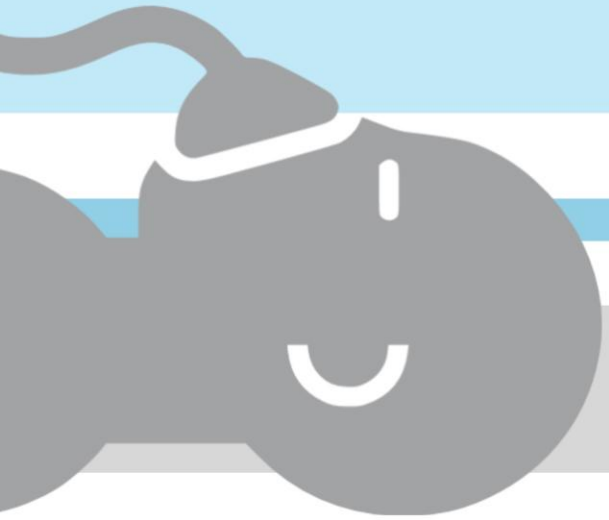

ANESTHESIA

(4) Part II Oxygen Therapy

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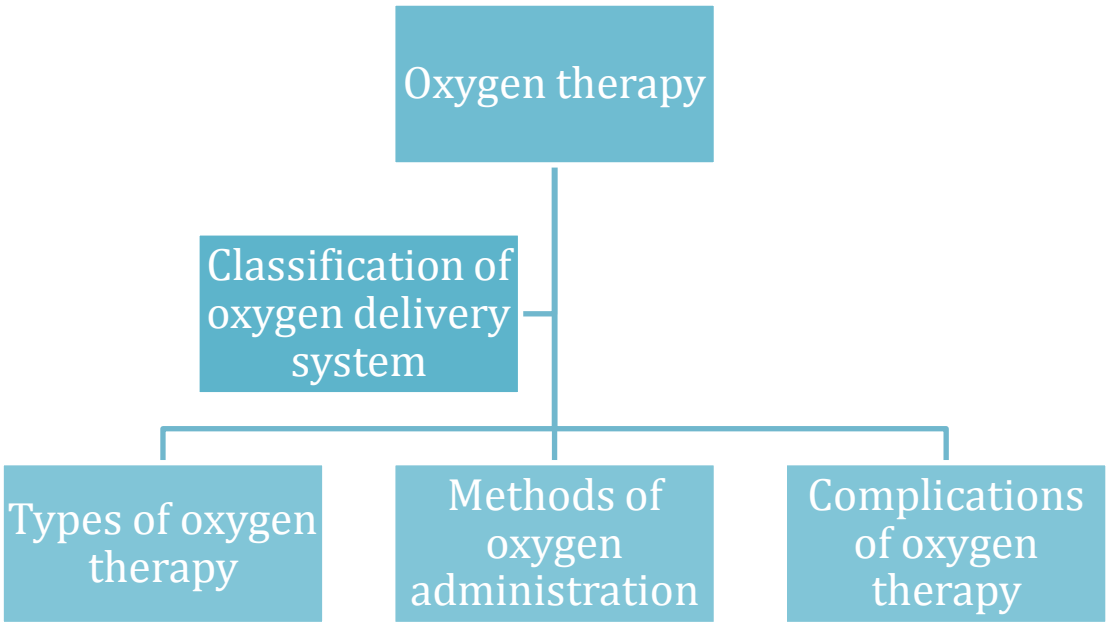
Doctor's note Team's note Not important Important 431 teamwork
(431 teamwork do not highlight it in yellow, but put it in a yellow "box")

Objectives:

- ✓ **Define the oxygen therapy**
- ✓ **Discuss the type of oxygen therapy**
- ✓ **List the purpose of using the oxygen therapy**
- ✓ **Explain the procedure**
- ✓ **Demonstrate the procedure**
- ✓ **List Complication of oxygen therapy**



Definition

- **Oxygen is a colorless, odorless, tasteless gas that is essential for the body to function properly and to survive.**

What is the meaning of O_2:

- **Oxygen therapy is the administration of oxygen at a concentration of pressure greater than that found in the environmental atmosphere**
- **The air that we breathe contain approximately 21% oxygen**
- **The heart relies on oxygen to pump blood.**
- **The brain can't tolerate hypoxia→ 4 minutes of no oxygen reaching to the brain→brain dead.**

Purpose:

- **Oxygen therapy is a key treatment in respiratory care.**

- **The purpose is to increase oxygen saturation in tissues where the saturation levels are too low due to illness or injury.**

- **Oxygen therapy is used to treat a wide variety of cases such as:**
  - **Documented hypoxemia**
  - **Severe respiratory distress (acute asthma or pneumonia)**
  - **Severe trauma**
  - **Chronic obstructive pulmonary disease (COPD, including chronic bronchitis, emphysema, and chronic asthma)**
  - **Pulmonary hypertension**
  - **Acute myocardial infarction (heart attack)**

- **Short-term therapy, such as post-anesthesia recovery**
- **Oxygen may also be used to treat chronic lung disease patients during exercise.**

Preparation:

- **A physician's order is required for oxygen therapy, except in emergency use. (Oxygen is considered a drug!)**
- **Clinical observations.**
- **Indicated in Arterial Blood Gas measurements (ABGs) .**
- **Pulse Oximetry (works by light waves so anything that blocks the light waves from reaching the RBCs will give a false reading. Example: henna, nail polish, etc.)**

Cautions for Oxygen therapy:

- **Oxygen toxicity – can occur with FIO2 > 50% longer than 48 hrs**
- **Danger of fire.**
- **Infections**

Classification of Oxygen Delivery System:

- **Low flow systems**
  - **Contributes partially to inspired gas the patient breathes**
  - **Ex: nasal cannula, simple mask, non-re breather mask, Partial rebreather mask**
- **High flow systems**
  - **Delivers specific and constant percentage of oxygen independent of patient's breathing**
  - **Ex: Venturi mask, trach collar, T-piece**

Methods of Oxygen Administration:

1) Nasal Cannula:

- ❖ It is disposable.
- ❖ Plastic device with two protruding prongs for insertion into the nostrils, connected to an oxygen source.
- ❖ Used for low-medium concentrations of Oxygen (24-44%).

Method	Amount Delivered (FiO2)	Priority nursing interventions	Advantages	Disadvantages
Nasal Cannula	Low Flow 24-44 % 1 L\min=24% 2 L\min=28% 3 L\min=32% 4 L\min=36% 5 L\min=40% 6 L\min=44% (Just add 4 as you go!) *Very important to memorize this box!	➢ Check frequently that both prongs are in clients nares ➢ Never deliver more than 2-3 L\min to client with chronic lung disease	➢ Client able to talk and eat with oxygen in place ➢ Easily used in home setting	➢ May cause irritation to the nasal and pharyngeal mucosa if oxygen flow rates are above 6 liters/minute Variable FIO2

2) Face Mask (4 types):

- ➢ The simple Oxygen mask
- ➢ The partial rebreather mask
- ➢ The non rebreather mask
- ➢ The venturi mask

❖ Simple Oxygen Mask:

- Simple mask is made of clear, flexible, plastic or rubber that can be molded to fit the face.
- It delivers 35% to 60% oxygen.
- A flow rate of 6 to 10 liters per minute.
- Often it is used when an increased delivery of oxygen is needed for short periods (i.e. less than 12 hours) like postoperative period.

Method	Amount Delivered (FiO2)	Priority nursing interventions	Advantages	Disadvantages
Simple Oxygen Mask	✓ Low Flow ✓ 6-10 L\min ✓ 35%-60% *Very important to memorize!	➢ Monitor client frequently to check placement of the mask. ➢ Support client if claustrophobia is concern ➢ Secure physician's order to replace mask with nasal cannula during meal time	➢ Can provide increased delivery of oxygen for short period of time	➢ Tight seal required to deliver higher concentration ➢ Difficult to keep mask in position over nose and mouth ➢ Potential for skin breakdown (pressure, moisture) ➢ Wasting ➢ Uncomfortable for pt while eating or talking ➢ Expensive

❖ The partial re-breather mask:

- The mask has a reservoir bag must remain inflated during both inspiration & expiration.
- It collects the first parts of the patients' exhaled air.
- It is used to deliver oxygen concentrations up to 80%.
- The oxygen flow rate must be maintained at *a minimum of 6 L/min* to ensure that the patient does not rebreathe large amounts of exhaled air.
- The remaining exhaled air exits through vents.

❖ The non re-breather mask:

- This mask provides the highest concentration of oxygen (95-100%) at a flow rate 6-15 L/min.
- It is similar to the partial re-breather mask except the two one-way valves prevent conservation of exhaled air.
- The bag is an oxygen reservoir.

Method	Amount Delivered (FiO2)	Priority nursing interventions	Advantages	Disadvantages
Partial Re-breather Mask	✓ Low Flow ✓ 6 L\min ✓ 75%-80% oxygen *Very important to memorize!	➢ Set flow rate so mask remains two-thirds full during inspiration ➢ Keep reservoir bag free of twists or kinks	➢ PT can inhale room air through openings in mask if oxygen supply is briefly interrupted	➢ Requires tight seal (eating and talking difficult, uncomfortable ➢ Not as drying to mucous membranes

Method	Amount Delivered (FiO2)	Priority nursing interventions	Advantages	Disadvantages
Non Re-breather Mask	✓ Low Flow ✓ 6-15 L \min ✓ 80%-100 *Very important to memorize!	➢ Maintain flow rate so reservoir bag only collapses slightly during inspiration ➢ Check that valves and rubber flaps are function properly (open during expiration) ➢ Monitor SaO2 with pulse oximeter.	➢ Delivers the highest possible oxygen concentration ➢ Suitable for pt breathing spontaneous with sever hypoxemia	➢ Impractical for long term Therapy ➢ Malfunction can cause CO2 buildup ➢ Expensive ➢ Feeling of suffocation ➢ Uncomfortable

❖ **The Venturi mask:**

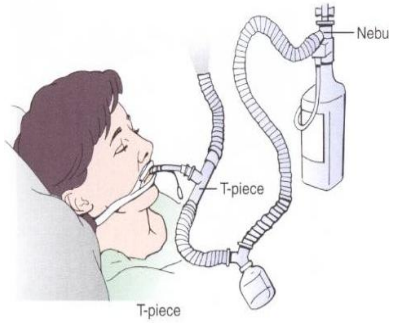
- **It is high flow concentration of oxygen.**
- **Oxygen from 40 - 50%**
- **At liters flow of 4 to 15 L/min.**
- We use it with COPD patients cause it delivers precise and low percentage of Oxygen.

Method	Amount Delivered (FiO2)	Priority nursing interventions	Advantages	Disadvantages
Venturi Mask	✓ Oxygen from 40-- 50% ✓ of 4 to 15L/min. *Very important to memorize!	➢ Requires careful mointoring to verify F1O2 at flow rate ordered ➢ Check that air intake valves are not blocked	➢ Delivers most precise oxygen concentration ➢ Doesn't dry mucous membranes (humidity)	➢ Uncomfortable ➢ Risk of skin irritation ➢ Causes respiratory depression in COPD patient with high oxygen concentration 50%

3) T-piece:

- **Used on end of ETT (endotracheal tube) when weaning from ventilator.**
- **Provides accurate FIO2.**
- **Provides good humidity.**

(Used in long-term ICU patients to decrease dryness and risk of infections)



Side effects and complications of oxygen therapy:

- **Oxygen toxicity**
- **Retrolental fibroplasia (especially in premature babies) free radicals→ blindness.**
- **Absorption atelectasis (with 100% oxygen supplementation, nitrogen replacements results in alveoli collapse as the body tends to absorb all the oxygen from the alveoli; vacuum effect)**
-

Oxygen Toxicity:

- **It is a condition in which ventilator failure occurs due to inspiration of a high concentration of oxygen for a prolonged period of time.**
- **Oxygen concentration greater than 50% over 24 to 48 hours can cause pathological changes in the lungs.**

Signs and symptoms of oxygen toxicity:

- **Non-productive cough.**
- **Nausea and vomiting.**
- **Sub-sternal chest pain.**
- **Fatigue.**
- **Nasal stuffiness.**
- **Headache.**
- **Sore throat.**
- **Hypoventilation.**
- **Nasal congestion.**
- **Dyspnea.**
- **Inspiration pain.**

N.B. These are all non-specific signs and symptoms however the presence of 3-4 should raise a high suspicion of oxygen toxicity. Oxygen toxicity is a diagnosis of suspicion)

Evaluation:

- **Breathing pattern regular and at normal rate.**
- **Pink color in nail beds, lips, conjunctiva of eyes.**
- **No confusion, disorientation, difficulty with cognition.**
- **Arterial oxygen concentration or hemoglobin and Oxygen saturation within normal limits.**
  N.B. There is a 12 seconds delay between the oxygen saturation reading and the true hypoxia.

Documentation:

- **Date and time oxygen started.**
- **Method of delivery.**
- **Oxygen concentration and flow rate.**
- **Patient observation.**
- **Add oro-nasal care to the nursing care plan**

O2 DELIVERY DEVICES:

EQUIPMENT	FLOW	FIO2	SPECIAL NOTES
NASAL CANNULA	1/2 - 6 L/M	.24 – 44	6 L/M MAX.
SIMPLE O2 MASK (WITHOUT BAG)	6 - 10 L/M	.35 – 55	USE 5 L/M MINIMUM
RESERVOIR MASK (MASK WITH BAG)	10-15 L/M	.60 -80	PAGE RT IF USED (BAG TO NOT COLLAPSE)
VENTI MASK	3 L/M 6 L/M	.24, 26, 31, .35, .40, .50	READ ENCLOSED INSTRUCTIONS
NEBULIZER	8 L/M OR >	.28, .30, .35 .40, .50, 70	MIST MUST BE VISIBLE
*** SHOWS THAT FIO2 VARIES WITH DIFFERENT F, VT, INSPIRATORY FLOW RATES.			

N.B. You should memorize all the numbers related to nasal cannula and the percentages of other methods.

Summary

- ✓ ***Oxygen is a drug, with serious side effects*** ***(O2 toxicity, retrolental fibroplasia, absorption atelectasis) if not used in a proper manner!***
- ✓ ***The brain can't tolerate long durations of hypoxia (4 mins of no O2 → brain death)***
- ✓ ***Oxygen therapy is used for the management of many diseases.***
- ✓ ***Oxygen can be administered via nasal cannula, mask (simple, partial rebreather, non-rebreather, venturi mask, T-piece)***
- ✓ ***Nasal cannula can cause dryness, ulcer, irritation of the nasal and pharyngeal mucosa.***
- ✓ ***Mask oxygenation can cause keratitis if not fitted properly on the face (came in contact with the eye for a period of time).***
- ✓ ***Peripheral vasoconstriction, methylene blue, CO, hypovolemia, nail polish, henna all can affect the pulse oximetry reading.***
- ✓ ***Non- rebreather mask delivers the highest possible oxygen concentration (95-100%)***
- ✓ ***Venturi delivers the most precise oxygen concentration, therefore used for COPD patients.***
- ✓ ***Non-rebreather mask has an oxygen reservoir bag as opposed to the partial rebreather mask, which has a CO2 reservoir bag.***
- ✓ ***Absorption atelectasis occurs when 100% oxygen is supplied, body absorbs all the oxygen leaving the alveoli completely empty to collapse.***
- ✓ ***The monitor reads oxygen saturation 12 seconds later than actual onset of desaturation.***
- ✓ ***Below 92% O2, oxygen saturation rapidly drops.***

MCQ's :

1. *Which of the following delivers the most accurate O2 concentration?*

    a. *Nasal Cannula*
    b. *Simple Mask*
    c. *Venturi Mask*
    d. *T-piece*

2. *Which of the following is a high flow system?*

    a. *Venturi Mask*
    b. *Simple Mask*
    c. *Partial Rebreather Mask*
    d. *Non- Rebreather Mask*

3. *Non-rebreather Mask delivers a maximum _____ % of O2.*
    a. *44%*
    b. *60%*
    c. *80%*
    d. *100%*

1. *C*
2. *A*
3. *D*

For mistakes or feedback

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