



Oxygenation

Nursing management of patients with impaired oxygenation status:

A. Nursing assessment of oxygenation status includes:

1. Health History:

- a. Exploration of the presenting problem, including duration, and the presence of cough, sputum, and pain.
- b. Past respiratory problems, and medical history.
- c. Lifestyle patterns, and the impact of the illness on activities of daily living.
- d. The client's knowledge level and coping abilities.

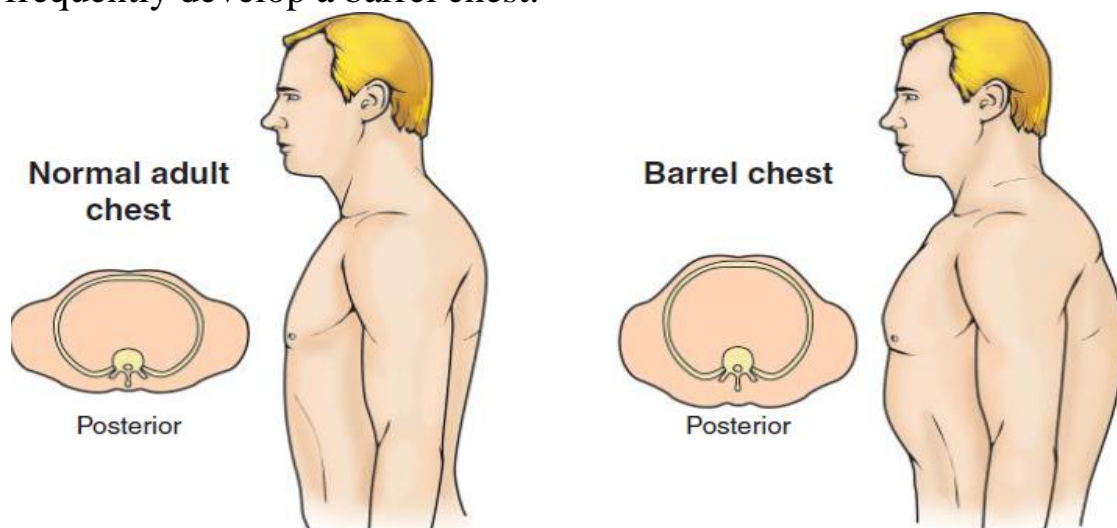
Health history related to oxygenation	
Problem	Descriptions
Cough	<ul style="list-style-type: none"> ◆ Onset: sudden or gradual, how long ago. ◆ Nature: dry, moist, productive, nonproductive. ◆ Pattern: continuous, occasional, related to time of day, position or activity, weather severity. ◆ Associated symptoms: pain, SOB, wheezing. ◆ Alleviating factors: vaporizers, medications.
Sputum	<ul style="list-style-type: none"> ◆ Amount, color, odor, and presence of blood. <p>Sputum color:</p> <ul style="list-style-type: none"> ✓ Clear/white: Associated with viral infections. ✓ Yellow/green: Associated with bacterial infection. ✓ Black: Associated with inhalation of smoke, or coal dust. ✓ Red/rust colored: Associated with the presence of blood (hemoptysis), tuberculosis, and pneumococcal pneumonia. ✓ Pink/frothy: Associated with pulmonary edema.
SOB	<ul style="list-style-type: none"> ◆ Onset: sudden or gradual. ◆ Pattern: associated with activity or position; continuous or intermittent. ◆ Associated symptoms: pain, cough, diaphoresis. ◆ Alleviating factors: position, medications.
Pain	<ul style="list-style-type: none"> ◆ Location, radiation. ◆ Nature: stabbing, burning, squeezing. ◆ Associated symptoms: dizziness, nausea, diaphoresis, palpitations. ◆ Aggravating factors, and Alleviating factors

2. Physical Examination:

- a. Observe the rate, depth, rhythm, and quality of respiration, noting the position that client assumes for breathing.

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- b. Inspects variations in the shape of the thorax that may indicate adaptation to chronic respiratory conditions. For example, clients with emphysema frequently develop a barrel chest.



- c. Palpate the thorax for bulges tenderness, abnormal movement. Palpation is also used to detect vocal (tactile) fremitus.
- d. The thorax can be percussed for diaphragmatic excursion (the movement of the diaphragm during maximal inspiration and expiration).
- e. Auscultation may reveal abnormal breath sounds such as rales (crackles) or wheezes (rhonci), pleural friction rub, or stridor.
- f. Assess the clients for signs and symptoms of hypoxia:
- ❖ The bluish discoloration of cyanosis is the result of the presence of desaturated hemoglobin in capillaries that may occur from either hypoxia or stagnant blood flow. When cyanosis is observed in the tongue, soft palate, and conjunctiva of the eye, it indicates hypoxemia, whereas cyanosis of the extremities, nail beds, and earlobes is often a result of vasoconstriction and stagnant blood flow.
 - ❖ Early clinical manifestations of hypoxia include restlessness, anxiety, dizziness, inability to concentrate, confusion, agitation, increased pulse rate, rapid and shallow respiration, and elevated blood pressure (unless the hypoxia is caused by shock) and cyanosis.
 - ❖ Clubbing of the fingers, which manifests as a flattened angle of the nailbed and a rounding of the fingertips, is a sign of chronic hypoxia.

3. Diagnostic and Laboratory Data:

- ✚ Sputum specimens & throat cultures.
- ✚ Visualization procedures (bronchoscopy).
- ✚ Arterial blood gases analysis.
- ✚ Pulse oximetry (a device placed on the fingertip for measuring SaO₂).
- ✚ Pulmonary function test (PFT): measures lung volume and capacity.



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- + Chest X-ray, CT scan, MRI. (Giving detailed pictures of thoracic structures).
- + Thoracentesis for sample collection.
- + Echocardiography, electrocardiography.

B. Nursing diagnosis: Oxygenation problems should be prioritized on the basis of the **A, B, C** format; that is, consider the **A**irway, **B**reathing, and **C**irculation. The primary nursing diagnoses are related to these priorities, that indicating alterations in respiratory function are:

1. **Ineffective air way clearance:** because of partial or complete obstruction of airway by (tongue, secretion, edema, and foreign body aspiration).
2. **Ineffective breathing pattern:** is commonly a problem for clients with pulmonary disease or **CNS** disorders that affect breathing.
3. **Impaired gas exchange:** Adequate O_2 does not enter the arterial blood and /or CO_2 is not removed from the venous blood. **e.g.** emphysema, atelectasis and pneumonia.

C. Outcome Identification and Planning:

The goals for caring a client with oxygenation problem are:

- a. Maintain a patent airway.
- b. Improve comfort and ease of breathing.
- c. Maintain or improve pulmonary ventilation and oxygenation.
- d. Improve the ability to facilitate in physical activities.
- e. Prevent risk associated with oxygenation problems such as skin and tissue breakdown, acid-base imbalance, and hopelessness.

D. Implementing nursing intervention:

1. **Ensuring a patent airway.**
2. **Positioning the client to allow for maximum chest expansion and encouraging ambulation:** The semi or high Fowler's position allows maximum chest expansion. The nurse also encourages clients to turn from side to side frequently, to permitted maximum expansion. Clients with severe pulmonary disease in one lung, if positioned laterally, should be generally positioned with the "good lung down" to improve diffusion of oxygen to the blood from functioning alveoli.
3. **Encouraging deep breathing and coughing exercises:** techniques may need to be taught to client to remove secretions from the airways. Effective coughing should be preceded by a series of slow, deep breaths. Normal forceful coughing involves the client inhaling deeply (pursed-lip breathing) and then coughing twice while exhaling. Alternative cough techniques such as forced expiratory technique, or huff coughing, may be taught for clients who are unable to perform a normal forceful cough.



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- 4. Ensuring adequate hydration:** adequate fluid intake, is important in thinning the pulmonary secretions so that they may be more easily expectorated. On the other hand, clients with CHF, may require limitation of fluid intake to reduce pulmonary congestion. **Nebulizers** are used to deliver humidity and medications, they may be used with O² delivery systems to provide moistened air directly to the client.
- 5. Administering Medications:** Bronchodilators, anti-inflammatory drugs, expectorants, and cough suppressants are some medications that may be used to treat respiratory problems. Other medications can be used to improve oxygenation by improving cardiovascular function. e.g., dobutamine increase cardiac output, thus improving O² transport. Pain medications are also administered to promote comfort.
- 6. Incentive spirometers:** also referred to as sustained maximal inspiration devices (SMIs), measure the flow of air inhaled through the mouthpiece. and are used to:
 - a. Improve pulmonary ventilation.
 - b. Counteract the effects of anesthesia or hypoventilation.
 - c. Loosen respiratory secretions.
 - d. Facilitate respiratory gaseous exchange.
 - e. Expand collapsed alveoli.
- 7. Percussion, vibration and postural drainage (PVD):** are techniques performed to promote the drainage of secretions from the lungs.
 - A. Percussion:**
 - ❖ Involves using a cupped hand to beat firmly on chest wall.
 - ❖ Percussion over congested lung areas can mechanically dislodge tenacious secretions from the bronchial walls.
 - ❖ To percuss a client's chest, ask the client to breathe slowly and deeply to promote relaxation, and percuss each affected lung segment for 1 to 2 minutes.
 - B. Vibration:**
 - ❖ A series of vigorous quivering produced by hands that are placed flat against the client's chest wall.
 - ❖ Used after percussion to increase the turbulence of the exhaled air and thus loosen thick secretions.
 - ❖ Ask the client to inhale deeply and exhale slowly through the nose or pursed lips. During the exhalation, tense all the hand and arm muscles, and using mostly the heel of the hand, vibrate (shake) the hands, moving them downward.
 - ❖ Stop the vibrating when the client inhales.
 - ❖ Vibrate during five exhalations over one affected lung segment.



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- ❖ After each vibration, encourage the client to cough and expectorate secretions into the sputum container.

C. Postural drainage:

- ❖ The drainage by gravity of secretions from lung segments, is accompanied by percussion and/or vibration applied to the chest wall to loosen secretions.
- ❖ A wide variety of positions is necessary to drain all segments of the lungs, but not all positions are required for every client.
- ❖ Before postural drainage, the client may be given a bronchodilator medication or nebulization therapy to loosen secretions.
- ❖ Scheduled two or three times daily, depending on the degree of lung congestion.
- ❖ It is best to avoid hours shortly after meals because postural drainage at these times can be tiring and can induce vomiting.

8. Oxygen therapy: The administration of O^2 is similar to that administering of medications and require similar nursing actions. When administering O^2 as an emergency measure, the nurse may initiate the therapy, and then contact the primary care provider for an order.

Supplemental O^2 is indicated for:

- a. Clients who have hypoxemia due to the reduced ability for diffusion of O^2 through the respiratory membrane (respiratory disease), or substantial loss of lung tissue due to tumors or surgery.
- b. Clients with severe anemia or blood loss.

O^2 is supplied by two ways in health care facilities:

- 1) Portable systems (cylinders, tanks, or O^2 concentrator).
- 2) Wall outlets (central).

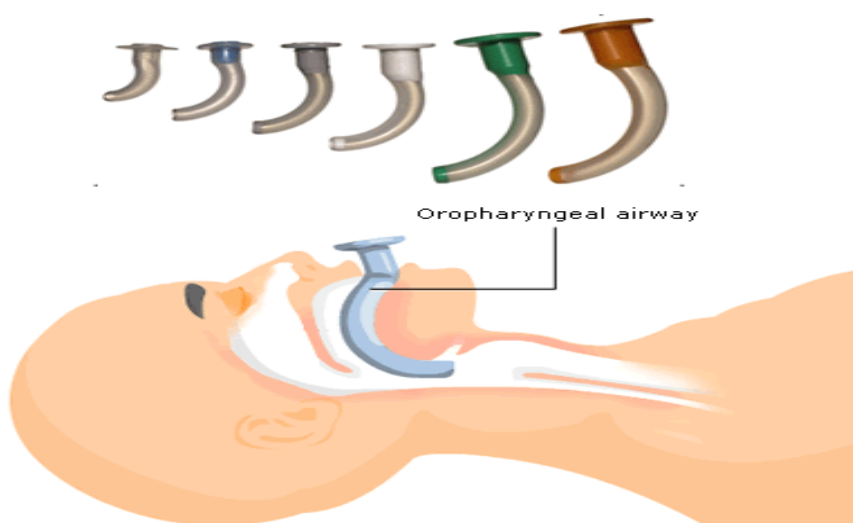
O^2 administered from a cylinders or wall outlets system is dry. Dry gases dehydrated the respiratory mucous membranes. Humidifying devices that add water vapor to inspired air are an essential adjunct of O^2 therapy, particularly for liters flows over 4 L per minutes. These device provide 20%- 40% humidity are commonly used when O^2 is delivered. Distilled or tap water is commonly used to humidify O^2 . Humidifiers prevent mucous membranes from drying and becoming irritated and loosen secretions for easier expectoration.

O^2 delivery systems:

1. Nasal cannula: at flow rate of 2-6 L/minute.
2. Face masks: at flow rate of 5-10 L/minute.
3. Face tent: at flow rate of 4-8 L/minute.
4. Transtracheal catheter: at flow rate of 15-20 L/minute.



5. Noninvasive positive pressure ventilation(ventilation mask and pump system) also called continuous positive airway pressure. Conditions requiring noninvasive ventilation include acute and chronic respiratory failure, pulmonary edema, COPD, and obstructive sleep apnea.
9. **Artificial airways:** are inserted to maintain a patent air passage for clients whose airway has become or may become obstructed, that's include four common types:
- a) **Oropharyngeal airways:** only used for clients with altered level of consciousness (e.g., because of general anesthesia, overdose, head injury). Sizes vary and should be appropriate to the size and age of the client.



- b) **Nasopharyngeal airways:** are tolerated better by alert clients. The nasopharyngeal airway should be well lubricated with water-soluble gel prior to inserting. Repositioning the airway in the other naris every 8 hours to prevent necrosis of the mucosa.

Both oropharyngeal and nasopharyngeal airways are used to keep the upper airway open when they become obstructed by secretions or the tongue.



- c) **Endotracheal tubes:** inserted in clients who have had general anesthesia or in emergency situation where mechanical ventilation is required.



d) Tracheostomy airways: temporary or permanent opening into the trachea when an endotracheal tube cannot be passed successfully. An opening (stoma) is made in the trachea below the cricoid cartilage, and a tracheostomy tube is passed through the opening and into the trachea.

10. Suction the airway: Suctioning: is aspirating secretions through a catheter connected to a suction machine or wall suction outlet when the clients have difficulty handling their secretions or an artificial airway is in place. The nurse decides when suctioning is needed by assessing the client for signs of respiratory distress or evidence that the client is unable to cough up and expectorate secretions.

- Adjust vacuum between 80 -120 mmHg for adults or 60-80 mmHg for pediatrics.
- Suction should not be applied for more than 10-15 seconds.
- Before re-suctioning, clear catheter with sterile water.
- Suctioning is associated with several complications: hypoxemia, trauma to the airway, nosocomial or health care–associated infection, and cardiac dysrhythmia, which is related to the hypoxemia.

11. Introduce chest drainage systems: Chest tubes may be inserted into the pleural cavity to drain collected air, blood or fluid in case of **pneumothorax, hemothorax and pleural effusion**. Because air rises, chest tubes for pneumothorax often are placed in the upper anterior thorax, whereas chest tubes used to drain blood and fluid generally are placed in the lower lateral chest wall.

12. Administer blood components: indicated when the client's oxygenation is impaired because of decreased circulating blood volume, decreased hemoglobin concentration in the blood (anemia), or hemorrhage. Red blood cells, plasma, clotting factors, proteins, or whole blood may be administered.

13. Monitor environmental and lifestyle conditions: Certain environmental allergens such as animal dander or feather pillows may be eliminate; others, such as house dust and pollen can be reduced using devices such as air filters. Smoking is a significant contributing factor in both heart and lung disease. Smoking cessation programs should be follow.

14. Emergency interventions: Complete airway obstruction, cardiac arrest, and respiratory arrest are emergency situations that will result in death if not immediately rectified.

A. Remove airway obstruction: The presence of a complete airway obstruction is characterized by an inability to speak, cough, or breathe; the victim may also raise his or her hands to the throat and will likely appear very anxious. The rescuer should verify that obstruction is present by asking the victim, "Are you choking?" Relief of the obstruction is attempted by way of the **Heimlich maneuver**.



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B. Initiate cardiopulmonary resuscitation (CPR): Cardiac and respiratory arrest require artificial support of circulation and ventilation. It is also referred to as basic life support (BLS).

E. Evaluation: determining whether the goals have been met, partially met, or not met.