits of a higher blood O_2 value need to be balanced against the risk of O_2 toxicity.
60	90	Adequate in almost all patients. Values are at steep part of O_2-hemoglobin dissociation curve. Provides adequate oxygenation but with less margin of error than above.
55	88	Adequate for patients with chronic hypoxemia if no cardiac problems occur. These values are also used as criteria for prescription of continuous O_2 therapy.
40	75	Inadequate but may be acceptable on a short-term basis if the patient also has CO_2 retention. In this situation, respirations may be stimulated by a low PaO_2. Thus the PaO_2 cannot be raised rapidly. O_2 therapy at a low concentration (24%-28%) will gradually increase the PaO_2. Monitoring for arrhythmias is necessary.
<40	<75	Inadequate. Tissue hypoxia and cardiac arrhythmias can be expected.

Respiratory Assessment
Pulse Oximetry



Interferences with Ventilation Regulation of Acid-Base Balance Arterial Blood Gas Interpretation

- Metabolic Acidosis:

Normal Values	pH 7.35 – 7.45	HCO3- 22-26 mEq/L	Paco2 35-45mm HG
Metabolic Acidosis	7.20	15	38
Compensated	7.28	9	23

Interferences with Ventilation Regulation of Acid-Base Balance Arterial Blood Gas Interpretation

- Metabolic Alkalosis

Normal Values	pH 7.35 – 7.45	HCO3- 22-26 mEq/L	Paco2 35-45mm HG
Metabolic Alkalosis	7.54	36	44
Compensated	7.42	31	50

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

pH - 7.50

Paco2 – 28

HCO3- - 25

Pao2 - 88

Pair Share – Critical Thinking
Arterial Blood Gas nterpretation

- **Medical Dx: Acute exacerbation of asthma**

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

pH -7.28

Paco2 – 52

HCO3- - 26

Pao2 - 68

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

Medical Dx: Acute exacerbation of emphysema

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

pH - 7.30

Paco2 – 37

HCO3- - 18

Pao2 - 90

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

- Medical Dx: Renal Failure

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

pH – 7.48

Paco2 – 45

HCO3- - 32

Pao2 – 98

Pair Share – Critical Thinking
Arterial Blood Gas Interpretation

Medical Dx: postop patient with NG with large amount of NG output

Interferences with Ventilation
Classification of Resp Failure

- **Hypoxemic PaO2 <= 60 mmHg on 60% O2**
  - **Acute Respiratory Distress Syndrome**
    - Direct lung injury: aspiration; severe, disseminated pulmonary infection; near-drowning; toxic gas inhalation; airway contusion
    - Indirect lung injury: sepsis/septic shock; severe non-thoracic trauma, cardiopulmonary bypass
  - **Pathophysiology** –
    - Fluid enters interstitial space and alveoli—impaired gas exchange
    - < PaO2 and > PaCO2.
    - Ischemia to pulmonary capillaries
    - < integrity of the alveolar-capillary membrane

Interferences with Ventilation
Resp Failure – Medical Tx Goals

- **Maintain adequate oxygenation & ventilation**

  - Oxygen therapy
  - Mobilization of secretions
    - Effective coughing and positioning
    - Hydration & humidification
  - Chest physical therapy
  - Airway suctioning
  - Positive pressure ventilation
  - Relief of bronchospasm
  - Reduction of airway inflammation
  - Reduction of pulmonary congestion
  - Treatment of pulmonary infections
  - Reduction of severe anxiety, pain, and agitation
  - Treat underlying cause
  - Maintain adequate cardiac output
  - Maintain adequate hemoglobin concentration

Interferences with Ventilation
Nursing Diagnosis

66-year old man with shortness of breath, dyspnea, orthopnea, profuse perspiration, feeling like he can't catch his breath. You observe him to have prolonged expiration.

Breath sounds: expiratory wheezing – upper lung fields bilaterally; rhonchi hear in right lung field

ABGs:

- pH -7.28
- Paco2 – 50
- HCO3- - 26
- Pao2 – 66

Pulse Oximetry: 89

B/P: 160/90 HR: 110 Resp: 14

Priority Nsg Actions?

Top Three Nsg Dx?

Interferences with Ventilation
Nursing Diagnosis

- Ineffective airway clearance
- Ineffective breathing pattern
- Risk for imbalanced fluid volume
- Anxiety
- Impaired gas exchange
- Imbalanced nutrition: less than body requirements

Interferences with Ventilation Classification of Resp Failure

- **Hypercapnic $PaCO_2$ > 45 and pH < 7.35**
  - Imbalance between ventilatory supply and ventilatory demand
    - **Supply**: maximum ventilation that the pt. can sustain without developing respiratory muscle fatigue
    - **Demand**: The amount of ventilatory needed to keep the $PaCO_2$ within normal limits
  - Normally: supply > demand
  - Hypercapnia – ventilatory failure – inability of the respiratory system to ventilate out sufficient CO_2 to maintain a normal $PaCO_2$

Interferences with Ventilation Respiratory Failure

- **Causes of hypercapnic respiratory failure**
  - **Airways & alveoli**
    - Asthma, emphysema, chronic bronchitis, cystic fibrosis
  - **Central nervous system**
    - Problems that suppress the drive to breathe – drug overdose, brainstem infarction, severe head injury, spinal cord injuries
  - **Chest wall**
    - Flail chest, fractures, kyphoscoliosis, massive obesity
  - **Neuromuscular conditions**
    - Guillain-Barre syndrome, muscular dystrophy, multiple sclerosis, myasthenia gravis, ALS

Interferences with Ventilation
Nursing Management
Tracheostomy Care

- **Indications for Tracheostomy**

  - Bypass an upper airway obstruction
  - Cases of prolonged intubation & mechanical ventilation
  - Facilitate removal of secretions
  - Permit oral intake & speech in a patient who requires long-term mechanical ventilation

Interferences with Ventilation
Nursing Management
Tracheostomy Care

- **Types of Tracheostomy Tubes**
  - Shiley & Portex fenestrated tracheostomy tube with cuff, inner cannula, decannulation plugs & pilot balloon
    - **Fenestrated: openings on the surface of the outer cannula that permit air from the lungs to flow over the vocal cords**
      - **Allows the patient to breathe spontaneously, speak, & cough up secretions**
      - **Used by the patient who can swallow without risk of aspiration but requires suctioning for secretion removal.**
      - **Used by the patient who requires mechanical ventilation for fewer than 24 hours a day**
  - Bivona (Fome) tracheostomy tube with foam cuff and obturator

Interferences with Ventilation
Nursing Management
Tracheostomy Care

- **Inserting trach tube**
  - Removing obturator
- **Trach tube maintenance**
  - Cuff – deflated versus inflated
- Trach suctioning
  - Sterile procedures
  - **Use only Normal sterile saline** (NO Water)
  - Apply suction as catheter is withdrawn
- **Cleaning procedure**
  - Disposable inner cannula
  - Skin care; Changing trach ties

Interferences with Ventilation
Nursing Management
Patient with a ET Tube or Trach

- **Maintain correct tube placement**
  - Breath sounds
- **Maintain proper cuff inflation**
  - Cuff pressure 20-25 mm Hg (capillary perfusion 30 mm Hg)
- **Monitor Oxygenation & Ventilation**
  - ABGs; pulse oximetry;
  - PETCO2 (partial pressure of end-tidal CO2
  - Respiratory rate assessment

Interferences with Ventilation
Nursing Management
Patient with a ET Tube or Trach

- **Maintain tube patency**
  - Closed and open suctioning
  - Assess patient:
    - Visible secretions
    - Sudden onset of respiratory distress
    - Suspected aspiration
    - Increase in peak airway pressure
    - Auscultation of adventitious breath sounds
    - Increased respiratory rate / increased cough
    - Sudden or gradual decrease in Pao2 and/or SpO2

Interferences with Ventilation Nursing Management Patient with a ET Tube or Trach

- **Providing Oral Care and Maintaining Skin Integrity**
  - Lips, mouth, teeth, tongue, oropharynx q2hr
  - Prevent pressure from ET tube
    - Ensure ET or Trach is secured properly
    - Change securing tapes qd & prn

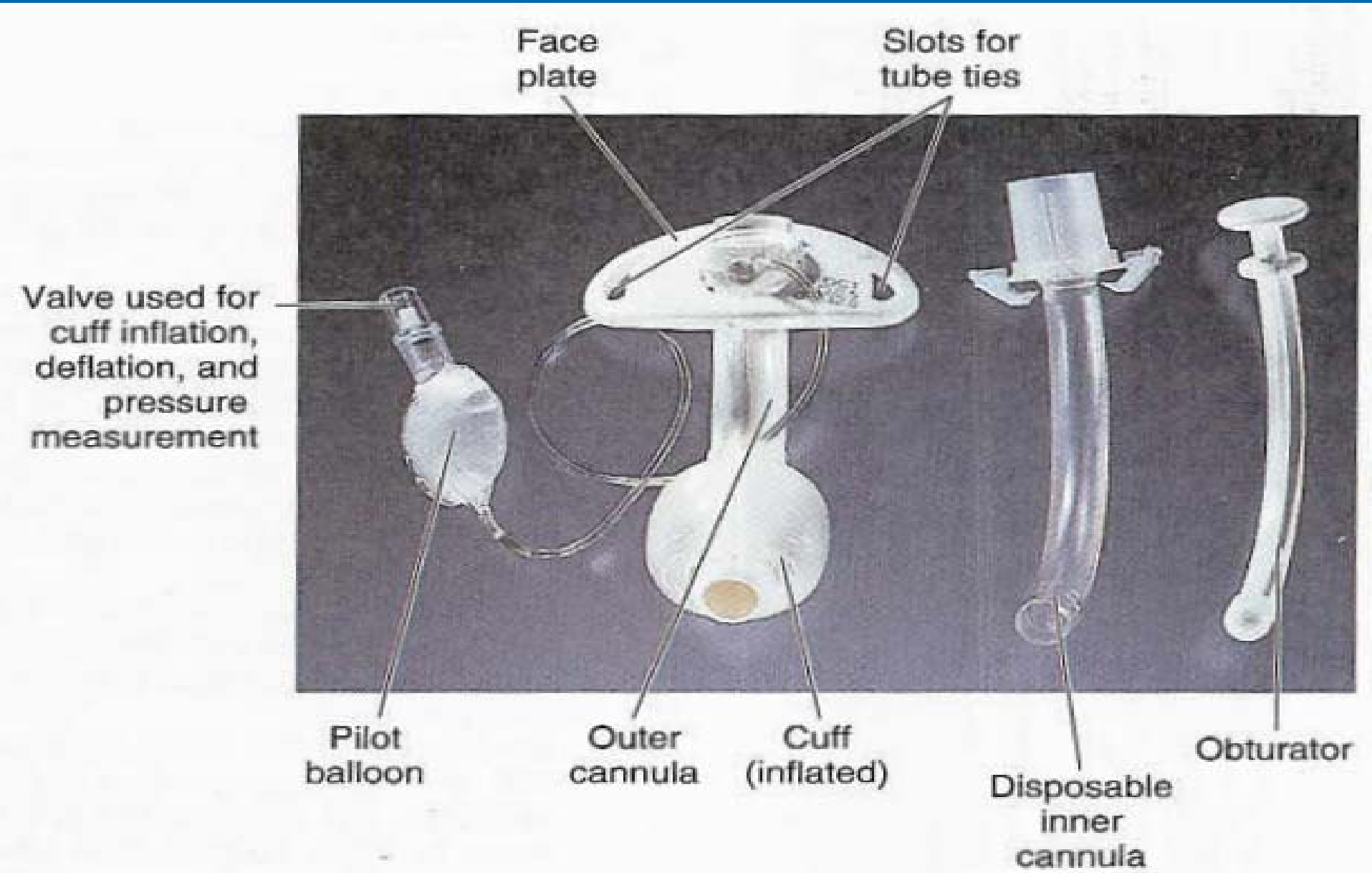
- **Fostering Comfort and Communication**
  - Position of comfort
  - Include family in care as appropriate
  - Pain relief
  - Methods of communication: pictures, word chart

Interferences with Ventilation
Nursing Management
Patient with a Trach

- **Nursing Diagnoses**:
  - Ineffective airway clearance
  - Impaired verbal communication
  - Risk for infection
  - Imbalanced nutrition
  - Impaired swallowing
  - Ineffective therapeutic regimen management
  - Potential complication—hypoxemia related to misplaced or properly functioning trach tube

Tracheostomy Tube
Velcro Collar

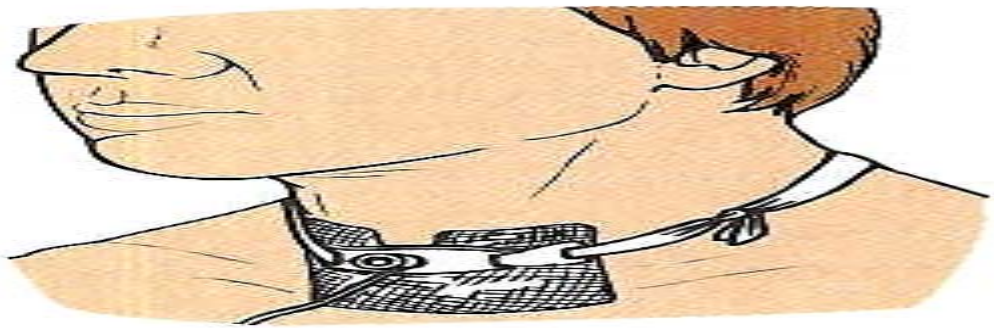
Anatomy of the Tracheostomy Tube



Fenestrated Tracheostomy Tube

Tracheostomy Suctioning

FIG. 26-7 Suctioning a tracheostomy. Using sterile technique, the ction catheter is being withdrawn from the airway while suction is plied. The pilot balloon tubing may be seen lying on the patient's est.



Pair Share – Critical Thinking

- Humidification of the air is essential for the patient with an artificial airway because humidification helps do which of the following?

  - Prevent tracheal damage
  - Promote thick secretions
  - Dry out the airways
  - Liquefy the secretions

Interferences with Ventilation
Nursing Management
Care of the Patient Requiring Mechanical Ventilation

- Types of mechanical ventilation
- Settings
- Modes of volume ventilation
- Complications
- Nutritional therapy
- Weaning from positive pressure ventilation & extubation
- Home mechanical ventilation

Interferences with Ventilation Nursing Management Care of the Patient Requiring Mechanical Ventilation

- Types of mechanical ventilation
  - Controlled mandatory ventilation (CMV) – breaths are delivered at a set rate and volume independent of the patient's respirations
  - Assist-control mechanical ventilation – delivered preset volume & frequency; when pt. initiates a spontaneous breath, a full volume is delivered
  - Synchronized intermittent mandatory ventilation – prevent volume at a frequency synchronized with patient's respirations – most common form used
  - Pressure support ventilation – preset level of positive airway pressure is set. Volume delivered depends on pressure level & airway compliance
  - Pressure-controlled inverse ratio ventilation – I/E ratio – ratio of duration of inspiration/expiration

Interferences with Ventilation Nursing Management Care of the Patient Requiring Mechanical Ventilation

- **Other Ventilatory Maneuvers:**
  - Positive end-expiratory pressure (PEEP) -- + pressure applied during expiration – increases functional residual capacity – prevents alveoli collapse
  - Continuous positive airway pressure (CPAP) – prevents patients airway pressure from falling to zero – Used for sleep apnea
  - High-frequency ventilation – delivery of small tidal volume at a rapid respiratory rate – maintains lung volume and reduces intrapulmonary shunting

Interferences with Ventilation Nursing Management

Complications of Mechanical Ventilation

- Pulmonary
  - Barotrauma
  - Volu - pressure trauma
  - Alveolar hypoventilation
  - Alveolar hyperventilation
  - Ventilator-assisted pneumonia
- Sodium & Water Imbalance – Na+ & fluid retention
- Neurologic – impaired cerebral blood floor
- Gastrointestinal – stress ulcer/GI bleed
- Musculoskeletal – contractures, pressure ulcers, footdrop, complications of immobility
- Psychosocial = pain, fear, isolation, anxiety, dependency
- Mechanical Disconnnection or Malfunction – Alarm Alert

Interferences with Ventilation
Nursing Management
Care of the Pt. Requiring Mechanical Ventilation -- Nutrition

- Establish a nutritional program if the pt is to be without food for 3-5 days
  - Total parenteral nutrition
  - Enteral feedings
    - Concern:
      - **Aspiration**
      - **Increased carbohydrates = increases CO_2 levels**

Interferences with Ventilation Nursing Management Weaning the Pt. from Mechanical Ventilation & Extubation

- Weaning: reducing ventilator support & resuming spontaneous ventilation
  - **Pre-weaning** – assessing Pt respiratory effort
    - Muscle strength; PEEP; TV; VC; clear lungs
  - **Weaning** – SIMV – synchronized intermittent mandatory ventilation; CPAP; humidified T-piece
  - **Outcome Phase** – extubation after hyperoxygenation & suctioning prior to removal; supplemental oxygen, monitoring, need for re-intubation

Interferences with Ventilation
Nursing Management
Home Mechanical Ventilation

- Negative & positive pressure ventilators
  - Settings and alarms
- Home Health / Family participation in care
- Decreased risk for nosocomial infection
- Concerns:
  - Reimbursement: home health, disposable products may be nonreimbursable
  - Family – respite care

Pair Share – Critical Thinking

- **A 72-year old female brought to the ER following a head-on car accident. She has blunt injury to the chest—difficulty breathing, cyanosis; receiving O_2 4l/min** NC.

Assessment priority?

Immediate nursing actions