Pulmonary therapeutic management

I Oxygen therapy
I Artificial airways
I Invasive mechanical ventilation

0 Noninvasive ventilation
0 Positioning therapy
0 Thoracic surgery
0 Pharmacology

Goal of therapy

- **Goal: to ensure adequate cellular oxygenation**
- **How? To permit full use of oxygen-carrying capacity of arterial blood**
- **How? To provide sufficient concentration of inspired oxygen**
- **What are the basic fysiological needs to do this?**
  - *adequate hemoglobin concentration*
  - *adequate cardiac output*

Principles of therapy

- How do we express the amount of oxygen given?
- What is the indication to give oxygen?
- What are the target values?

How do we express the amount of oxygen given?

- **Percentage of inhaled air**
  - normal: 21%
  - mask: 40%
- **Fraction of inspired oxygen (Fio2): 0.4**
- **liters per minute (L/min): 2-15**

What are indications to give oxygen?

- *Hypoxemia*
- *Hypoxia*
- *Fever*
- *Shock*
- *Multitrauma*

What are the target values?

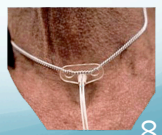
- *arterial partial pressure of oxygen (PaO2) >60mmHg*
- *arterial hemoglobin saturation (SaO2) greater than 90%*

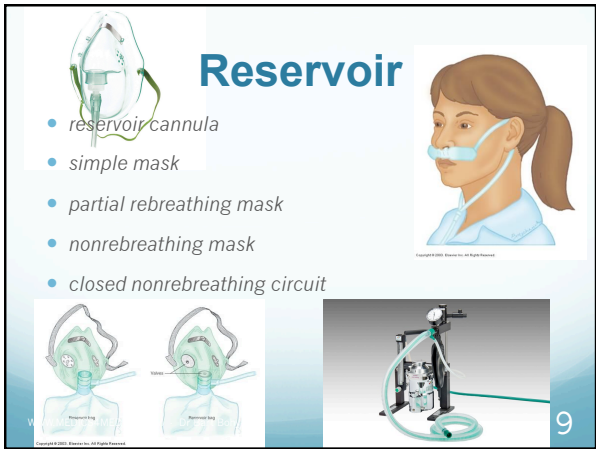
Methods of delivery

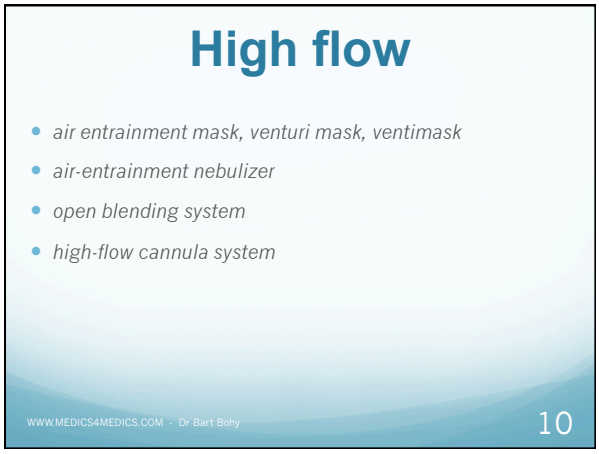
- low flow
- reservoir
- high flow

Low flow

- *nasal cannula:* Used for
  - *stable patients needing low FiO2*
  - *home care patients requiring long term therapy*
- *nasal catheter*
  - used for procedures in which canulla is difficult to use
    - *bronchoscopy*
    - *long term care for infants*
- *transtracheal catheter:*
  - for home care patients who need increased mobility or who do not accept nasal oxygen




Reservoir
reservoir cannula
simple mask
partial rebreathing mask
nonrebreathing mask
closed nonrebreathing circuit
9


High flow
air entrainment mask, venturi mask, ventimask
air-entrainment nebulizer
open blending system
high-flow cannula system
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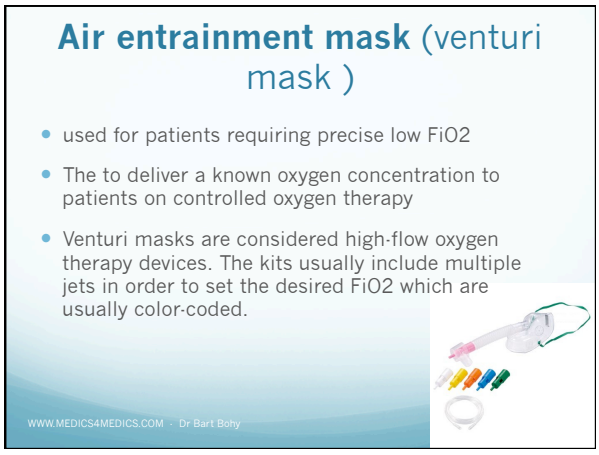
10


Air entrainment mask (venturi mask)
used for patients requiring precise low FiO2
The to deliver a known oxygen concentration to patients on controlled oxygen therapy
Venturi masks are considered high-flow oxygen therapy devices. The kits usually include multiple jets in order to set the desired FiO2 which are usually color-coded.
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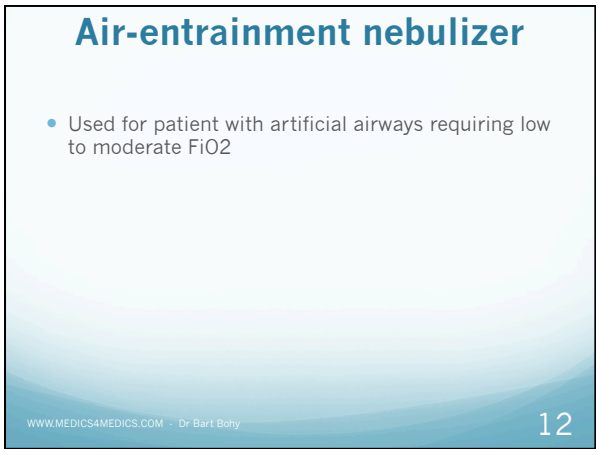
Air-entrainment nebulizer
Used for patient with artificial airways requiring low to moderate FiO2
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12

Open blending system

- A piston ventilator is disclosed herein which uniquely includes an oxygen blending module which supplies oxygen enhancement for aiding patients requiring respiratory treatment.
- used for patients with high ventilation needs who need high FiO2

High-flow cannula system

- for patients with high or variable ventilation needs who need supplemental oxygen, positive pressure or humidity

Complications of oxygen therapy

- **oxygen toxicity**
- **carbon dioxide retention**
- **absorption atelectasis**

Oxygen toxicity

- *when does it occur?*

In patients who breathes oxygen concentrations of greater than 50% for longer than 24 hours.

How does it work?

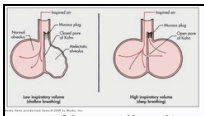
- The administration of higher-than-normal oxygen concentrations produces oxygen free radicals. These damage the alveolar-capillary membrane.
- Normally, enzymes neutralize the radicals
- Damage to the lung parenchyma and vasculature occurs, resulting in the initiation of acute respiratory distress syndrome (ARDS)

Symptoms of oxygen toxicity

- chest pain when deep breathing
- sore throat, tracheal irritation and a dry cough
- pleuritic pain on inhalation, followed by dyspnea
- eye and ear discomforts

Carbon dioxide retention

- *in patients with severe COPD, CO2 retention may occur as a result of administration of oxygen in high concentrations*
- *In COPD patients, hypoxemia is the stimulus to breathe, rather than the arterial partial pressure of carbon dioxide*



Absorption atelectasis

- Normally nitrogen fills the alveoli and helps hold them open.
- Breathing high concentrations of oxygen washes out the nitrogen.
- Oxygen is absorbed into the bloodstream faster than it can be replaced in the alveaoli. Therefor the alveoli start to shrink and collapse in areas of the lungs that are minimally ventilated

Nursing management of oxygen therapy

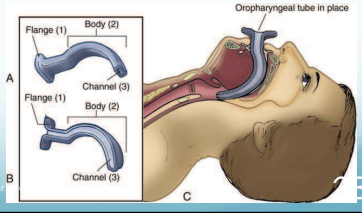
- ensuring that oxygen is being administered as ordered
- observing for complications of the therapy
- confirming that the oxygen therapy device is properly positioned
- during meals, replacing an oxygen mask to an nasal cannula.
- ensuring that oxygen therapy continues to be given during transport
- using a pulse oximeter

Artificial airways

- oropharyngeal airway
- nasopharyngeal airway
- endotracheal tube
- tracheostomy tubes

Oropharyngeal airway

- **also known as**
  - *oral airway*
  - *Guedel pattern airway*
  - *OPA*
  - *Mayo canule*



Oropharyngeal airway: definition

- An oropharyngeal airway is a medical device called an airway adjunct
- used to **temporary** maintain or open a patient's airway.
- by preventing the tongue from covering the epiglottis.
- When a person becomes unconscious, the muscles in their jaw relax and allow the tongue to obstruct the airway.

Oropharyngeal airway

- Use of an OPA does not remove the need for the recovery position and ongoing assessment of the airway and it does not prevent obstruction by liquids (blood, saliva, food) or the closing of the glottis, but it can facilitate ventilation during CPR.

Oropharyngeal airway

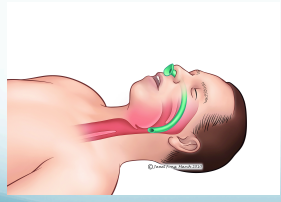
- The correct size is chosen by holding the airway against the side of the patient's face and ensuring that it extends from the corner of the mouth to the angle of the jaw

Insertion of OPA

- *The airway is then inserted into the person's mouth upside down. Once contact is made with the back of the throat, the airway is rotated 180 degrees, allowing for easy insertion, and assuring that the tongue is secured*
- *An alternative method for insertion, the method that is recommended for use in children and infants, involves holding the tongue forward with a tongue depressor and inserting the airway right side up*

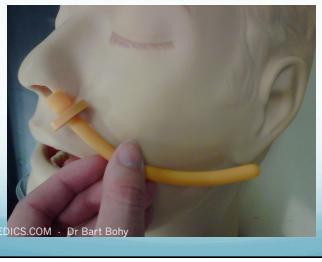
Nasopharyngeal airway

- A nasopharyngeal airway is a tube that is designed to be inserted into the nasal passageway to temporary secure an open airway



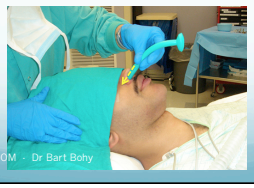
Nasopharyngeal airway

- **The correct size airway is chosen by measuring the device on the patient: the device should reach from the patient's nostril to the earlobe or the angle of the jaw.**



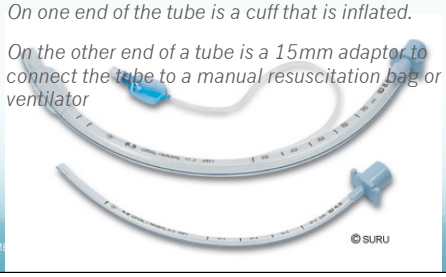
Nasopharyngeal airway

- **Insertion: The outside of the tube is lubricated with a water-based lubricant so that it enters the nose more easily. The device is inserted until the flared end rests against the nostril. Some tubes contain a safety pin to prevent inserting the tube too deeply. Care must be taken to ensure the pin does not stick into the nostril.**



Endotracheal tube

- *ETT's are available in various sizes, based on the diameter of the tube.*
- *On one end of the tube is a cuff that is inflated.*
- *On the other end of a tube is a 15mm adaptor to connect the tube to a manual resuscitation bag or a ventilator*



Rapid sequence intubation

Rapid sequence intubation is an advanced airway management medical procedure used to achieve tracheal intubation under general anesthesia in patients who are at high risk of pulmonary aspiration.

It involves

- preoxygenation with a high concentration of oxygen gas,
- followed by administering
  - rapid-onset hypnotic
  - and neuromuscular-blocking drugs that induce prompt unconsciousness and paralysis, allowing tracheal intubation with minimal delay.
- Unlike other methods of induction, **no artificial ventilation** is provided from the time that drugs are administered until after intubation has been achieved; this minimises insufflation of air into the stomach.

Preparation

- The necessary equipment is gathered
  - *a suction system with catheters*
  - *a manual resuscitation bag (MRB) or Bag valve mask*
    - *Check the right size of the mask*
    - *Connect to 100% oxygen*
  - *a laryngoscope handle with assorted blades*
  - *a variety of sizes of ETT's*
  - *a stylet*
- The patient
  - *a functional intraveneus catheter in place*
  - *monitoring*
  - *a pulse oximeter*
  - *ECG monitoring*
  - *blood pressure meter*

Preoxygenation

- 100% oxygen for 3 to 5 minutes via a tight-fitting face mask.
- assisted ventilations only if necessary
  - *to avoid positive pressure ventilation to avoid gastric distention ans the risk of aspiration*
  - *If the patient is ventilated, cricoid pressure should be initiated*

Pretreatment

- The patient is pretreated to avoid the physiologic response to intubation. These medications should be given 3 minutes before the next step and include
- *lidocaine*
- *fentanyl*
- *atropine*

Paralysis with induction

- A sedative agent and a paralytic agent are administered in rapid sequence.
- sedative agents used
  - *propofol 1 or 2%*
  - *etomidate*
  - *midazolam*
  - *ketamine*
- neuromuscular blocking agents
  - *succinylcholine*
  - *rocuronium*

Protection and positioning

- The patient is positioned with the neck flexed and the head extended in the "sniff" position.
- The oral cavity is suctioned
- dental devices are removed
- cricoid pressure is applied

Placement of the endotracheal tube

- The ETT is inserted into the trachea and placement is confirmed
- *each intubation attempt is limited to 30 seconds.*

Post intubation management

- Listen for bilateral breath sounds
- Used CO2 detector
- Take chest radiogrphy
- note the level of insertion
- secure the tube

Early complications of endotracheal intubation

- *trauma to:* mouth,pharynx, trachea
- *hypoxemia & hypercapnia*
- *bradycardia, tachycardia, dysrhytmias*
- *hypertension, hypotension*

Late complications of endotracheal intubation

- *late complications*
  - inflammation, ulceration: *nasal, oral, sinusitis, otitis*
  - Injuries: *laryngeal, tracheal,*
  - Tube: *obstruction, displacement*
- *late complications after removal*
  - Stenosis: *larygeal, tracheal*
  - cricoid abcess

Tracheostomy tubes

- **introduction**
  - *indications*
  - *Advantages*
  - *kind of tubes*
- **tracheostomy procedure**
- **Complications**
- **nursing management**
- **humidification**
- **cuff management**
- **suctioning**
- *Complications*
- **Communication**
- **oral hygiene**
- **extubation and decannulation**

Tracheostomy tubes: introduction

- *indications*
  - **intubation needed > 7-10 days**
  - upper airway obstruction: *trauma, tumor, swelling*
- *advantages*
  - avoiding of complications of endotracheal intubation: *oral, nasal, pharyngeal, laryngeal*
  - less air flow resistance
  - easier secretion removal
  - increased patient comfort
    - *can eat*
    - *can talk*
    - *easier weaning*
    - *acceptance*
- *kind of tubes*
  - single lumen
  - dual lumen

Tracheostomy procedure

- NTK

Complications of tracheostomy

- *early complications*
  - misplacement
  - hemorrhage
  - laryngeal nerve injury
  - pneumothorax
  - pneumomediastinum
  - cardiac arrest
- *late complications*
  - stomal infection
  - hemorrhage
  - tracheaomalacia
  - tracheoesophageal fistula
  - tracheoinnominate artery fistula
  - tube obstruction
  - tube displacement
- *late complications after removal*
  - tracheal stenosis
  - tracheocutaneous fistula

Nursing management

- *tube placement*
- *humidification*
- *cuff management*
- *suctioning*
- *communication*

Cuff management

- *cuff inflation techniques*
- *foam cuff tracheostomy tubes*
- *subglottic secretion removal*

Suctioning

- *complications*
- *suctioning protocol*
- *closed tracheal suction system*

Communication with tracheostomy patients

- *use of verbal and non verbal language*
  - *gestures*
  - *lip reading*
  - *pointing*
  - *facial expressions*
  - *eye blinking*
- *devices*
  - pen & paper
  - magic slates
  - magnetic boards
  - symbol boards
  - flash cards
- *Passy-Muir valve:* need to
  - *deflate the cuff*
  - *increase tidal volume*

Oral hygiene

- *risk of VAP: Ventilator associated pneumonia*
- *secretions*
  - saliva
  - dental plaque
- *problems*
  - few evidence
  - low priority for many nurses
- *procedures*
  - brushing teeth
  - brushing tongue
  - deep pharyngeal suctioning
  - rinsing or swabbing the mouth with chlorhexidine every 12 hours

Extubation and decannulation

- *clear secretions*
- *deflate cuff*
- *remove tube*
- *complications*
  - sore throat
  - stridor
  - hoarseness
  - odynophagia: painfull swallowing