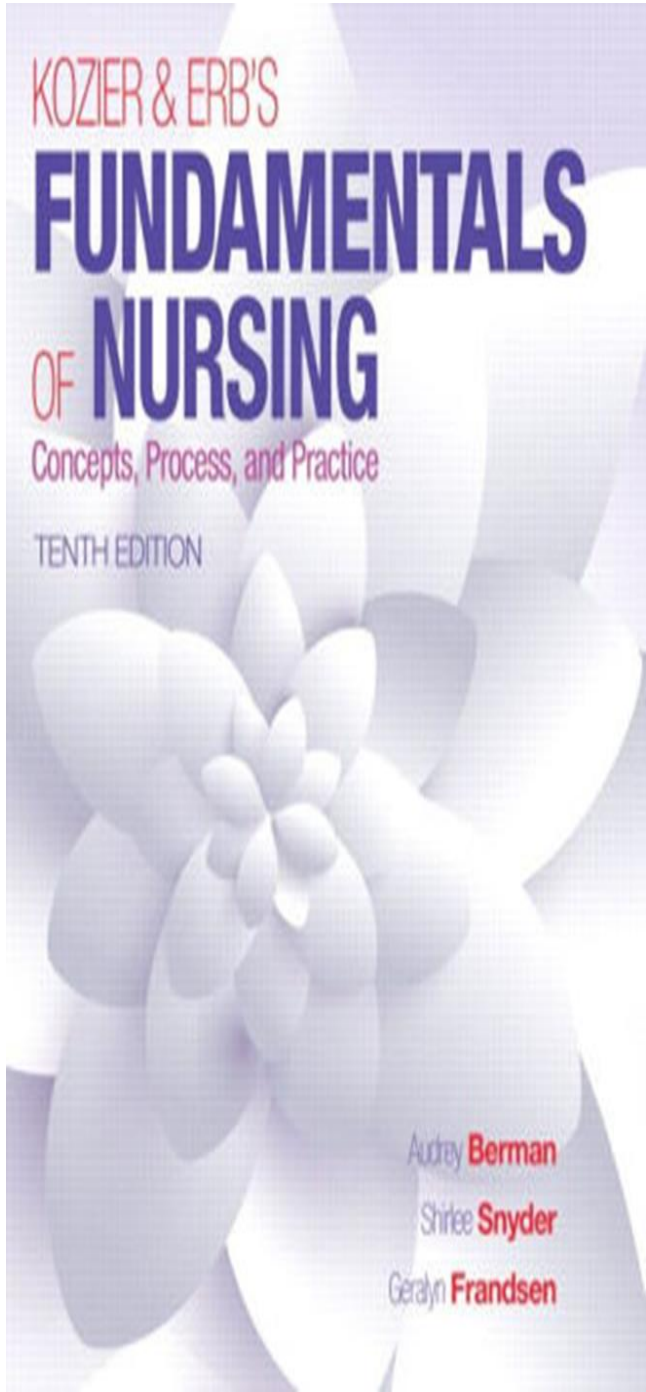
# Unit9
# Oxygenation

- Alterations in respiratory function
  - Oxygen delivery system



# Oxygenation

**Respiration:** is process of gas exchange between individual and environment.

# Alteration in Respiratory Function

Respiratory function can be altered by conditions that affect three areas of function:

1- The movement of air into or out of the lungs

2- The diffusion of oxygen & carbon dioxide between the alveoli & the pulmonary capillaries

3- The transport of oxygen and carbon dioxide via the blood to and from the tissue cells

# Three major alterations in respiration are

1) Hypoxia;
2) Altered breathing pattern;
3) Obstructed or partially obstructed airway.

# 1- Hypoxia

- **Hypoxia** is a condition of insufficient oxygen anywhere in the body, from the inspired gas to the tissues.
- It can be related to any parts of respiration: ventilation, diffusion of gases, or transport of gases by the blood, and can be caused by any condition that alters one or more parts of the process.
- It can develop when lung's ability to diffuse oxygen into arterial blood decreases, as with pulmonary edema, or can result from problems in the delivery of oxygen to the tissues such as anemia, cardiac failure and embolism.

# 1- Hypoxia

*__Hypoventilation:__ is another cause of hypoxia that is inadequate alveolar ventilation due to decreased tidal volume.

-It may occur because of diseases of respiratory muscles, drugs.

-With hypoventilation, carbon dioxide (CO2) accumulates in the blood.

-This condition is called **hypercarbia (hypercapnia).**

*__Hypoxemia__ is reduced oxygen (O2) in blood and is characterized by a low partial pressure of O2 in arterial blood or low saturation of oxy-hemoglobin.

*__Cyanosis__ is bluish discoloration of skin, nail beds, and mucous membranes, due to reduced oxygen levels of hemoglobin.

# Types of Hypoxia

1- **Acute**. Face of acutely hypoxic person usually appears anxious, tired, and drawn.

Person assumes a sitting position (leaning forward) slightly to permit greater expansion of the thoracic cavity.

**2- Chronic.** Client appears fatigued and lethargic.

The client's fingers and toes may be clubbed as a result of long term lack of oxygen in the arterial blood supply.

# Signs of Hypoxia

1-Rapid pulse,

2-Rapid shallow respiration and dyspnea,

3-Substernal or intercostals retractions,

5-Cyanosis,

6-Increased restlessness,

7-Flaring of the nares.

# 2-Altered Breathing Patterns

❖**Breathing patterns** refer to rate, volume, rhythm, and relative ease or effort of respiration.

## a. Rate

➢**Eupnea** is normal respiration, quiet, rhythmic and effortless.

➢**Tachypnea** is rapid rate is seen with fever, pain, metabolic acidosis and with hypercapnia or Anoxemia (decreased oxygen in the blood).

➢**Bradypnea** is an abnormally slow respiratory rate, which may be seen in clients who have taken drugs such as morphine sulfate, metabolic alkalosis, who have increased intracranial pressure.

➢**Apnea** is cessation of breathing.

# 2-Altered Breathing Patterns

## b. Volume/ Depth

**Hyperventilation** is an excessive amount of air in the lungs.

--It results from an increase in the rate and depth of respirations.

**Hypoventilation** : inadequate alveolar ventilation that is ventilation that does not meet the body's requirement.

-As a result carbon dioxide is retained in the blood stream.

# 2-Altered Breathing Patterns

**c. Rhythm:** regular or irregular.

The abnormal respiratory pattern includes:

- **Cheyne-stokes respiration**. Waxing and waning of respirations from very deep to very shallow breathing and temporary apnea.
- **Apneusis**; prolonged gasping inspiration followed by a very short, usually inefficient expiration.
- **Biot's** (cluster) respirations: shallow breaths interrupted by apnea.

# 2-Altered Breathing Patterns

## d. Ease or Effort

**Dyspnea** refers to: difficult or labored breathing.
Shortness of breath (SOB), unable to get enough air.

**Orthopnea** refers to inability to breathe except in an upright or standing position.

# 2-Altered Breathing Patterns

## e. Adventitious breath sounds

Abnormal breath sounds e.g.,

- **Stridor** (harsh, high-pitched sound, may be heard during inspiration),
- **Wheezes** (continuous, high-pitched musical squeak or whistling sound occurring on expiration and sometimes on inspiration
- **Stertor** (snoring or sonorous respiration, usually due to a partial obstruction of the upper airway), crackles……

# 2-Altered Breathing Patterns

## f. Secretions and coughing

- **Hemoptysis:** the presence of blood in the sputum.
- **Productive cough:** a cough accompanied by expectorated secretions.
- **Nonproductive cough:** a dry, harsh cough without secretions.

# 3- Obstructed Airway

- **A complete or partially** obstructed airway can occur anywhere along the upper or lower respiratory passageways.

**-An upper airway** obstruction in nose, pharynx, larynx, or trachea.
Caused by: a foreign object, such as food; or the tongue falls back into the oropharynx when a person is unconscious; or when secretions collect in the passageways

-The respirations will sound gurgle or bubbly as the air attempts to pass through the secretions.

**-Lower airway obstruction is:** in passageways in bronchi and lungs.

-Partial obstruction of upper airway passages is indicated by a low-pitched snoring sound during inhalation.

# 3- Obstructed Airway

-**Complete obstruction** is indicated by extreme inspiratory effort that produces no chest movement, and client may exhibit marked sternal and inter-costals retractions.

-Lower airway obstruction is not always as easy to observe.

# Physical Examination and Diagnostic Evaluation

- Observe rate, depth, rhythm, quality of respirations, position the client assumes for breathing.
- Shape of the thorax.
- Pulse oximetry:

✓Noninvasive device that measure an 02 saturation (SaO2), the amount of oxygenated hemoglobin in arterial blood.

✓It is connected to a sensor attached to the client's finger, toe, nose, earlobe, or forehead.

✓ It can detect hypoxemia before clinical signs and symptoms.

# Physical Examination and Diagnostic Evaluation

- Arterial blood gases (ABGs)
- Pulmonary functions tests:

✓To measure lung volume and capacity.

✓Assess respiratory function and dysfunction

✓Studies mechanics of breathing and gas exchange

- CXR (to diagnose disease and to assess progress of disease); Bronchoscopy, Laryngoscopy, lung scan.
- Sputum specimens and throat culture and swab(Sputum is the mucous secretion from the lungs, bronchi, and trachea)

# Purpose of Sputum Specimens

- Culture and sensitivity to identify a specific microorganism and its drug sensitivities.
- Cytology to identify the origin, structure, function, and pathology of cells and to identify cancer in the lung and its specific cell type.
- Acid-fast bacilli (AFB) to identify presence of Tuberculosis (TB).
- To assess the effectiveness of therapy.

# 2- Throat Swab

- Sample is collected from the mucosa of the oropharynx and tonsillar regions using culture swab.
- The sample is them cultured and examined for the presence of disease-producing microorganisms.

# Oxygen Therapy

- It is a treatment that provides patients  with supplemental, or extra, oxygen

# Oxygen Therapy Methods

## 1- Cannula

✓The nasal cannula (nasal prongs) is the most common inexpensive device.

✓It is easy to apply and does not interfere with the client's ability to eat or talk.

✓It is comfortable, permits freedom of movement, and is well tolerated .

✓It delivers low concentration of oxygen (24-45%) at flow rates of 2-6L/minute.

# Oxygen Therapy Methods

**2- Face Mask ：** Face masks that cover the client's nose and mouth

Types of oxygen masks:

1-**Simple Face mask**: delivers oxygen concentrations from 40-60% at liter flows of 5-8 L/minute.

2- **Partial re-breather mask**: delivers 60-90% at liter flows of 6-10 L / min. Oxygen reservoir bag that is attached allows client to re-breathe about first third of exhaled air in conjunction with oxygen.

3- **Nonrebreather mask**: delivers 95-100% at liter flows of 10-15L/minute. One way valves on mask and between reservoir bag and mask prevent room air and client's exhaled air from entering bag so only oxygen in bag is inspired.

4- **Venturi mask**: delivers 24-40 or 50% at liter flows of 4-10 L/minute. It has wide-bore tubing and color-coded jet adapters that correspond to a precise oxygen concentration and liter flow.

# Oxygen Therapy Methods

**3- Face Tent**

-It provides varying concentrations of oxygen, for example, 30-50% concentration of oxygen at 4-8L/minute.

-So, frequently inspect the client's facial skin for dampness and dry and treat as needed.

**4- Invasive methods**

**a. Transtracheal Oxygen Delivery (** Tracheostomy)

-It used for oxygen dependent clients.

-Oxygen is delivered through a small, narrow plastic cannula surgically inserted through skin directly into the trachea.

-The client requires less oxygen (0.5-2 L/minute).

**b. Endotracheal Intubation**

# Suctioning

- Oropharyngeal
  - 10-15 cm along side of mouth
- Nasopharyngeal
  - Along floor
  - 10-15 sec, rotate, 20-30 sec intervals, 5 min total
- Avoid complications
  - Hyperinflation
  - Hyper-oxygenation