

NURSING FOUNDATIONS II (N11) STUDY GUIDE

BASIC NURSING SKILLS IN THE CARE OF CLIENTS WITH BASIC PHYSIOLOGIC NEEDS: OXYGENATION

Introduction

Sufficient oxygenation is vital to maintain life and that we know based on our earlier learnings. For this session, you would need to recall what you have learned about oxygenation and the anatomy and physiology of the respiratory system and you would be expected to integrate this knowledge in the basic care of your clients with problems in oxygenation.

We need to know what is normal to be able to identify what is abnormal. When we prioritize our nursing interventions, we often say that we use “ABCs,” an acronym to signify the importance of maintaining a patient’s airway, breathing, and circulation. During the oxygenation process, several body systems work collaboratively to take in oxygen from the air, carry it through the bloodstream and oxygenate the tissues adequately. Any alteration

Let us take an example of what you have learned in your anatomy and physiology. You have learned that a healthy adult with healthy lungs will present himself with breathing that is unlabored, about 12-20 breaths per minute. But what if the client in front of you presents himself with the following:

- labored breathing around 30 breaths per minute
- is showing signs of increased respiratory effort such as nasal flaring and use of accessory muscle were evident
- positive for cyanosis
- showing signs of anxiety, confusion, restless

We will be discussing this scenario in this session.

Learning Outcomes

After studying this topic, you should be able to:

1. Describe the mechanisms for respiratory regulation.
2. Identify factors influencing respiratory function.
3. Identify four major types of conditions that can alter respiratory function.
4. Identify significant findings from data obtained based on nursing assessment.
5. Identify common nursing diagnoses based on significant assessment findings.
6. State outcome criteria for evaluating client responses to measures that promote adequate oxygenation.
7. Describe common nursing interventions to address nursing problems on respiratory function and oxygenation.
8. Discuss roles and responsibilities of nurses in providing oxygen therapy, administration and management.
9. Describe the steps in oxygen therapy, administration and management.
10. Evaluate outcomes of care and client’s response to interventions.

11. Develop a care plan for clients experiencing mild to moderate problems in oxygenation using the NANDA-I, NOC and NIC taxonomies.
12. Demonstrate appropriate documentation and reporting of nursing care.

ANATOMY AND PHYSIOLOGY OF RESPIRATION

Oxygen, a clear, odorless gas that constitutes approximately 21% of the air we breathe, is necessary for proper functioning of all living cells. The absence of oxygen can lead to cellular, tissue, and death.

Oxygenation is the delivery of oxygen to the body's cells.

Processes involved are: **ventilation, alveolar gas exchange, oxygen transport and delivery, and cellular respiration.**

DEEPENING YOUR UNDERSTANDING

Read: Oxygenation: Chapter 49, pp. 1303 - 1348

Berman, A., Snyder, S., & Frandsen, G. (2016). Oxygenation. *Kozier & Erb's Fundamentals of Nursing: Concepts, Process, and Practice*. 11th ed. (Global Edition) Upper Saddle River, New Jersey: Pearson Education, Inc.

You can also refer to the PowerPoint slide : **Basic Nursing Skills in the Care of CLIENTS with Basic Physiologic needs : OXYGENATION** uploaded in the course site.

Bring the following to class :

1. Non inflated balloon
2. Tape measure

Structures Of The Respiratory System

To enable us to assess the oxygenation status of our clients, and understand the meaning of our assessment, it is important that we have a clear understanding of the underlying structures of the respiratory system and how it works. Usually when we talk of respiration, the first thing which comes to our mind is breathing but the process is more than breathing itself.s

Respiratory System

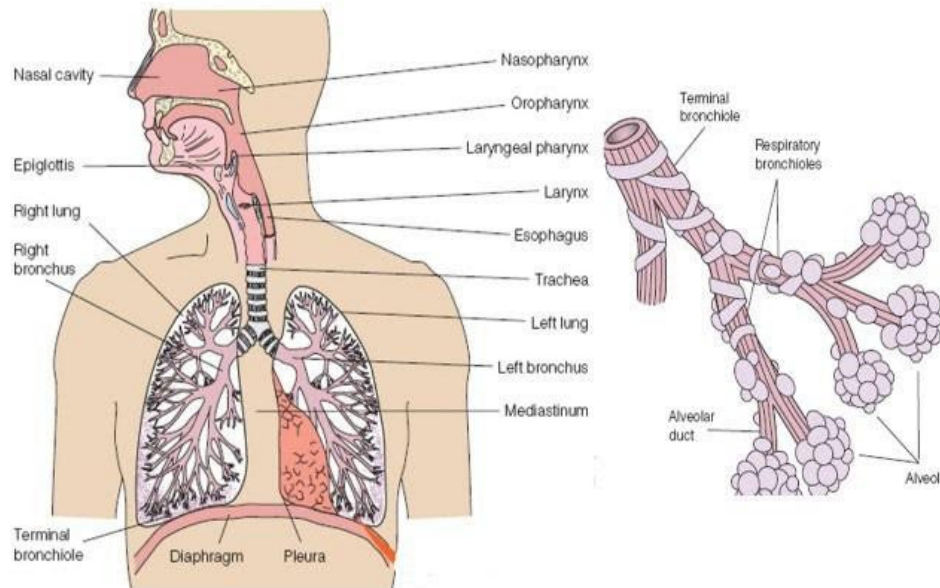


FIGURE 1tB

Respiratory bronchioles, alveolar duct, alveoli

FIGURE 1A

Organs of the Respiratory Tract

PHYSIOLOGY OF RESPIRATORY SYSTEM:

The main function of the respiratory system is providing the body with constant supply of oxygen and removing Carbon dioxide or gas exchange

Major organs of the respiratory system functions primarily to provide oxygen to the tissues of the body for cellular respiration, remove waste the product which is carbon dioxide and help maintain acid base balance.

Pulmonary ventilation is movement of air into and out of the lungs. Respiration is the exchange of air. Perfusion is delivery to tissues.

Pulmonary Ventilation

- Movement of air into and out of lungs
- 2 phases, inhalation and exhalation
 - Inspiration- active phase, involves movement of muscles
 - Expiration- passive phase, movement of air out of lungs
- Immediately before inspiration, air pressure in the lungs is equal to that of surrounding atmospheric pressure
- The pressure in the lungs decreases as the volume increases

- Other factors that contribute to air flow into and out of lungs:
 - musculature; compliance of lung tissue; airway resistance
- *Lung compliance* is ease with which lungs can be inflated and affects lung volumes

- ability of lungs to fill is aided by elasticity and surfactant
- emphysema results in decreased elasticity and compliance
- *Airway resistance* is any obstruction or impediment of air as it moves through the airway
 - bronchial constriction in asthma is a form of airway resistance due to decreased diameter of airways

Respiration

- *Gas exchange* occurs at terminal alveolar capillary system
 - via diffusion - high concentration to lower concentration
 - the greater pressure of O₂ in the alveoli forces the O₂ to diffuse into the unoxygenated venous blood; CO₂ from blood to alveoli
- *Diffusion of gases* in the lung is influenced by four factors
 - change in surface area available
 - thickening of alveolar capillary membrane
 - partial pressure
 - solubility and molecular weight of gas
- *Surface Area*
 - any detrimental change in area available for gas exchange hinders diffusion
 - atelectasis decreases surface area
 - conditions that can lead to atelectasis: obstruction d/t foreign body, mucous plugging, airway constriction, external compression (i.e. Tumors or large blood vessels), and immobility
 - any disease that results in thickening of alveolar membrane affects diffusion
- *Partial Pressure*
 - pressure resulting from any gas in a mixture depending on its concentration
 - higher altitudes have lower partial pressure of oxygen
- *Solubility and Molecular Weight*
 - CO₂ has greater solubility and diffuses more quickly allowing it to be exhaled during each expiratory phase

Perfusion

- Body process of supplying oxygenated blood to the cells; reliant on adequate cardiac output
- Amount of blood flowing through the lungs is a factor in the amount of oxygen and other gases exchanged
 - can depend on client's position and activity level
 - increased activity results in increased needed for cellular oxygen in body's tissue which leads to an increase in cardiac output and increase of blood to lungs
 - perfusion also depends on adequate cardiovascular functioning
- Hypoxia- condition in which inadequate amount of oxygen is available to cells
 - most common symptoms of hypoxia are:
 - dyspnea
 - elevated blood pressure with small pulse pressure

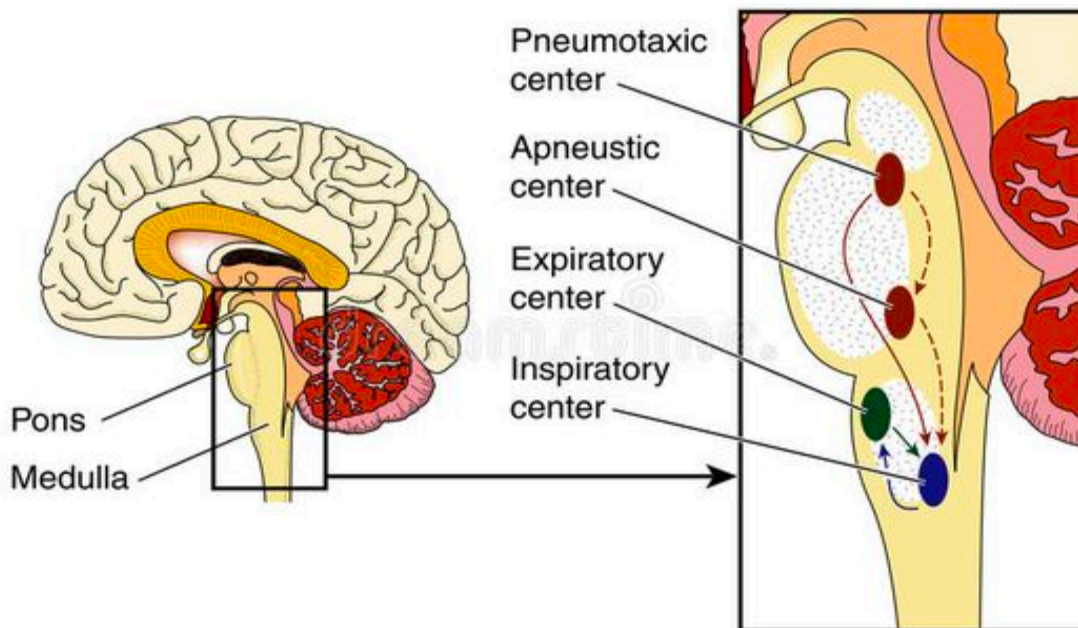
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- elevated blood pressure with small pulse pressure
- increased respiratory and pulse rates
- pallor
- cyanosis
- hypoxia is often caused by hypoventilation
- S/SX: altered thought processes, headaches, chest pain, enlarged heart, clubbing, anorexia, constipation, decreased urinary output, decreased libido, weakness, muscle pain

Regulation of Respiration

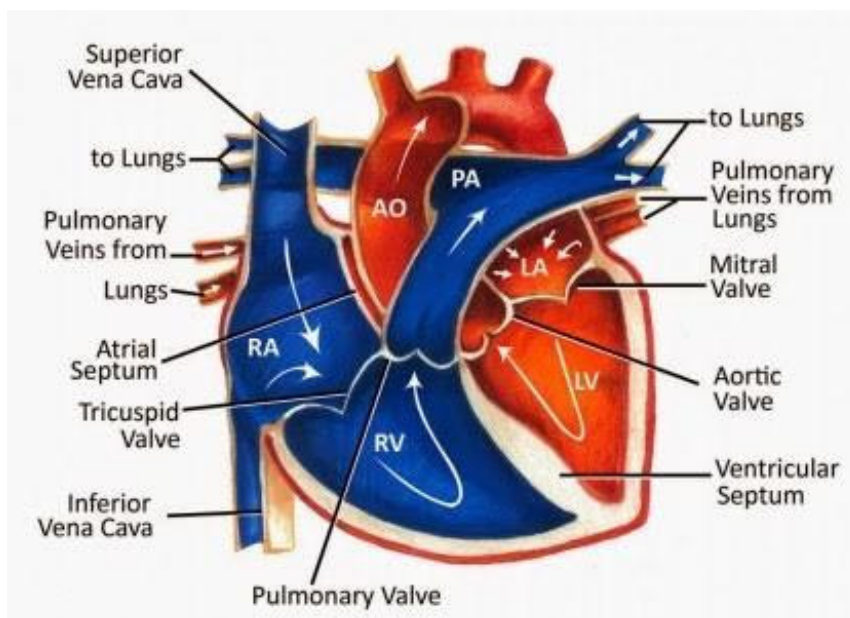
- Respiratory center is located in the medulla oblongata
 - it is stimulated by an increase in CO₂ and hydrogen ions and, to a lesser degree, by decreased O₂ in arterial blood
 - chemoreceptors in aortic arch and carotid bodies are sensitive to arterial blood gas levels and blood pressure and can activate the medulla
 - proprioceptors in muscles and joints respond to body movement and can increase ventilation
- Stimulation of medulla increased rate and depth of ventilation to blow off CO₂ and hydrogen and increase O₂
 - if a condition causes a chronic change in O₂ and CO₂ levels, the chemoreceptors may become desensitized and not regulate ventilation adequately



CV System and Transport of Gases

For oxygen and carbon dioxide to move through out the body an adequately functioning cardiovascular system is vital.

- The cardiovascular system is composed of:
 - heart and blood vessels
 - atria- receive blood from veins
 - ventricles- receive blood from atria and force blood to the body and lungs
 - one-way **valves that direct flow are located at entrance and exit of each ventricle**



Factors Affecting Respiratory Function

Factors that influence oxygenation affect the cardiovascular system as well as the respiratory system. These factors include:

1. Health Status / Level of Health

- Acute and chronic illness can affect respiratory function
 - individuals with renal and cardiac problems have compromised respiratory function because of fluid overload and impaired tissue perfusion
 - individuals with chronic illness often have muscle wasting and poor muscle tone
 - Anemia can lead to impaired gas exchange
 - MI causes lack of blood supply to the heart. Damaged tissue results in less effective contractions and decreased perfusion and gas exchange
 - scoliosis- air trapping
 - Obesity- lack of exercise, decreased inflation at base of lungs, chronic bronchitis

Age

Developmental Considerations:

A. Neonates and Infants:

- lungs transition from fluid filled to air filled
- airways are short and aspiration is a potential problem
- RR is rapid
- surfactant is formed in utero at 34 to 36 weeks
- respiratory activity is primarily abdominal

B. Toddlers, Preschoolers, School Aged and Adolescent:

- preschool child's eustachian tubes, bronchi, and bronchioles are elongated and less angular
- by end of late childhood, immune system is more developed

C. Older Adults:

- airways become less elastic
- respiratory muscles are less effective
- airways collapse more easily

3. Medications

- Clients receiving drugs that affect the CNS need to be monitored for respiratory depression or arrest
- Opioids depress the medullary respiratory center

4. Lifestyle

- Sedentary activity patterns do not encourage expansion of alveoli
- People who exercise respond better to respiratory stressors
- Cigarette smoking is the most important risk factor for COPD

5. Environment

- Altitude, pollution; extreme temperatures (HOT/COLD)
- Occupation exposure to asbestos

6. Psychological Health/ Stress:

Those responding to stress may hyperventilate which can lead to lowered CO₂

Alterations in Respiratory Functions

It is important to have a good understanding of conditions that can alter the respiratory function for this will serve as our guide in performing the appropriate nursing intervention. Respiratory function could be altered by conditions which affect the patency of the airway, movement of air in and out of the lungs, diffusion of carbon dioxide between the alveoli and the pulmonary capillaries and transport of oxygen and carbon dioxide via the blood to and from the tissue cells.

Activity 1

Answer the following: post your answers in the discussion forum.

- Inflate the balloon then deflate it. Put the balloon inside a 300 ml water bottle and try inflating it. Compare your experience. Why the difference?
- Put a small hole in the balloon, then inflate it. What happens?
- If we compare the balloon to our lungs, can you describe what will happen if certain conditions prevent the lungs to fully expand?

Applying the Nursing Process in The Care of Clients with Mild to Moderate Health Problems Related to Oxygenation

Discussion will focus on the role of the nurse in the management of clients with mild to moderate oxygenation problems using the nursing process.

1. Assessment
 - Nursing Health History
 - Physical examination Common laboratory and diagnostic tests: Pulmonary Function tests; sputum test, throat cultures, arterial blood gas, visualization procedures
2. Nursing Diagnosis
 - Examples and definitions of NANDA-I nursing diagnoses related to oxygenation:
 - Ineffective Airway Clearance
 - Impaired Gas Exchange
 - Ineffective Breathing Pattern
 - Impaired gas exchange
 - Activity Intolerance
3. Planning: Goals/Outcomes of Care
 - Statement of outcomes of care to meet client needs on oxygenation following the NOC taxonomy
 - this would include: a. maintaining a patent airway, b. improves comfort and ease of breathing; c. maintaining and improving pulmonary ventilation and oxygenation; d. improving ability to participate in activities; e. preventing risks associated with oxygenation problems.
4. Implementation
 - Improving oxygen uptake and delivery
 - Basic Nursing interventions/ skills to achieve this goal include: a. ensuring a patent airway, b. proper positioning, c. deep breathing and coughing exercises, d. encourage/ensure adequate hydration; e. use of incentive spirometry; percussion, vibration and postural drainage; g. suctioning

Basic Nursing Intervention/ skill:

Oxygen therapy - Administration of supplemental oxygen is a procedure similar to that of administering medications. It requires a prescription or medical order from the primary care provider who specifies the concentration and method of delivery. Low flow and high flow systems are available to deliver oxygen to the client.

Ex.

1. **Nasal cannula or nasal prongs**- the most common device used to administer oxygen. it delivers a relatively low concentration of oxygen (24%-40% at a flow rate- 2-6L/min)

It is relatively comfortable for the client because it allows him to talk, eat and gives the client some freedom in his movement

2. **Simple face mask** - delivers 40%- 60% (5- 8 L/min)

3. Nonrebreather face mask- delivers highest oxygen concentration possible - 95% - 100% (without intubation and ventilation) the mask has a one- way valve and has a reservoir bag attached - this ensures that only the oxygen in the bag is inspired (room air and exhaled air cannot enter the bag)

4. **Venturi mask** - deliver oxygen concentrations from 24% - 50%with the use of color coded jet adaptors that corresponds to a precise oxygen concentration and liter flow

5. **Partial rebreather mask** - delivers 60%-90% (6-10 L) - it has an oxygen reservoir bag attached which allows the client to be able to rebreathe abt 1/3 of exhaled air

Suctioning : a method of removing retained secretions or other semi-liquid fluids from the patient's airways

To perform suctioning properly, it's important to have the right equipment. You will need the following:

- Vacuum source
- Collection bottle
- Connecting tubing
- Disposable sterile gloves
- Sterile suction catheter
- Sterile water
- Goggles, mask, etc.
- Supplemental Oxygen source
- Pulse oximeter
- Stethoscope
- Sterile sputum trap – if sample of secretion/sputum is needed

What is the Normal Suctioning Pressure?

In order to suction a patient effectively, you need to set the proper suctioning pressure to ensure that a) it's strong enough to remove the secretions, and b) it's not dangerously strong enough to cause damage to the airway.

A general rule of thumb: The suction pressure should be set at the lowest effective level.

- For adults, the suction pressure should be set from 120-150 mm Hg.
- For children, the suction pressure should be set from 100-120 mm.
- For infants, the suction pressure should be set from 80-100 mm Hg.s

Read: Oxygenation: Chapter 50, pp. 1285- 1292.

Berman, A., Snyder, S., & Frandsen, G. (2016). *Oxygenation*. Kozier's & Erb's Fundamentals of Nursing: Concepts, Process, and Practice. 12th ed. (Global Edition)Upper Saddle River, New Jersey: Pearson Education, Inc.

Nursing Skills Building:

Oxygen Therapy

https://docs.google.com/presentation/d/1qKOLhfCQkjKrRGeu9VudNBSck3JRQFK6Hx4Tc-U42f8/present#slide=id.gee51da024c_0_0

Suctioning: ex oropharyngeal suctioning

[Performing oropharyngeal suctioning](#)

View the related video materials at Elsevier Clinical Skills (2020). OXYgen Therapy. Accessed from: <https://www.elsevierclinicalskills.co.uk/SampleSkill/tabid/112/sid/1589/Default.aspx#&&index=7>

Refer to UPCN Procedure e-Manual and view short video clips demonstrating proper use/administration of the different oxygen devices and Suctioning

Read: Oxygenation: Chapter 49 pp. 1303- 1348

Berman, A., Snyder, S., & Frandsen, G. (2016). *Oxygenation*. Kozier's & Erb's Fundamentals of Nursing: Concepts, Process, and Practice. 11th ed. (Global edition)Upper Saddle River, New Jersey: Pearson Education, Inc.s

5.Evaluation of outcomes of care



Client's response to interventions

Assignment # 1: Clinical Application: Oxygenation

Post your answers in the submission bin

Scenario : Patient claims that he was having some difficulty in breathing. Upon reading her chart, you saw that there was an order for oxygen at 2L via nasal cannula .

Answer the following :

- 1.What are the indications of Oxygen therapy?
2. What should you do before starting the oxygen therapy?
3. Give 2 Nursing responsibilities when administering oxygen therapy.

References

Berman, A., Snyder, S., & Frandsen, G. (2016). *OXYGENATION*. Kozier& Erb's Fundamentals of Nursing: Concepts, Process, and Practice. 11th ed.(Global Edition)Upper Saddle River, New Jersey: Pearson Education, Inc. Chapter 49 pp. 1303-1348s

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UPCN procedure Checklist e-Manual
UPCN Video Checcklist

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