

Nursing Process - Oxygenation

Respiratory System Basics
Impaired function
Nursing Interventions
Nursing Diagnoses

Structure of the Respiratory System

- Upper Respiratory Tract
 - Mouth, Nose, Pharynx: warms & humidifies, cleans, filters foreign particles
- Lower Respiratory Tract
 - Trachea, bronchi, bronchioles: cartilage and smooth muscles hold open
 - Lungs: alveoli – gas exchange

Function of the Respiratory System

- **Ventilation – mechanical process of moving air into and out of lungs**
 - Pressure changes w/i chest
 - Inspiration: diaphragm, intercostals contract
 - Expiration: they relax
 - I:E Ratio, 1:2 w/normal breathing
- **Gas diffusion – molecules move from an area of greater conc or PRESSURE to lesser**
 - Insp.- O₂ moves into blood as “partial pressure” is lower, CO₂ moves from blood to alveoli
 - Exp. - Mechanical: CO₂ is expelled from lung
- **Arterial blood: PaO₂, PaCO₂**

Respiratory Function-Gas transport

Oxygen – O₂

- Small amt dissolved in the plasma (blood)
- Most molecules carried on hemoglobin, (not in ion form)

Carbon dioxide – CO₂

- Most carried in plasma in dissociated form
- Some attach to amino acids

Control of Ventilation

- Respiratory Centers: generate impulses to resp muscles – diaphragm & intercostals
- Chemoreceptors: evaluate levels CO₂, O₂, H⁺ (acid/base balance)
 - Central receptors: medula of brain
 - Peripheral receptors: aortic arch, carotid arteries
- PaCO₂ – primary role in stimulation of change in respiration

Normal Respiration

- Rate: 12 – 20
- Usually the same volume of air w/ each
- Tidal volume – 500 ml per breath
- More volume when awake, less sleeping, rate also decreases at night

Lifespan considerations: older adult

- Decreased ciliary action
- Decreased strength of cough
- Decreased rib cage mobility

Lifestyle considerations

Negative Impact

- Smoking
- Excessive alcohol or drug use
- Poor nutrition

**Altered Respiratory Function:
Restrictive**

- **Damage to alveolar tissue: tissues swell and thicken**
 - Atelectasis - collapse of alveoli
- **Stiffening of lung tissue**
 - Infections - pneumonia
 - Pulmonary fibrosis
- **Pain**
 - Post-operative
 - Injuries to chest cavity, ribs
 - Obesity
- **Neuromuscular disorders**
 - ALS(Amyotrophic Lateral Sclerosis)
 - Guillian Barrie

Manifestations of Impaired Respiratory Function

- Objective:
 - Abnormal breath sounds
 - Accessory muscle use, tripod positioning
 - Cough and sputum production
 - Chest pain – related to infection, inflammation
 - Cyanosis, clubbing
- Subjective:
 - Patient's report of dyspnea

Signs/Symptoms of Hypoxia

- Changes in mental status: restlessness, confusion, irritability progressing to somnolence, coma
- Changes in vital signs: initial compensation for hypoxia
- Late changes -
Changes in skin
Secondary symptoms: change in GI function, change in renal function




Pulse Oximetry


- Values are approximate...
- O2 sat. 90% = PaO2 55mmHg = moderate hypoxemia
- O2 sat. 75% = PaO2 40mmHg = severe hypoxemia
- O2 sat. 50% = PaO2 25mmHg = life threatening
- * O2 saturation of 90% is a critical value. Do assess baseline relative to patient's history of pulmonary disease.

Oxygenation – Nursing Interventions

- Positioning:
 - to maximize respiratory function
 - to mobilize secretions
- Deep Breathing
- Coughing
- ↑Activity/Ambulation
- Hydration
- “T,C,DB” or C,DB – turn,cough,deep breathe



Techniques for Coughing and Deep Breathing



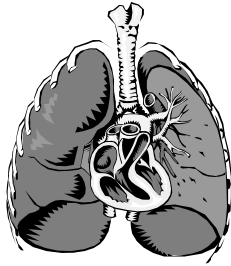
- Coughing technique:
 - hold 3 sec
 - demonstrate
- To enhance effectiveness:
 - Incisional splinting
 - Pre-medicating for pain
- Deep Breathing
 - Incentive Spirometry:
 - Rationale:
 - Indications:
 - Patient Teaching:

Oxygen Therapy

- May reverse hypoxemia which will improve tissue oxygenation
- Helps eliminate or reduce dyspnea
- Improves comfort
- Will not correct the underlying cause of oxygenation problems!!

Oxygen Therapy

- Flow expressed in liters per minute
- What is the concentration of O₂ in room air??
- Goal is to provide lowest percentage of oxygen that will maintain arterial oxygenation within a normal range



Oxygen Therapy

- Nasal Cannula: delivers 22 - 44% oxygen at flow rate of 1-6 liters per minute (L/min)
- Nursing implications:
 - Limit maximum flow to 6 L/min.
 - Mouth breathing does not diminish O₂ delivery if nasal passages are patent.
- Simple Mask: delivers 40 - 60% @ 6-10 L/min.
- Nursing implications:
 - Minimum of 5-6 L/min flow is required to prevent re-breathing of CO₂
 - not as well tolerated by patient as cannula

Oxygen Therapy

- Reservoir Nasal Cannula: stores oxygen in a reservoir and delivers a bolus of concentrated oxygen at beginning of inspiration. Can deliver 50% or greater % oxygen at > 6 liters per minute.
- Nursing Implications:
 - Must be humidified at > 4 lpm
 - Better tolerated than a mask for patient's requiring higher percentages of oxygen.




Oxygen Therapy

<ul style="list-style-type: none">■ Venturi Mask: Delivers 24 - 50% within 1% accuracy @ 3-8 L/min <p>Provides precise and consistent O2 concentration if adjusted according to specifications</p> <ul style="list-style-type: none">■ Nursing implications:<ul style="list-style-type: none">- precise adjustment is required- not as well tolerated as cannula, noisy	<ul style="list-style-type: none">■ Low flow partial re-breather: delivers 60 - 80% @ 6-8 L/min■ Non-rebreather Mask: delivers up to 90% @ 10-15 L/min■ Nursing implications:<ul style="list-style-type: none">- Must use sufficient flow to keep reservoir inflated- Not a long-term device- used for critically ill patients
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Oxygen Therapy

- Bi-level Positive Airway pressure (BiPAP): delivers non-invasive pressure support ventilation by nasal mask or face mask. Higher pressure during inspiration, lower pressure during expiration to maintain positive airway pressure. Eases the work of breathing and enhances gas exchange. Most often used for patient's with severe COPD, sleep apnea. Delivers a pre-set % of oxygen, inspiration can be patient triggered and/or a pre-set rate.
- Nursing implications:
 - Mask must fit snugly to be effective.
 - Communication, eating, drinking are adversely affected.
 - Very drying to mucous membranes.

More Nursing Implications



- Oxygen is a drug!! It requires an order to administer.
- Safety – oxygen supports combustion!
- Assess that Oxygen is being delivered as prescribed and device is properly in place, connections secure. When?
- Provide frequent oral and nasal care.
- Check skin behind ears for breakdown.

The Post-op Client

<ul style="list-style-type: none">■ Nursing Interventions:■ Assess!!■ Turn, cough, deep breathe every two hours■ Incentive spirometer if ordered■ Increase activity out of bed (OOB)■ Position for maximum lung expansion■ Promote hydration	<ul style="list-style-type: none">■ Documentation:■ 0800 HOB up 45 degrees. Lungs clear on auscultation. O2 sat. 95% on room air. Used incentive spirometer x5 to 1500mL. Productive cough small amount white sputum. M. Bright SN
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The Patient Hypoventilating

<ul style="list-style-type: none">■ Nursing Interventions:■ Assess!!!■ Position for maximum lung expansion■ Stimulate and encourage deep breathing	<ul style="list-style-type: none">■ Documentation:■ 0800 Somnolent. Respirations 12, shallow. O2 sat. on O2 2 L/min. cannula 88% Re-positioned, HOB up 45 degrees. Stimulated and encouraged to take deep breaths. M. Bright SN■ 0815 More awake, talking. Respirations 14. O2 sat. up to 94% on O2 2 L/min. cannula. M. Bright SN
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The Dyspneic Patient

<ul style="list-style-type: none">■ Nursing interventions:■ Assess!!!■ Stay with the patient■ Call physician based on appropriate assessment findings.■ Position for comfort and maximum lung expansion■ O2 therapy if indicated and ordered.	<ul style="list-style-type: none">■ Documentation:■ 1000 c/o SOB. Respirations 32, labored. Lungs bilateral scattered rales. O2 sat. room air 88% Color pale, nail beds cyanotic. Skin cool. HOB elevated to 45 degrees. RN notified. M. Bright SN■ 1010. Above findings verified. Physician notified. O2 4L/min. started via nasal cannula. Lasix 40mg IVP given stat. I. Emtha RN
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Critical Elements

- Positions client to facilitate oxygenation.
- Assures correct oxygen delivery.
- Assess oxygen saturation.

Defining Characteristics

<ul style="list-style-type: none">■ Ineffective Breathing Patterns: Major: Change in respiratory rate or rhythm from baseline Minor: Orthopnea, tachypnea, hyper/hypoventilation Splinted/guarded respirations	<ul style="list-style-type: none">■ Impaired Gas Exchange: Major: Dyspnea on exertion Minor: Pursed-lip breathing, tripod positioning, confusion agitation Lethargy/fatigue Decreased O2 saturation Cyanosis
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Defining Characteristics

<ul style="list-style-type: none">■ Ineffective Airway Clearance: Major: Ineffective or absent cough Inability to remove airway secretions Minor: Abnormal breath sounds Abnormal respiratory rate, rhythm, depth	<ul style="list-style-type: none">■ Risk for Aspiration ■ Presence of favorable conditions for aspiration such as: Reduced LOC, delayed gastric emptying, impaired swallowing (dysphagia)
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Defining Characteristics

■ **Activity Intolerance:**

Major: Altered physiologic response to activity... dyspnea, excessively increased respiratory and/or pulse rate, failure to return to pre-activity level in 3 minutes, blood pressure does not increase with activity

■ **Minor:** Weakness, pallor or cyanosis, vertigo, fatigue, confusion

■ **How is this diagnosis different from Impaired Gas Exchange?**
