WEEK TWO
EDAPT NOTES

Nursing Care: Altered Gas Exchange

Introduction to Nursing Care: Altered Gas Exchange

- The nursing care of clients who have altered gas exchange involves understanding the pathophysiology of the disease process or injury that disrupts the oxygenation of the body
- Altered gas exchange can be caused by many disease processes affecting oxygenation in the body, such as:
    - heart diseases (coronary artery disease, myocardial infarction, inflammatory and structural heart disorders)
    - respiratory diseases (upper and lower respiratory tract disorders, chronic obstructive pulmonary disease [COPD])
    - renal disorders (acute kidney injury, chronic kidney disease, nephrotic syndrome, glomerulonephritis)

Assessment: Altered Gas Exchange

- When caring for a client with altered gas exchange, it is important to look at their history, medications, social and lifestyle factors, and procedures or surgeries that could impact their health.
- In addition, physical assessment findings can lead to additional cues indicating an alteration in gas exchange.

Assessment data	**Examples**	**Rationale**
Past Medical History/ History of Present Illness	Heart failure Valvular disorders Dysrhythmias Respiratory infections Chronic obstructive pulmonary disease (COPD) Kidney disease Liver disease Pregnancy	These clinical conditions may affect gas exchange by reducing the ability of the lungs to function correctly, or by causing an impairment of carbon dioxide leaving the alveoli or oxygen entering the alveoli. This can be caused by lung swelling (pulmonary edema), decreased ability of the lung to expand, or the inability of the blood to freely flow and exchange gasses in the capillary beds of the lungs.
Procedures	Recent surgery Respiratory procedures Pulmonary surgeries	Anesthesia and prolonged immobility can decrease lung function and increase the risk of lung infection, inflammation, and decreased lung inflation. In addition, procedures including chest tube insertions and pulmonary surgery may also impact gas exchange.
Medications	Intravenous (IV) fluids Sedatives Allergic reactions	Fluids can cause overload or electrolyte imbalances that may affect gas exchange. Some medications can cause decreased respirations, which alters gas exchange. Allergic reactions to medications can

		cause bronchoconstriction that limits gas exchange.
Lifestyle / Social	Recreational chemical inhalation Diet Obesity	Cigarettes or any type of vape/drug inhalation can cause lung damage, leading to decreased gas exchange. Obesity can cause resistance to the diaphragm or sleep apnea, which leads to impaired gas exchange. A high-sodium diet can cause hypertension and the potential for fluid overload, leading to poor gas exchange.
Vital Signs	Respiratory rate Oxygen saturation	Often, when there is a low oxygen level or high carbon dioxide level, the respiratory rate will increase to compensate. In addition, oxygen saturation may decrease due to altered gas exchange.
Respiratory Assessment	Lung sounds	Abnormal lung sounds including decreased air movement, asymmetrical chest movement or deformity, or adventitious breath sounds can suggest an altered gas exchange.
Lab Results	Arterial blood gasses Venous blood gasses Lactic acid level Carbon dioxide level	Arterial blood gasses are perhaps the most accurate indicator of an altered gas exchange. In addition, some other results can also clarify this issue, including venous blood gasses, lactic acid levels, or carbon dioxide levels.
Procedure Results	Computerized tomography (CT) scan Pulmonary angiogram Ventilation / perfusion Chest x-ray	All types of procedures can indirectly or directly suggest there is an altered gas exchange. The most accurate direct test for gas exchange is the ventilation perfusion scan (also called a VQ scan).

Review of Systems

- Based on the data collected from the history and physical assessment of the client, including past medical and surgical history, procedures, lifestyle, and medications
  (over-the-counter or prescribed), the nurse will perform a head-to-toe assessment of the client and look at the laboratory and radiology test results.
- The interprofessional care of altered gas exchange may be different based on the etiology and some of the assessment findings.
- There are generally things that nurses can do to treat altered gas exchange, regardless of the etiology.
- This includes actions that improve gas exchange and further assessment that may involve focusing on and treating an underlying cause.

System	Nursing Actions/Assessment	Rational

Neurological	Monitor neurological function and level of consciousness.	Changes in gas exchange can cause altered mental status such as confusion, lethargy, drowsiness, stupor,
		or coma.
Respiratory	Elevate the head of the bed (90 degrees/high-Fowler's position).	This will expand the lungs by taking pressure off the diaphragm and forcing any fluid in the lungs towards the bottom, so more surface area is available for gas exchange.
	Monitor respiratory rate, breathing pattern, and oxygen saturation.	Change in respiratory rate, breathing pattern, and oxygenation can suggest the need for further action.
	Assess for adventitious lung sounds (crackles, rales, stridor, absent, etc.).	This may help clarify the cause of an alteration in gas exchange and can also be used to evaluate results before and after nursing actions.
	Encourage deep/pursed-lip breathing exercises, ambulation, active/passive ROM, and the use of an incentive spirometer.	These are techniques used to expand the lungs, slow a client's breathing, and offer some comfort for shortness of breath.
	Report new abnormal findings or changes to the healthcare provider.	This facilitates the need for further testing, medication, or other therapies that will identify and treat underlying causes of altered gas exchange.

- Altered gas exchange can cause some changes in the cardiovascular system because it can affect the oxygen levels in the blood. Oxygen is vital for the body to function.

System	**Nursing Actions/ Assessment**	**Rationale**
Cardiac	Monitor blood pressure and heart rate.	The body can compensate for an altered gas exchange by activation of the sympathetic system, causing an increase in pulse rate and blood pressure. These can be cues suggesting altered gas exchange is present.
Gastrointestinal	Auscultate heart sounds.	Any changes in heart sounds may suggest extra fluid that is backing up into the lungs, causing pulmonary edema, a condition in which fluid blocks the exchange of gasses (oxygen and carbon dioxide).
	Measure abdominal girth.	Increased abdominal girth can cause restriction of the diaphragm, leading to decreased lung volume and reduced gas exchange.

Genitourinary	Monitor intake (oral or IV fluids) and output (urine).	Excess fluid balance can lead to altered gas exchange. Monitoring fluid input and
		output can identify early signs of fluid overload.

Nursing Actions: Altered Gas Exchange

- Depending on the cause of the altered gas exchange, there are a variety of treatments that may be ordered by the healthcare provider.
- Generally, for altered gas exchange, some actions will improve or eliminate the alteration.
- Some actions the nurse may perform.
  - Oxygen therapy
    - Oxygen therapy is one of the quickest ways to improve gas exchange.
    - Immediately delivering oxygen by nasal cannula, mask, or another device is often done initially as part of the treatment for clients with gas exchange problems.
  - Chest procedures
    - Several things can cause an altered gas exchange. Sometimes it is constriction of the lung from inflating (blood, fluid, or infection in the pleural space). When this occurs, a thoracentesis (putting a needle or tube in the chest to drain the fluid) is performed. Often, the nurse will assist in the procedure and may need to monitor chest tubes that are inserted to continually drain fluid.
  - Ventilation
    - While oxygen can be administered when there is altered gas exchange, problems with ventilation may stop the oxygen from getting to the alveoli. When this occurs, artificial ventilation is done. A bag-valve-mask is one device that ventilates the lungs; a mechanical ventilator is another.
  - Medications
    - Many times, medications are given to reduce the problems that are causing altered gas exchange.
    - Here are some medications that are used to improve gas exchange in select conditions:

Medication Class	Pathophysiologic Problem	Considerations
Diuretics	Pulmonary congestion	Monitor electrolytes and blood pressure.
Antibiotics	Bacterial respiratory infection	Check for allergies to antibiotics.
Bronchodilators	Asthma	These can cause tachycardia and high blood pressure.
Steroids	Lung inflammation	Monitor for long-term side effects.

Antifungals	Fungal lung infection	These usually require prolonged treatment.
Anticholinergics	Chronic obstructive pulmonary	These can lead to anticholinergic toxicity.
	disease	
Bicarbonate	Acidosis (respiratory or metabolic)	Monitor arterial blood gasses frequently.

Oxygen Therapy

- Oxygen therapy is used to improve poor oxygenation in the lungs.
- Administration of oxygen is based on respiratory assessment and arterial blood gas results.
- There are different delivery devices for oxygen that deliver different concentrations of oxygen.

Delivery Device	**Liters per Minute**	**Oxygen Concentration**
Nasal cannula	1 to 6 LPM	24% to 44%
Simple face mask	6 to 12 LPM	35% to 50%
Partial and non rebreather masks	10 to 15 LPM	60% to 90%
Venturi mask	2 to 15 LPM	24% to 60%
High- flow nasal cannula	Up to 60 LPM	Up to 100%

Nursing Actions: Procedures

- Chest thoracentesis often happens urgently or emergency.
- Once the fluid is drained and if a chest tube is left in place, the client usually quickly improves.
- There are some things to remember with chest thoracentesis and chest tube insertion and care.
    - Thoracentesis
        - A needle is inserted into an area just outside the lung (usually the pleural space) to collect fluid either for analysis or to help the client breathe better. Things to remember:
            - This is a sterile procedure performed by a healthcare provider, so a sterile field including gloves and masks should be worn.
            - The fluid collected may need to be sent to the lab for analysis, so a properly marked container should be ready and sent to the lab right away.
            - If a chest tube is not inserted, an occlusive dressing should be used to cover the injection site.
            - Remember to medicate for pain.
    - Chest tubes