

## **Basics of Oxygen Therapy**

- This training is developed to demonstrate equipment or procedures that are to be used by qualified health care providers who are operating within the scope of their practice. Individual institutional policies and procedures must be followed at all times. It may also be used to train respiratory therapy extenders who would function as respiratory assistants working under the license of a respiratory therapist in the event of a disaster. The role of extenders would be decided by the institution or by the state. Viewing this demonstration does not imply competence. Competence in any of these procedures must be assessed by the institution where you practice.

- **Indications for Oxygen Therapy**

- Evidence of hypoxemia
- P<sub>a</sub>O<sub>2</sub> of < 60 mmHg
- S<sub>p</sub>O<sub>2</sub> of less than 90%
- Severe trauma
- Known or suspected MI or acute coronary syndrome
- Short term
- Surgery or post-anesthesia

- **Cautions Hazards of Oxygen Therapy**

- Oxygen induced hypercapnea
- Chronic CO<sub>2</sub> retainers
- Adjust saturation requirements
- Absorption atelectasis
- Oxygen toxicity
- Oxygen supports combustion and increases fire risks

- **Terminology**

- High flow device vs. low flow device
- High Concentration vs. low concentration
- Pulse oximeter
- Titration protocols
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- **High Flow vs. Low Flow**

- Low flow adds oxygen to patients inspiratory flow
- High flow provides all inspiratory flow
- 40 – **60** liters per minute

- **High vs. Low Concentration**

- Low concentration
- 21% to 50%
- High concentration
- 50% to 100%

- Either can be high or low flow
- **Pulse Oximetry**
  - Inaccurate in presence of:
    - Dark pigmentation
    - Poor perfusion
    - Some nail polishes
    - Ambient light
    - Movement
  - Correlate with pulse
- **Oxygen Titration**
  - Protocols are written to allow staff to increase or decrease flows or  $F_{I}O_2$
  - Usually done by one department for consistency
  - Keep  $S_pO_2 > 92\%$  for most patients
  - Keep  $S_pO_2$  between 88% and 92% for patients with COPD
  - Greatly reduce the use of oxygen
- **Oxygen Flowmeters**
  - Read center of float (ball)
- **Oxygen Delivery Devices**
  - Nasal Cannula
  - Simple Mask
  - High/low flow mask
  - Air entrainment or venti mask
  - Partial/non-rebreather mask
  - High flow blender
  - Nasal Cannula
    - Two nasal prongs
    - 6 to 25 ft. tubing
    - Low flow
    - Low concentration
- **Nasal Cannula**
  - $F_{I}O_2$  *estimation* (normal respiratory rate, rhythm and volume)
    - 1 = 24%
    - 2 = 28%
    - 3 = 32%
    - 4 = 36%
    - 5 = 40%
    - 6 = 44%

- Humidify > 4 liters
- Cannot exceed 6 liters unless specialty system used

- **Simple Oxygen Mask**

- 5 – 10 liters per minute
- < 5 liters will not flush CO<sub>2</sub> from mask
- 35 – 50% FIO<sub>2</sub>
- Switch to cannula for meals etc.

- **Air Entrainment or Venti Masks**

- High flow device
- Entrain air through side ports to achieve high flows
- Variable entrainment ports
- and/or jets adjust FIO<sub>2</sub>
- Air Entrainment or Venti Masks
- Manufacturer recommends liter flows for each F<sub>I</sub>O<sub>2</sub>

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- **Partial Rebreather Mask**

- Low flow, medium concentration
- 40 – 70%
- 6 – 10 liters per minute
- Bag should remain at least 1/3 full during inspiration

- **Non-Rebreather Mask**

- Valves added
- Low flow high Concentration
- 60 – 80%
- 10 liters per minute
- Bag should remain at least 1/3 full during inspiration
- Commonly (wrongly) referred to as 100% NRB

- **Blender System**

- Delivers both high and low concentrations at high flows
- Requires heated humidification
- High concentration mask or T-piece
- Costly

- **Conserving Devices**

- Used for short-term use (exercise)
- May use ½ the amount of oxygen to achieve same S<sub>p</sub>O<sub>2</sub>
- Use S<sub>p</sub>O<sub>2</sub> to adjust liter flow
- Conserving Devices
- Mustache-style

- **Aerosol Generators**

- Main purpose is to provide aerosol
- Provide oxygen or air depending on the gas source
- Require higher flows to get aerosol output

- **Bag/Valve/Mask Systems**
- With reservoir and 10 – 15 liters will deliver up to 100%
- 40 – 60% with oxygen and no reservoir
- **Ventilators and CPAP/BiPAP systems**
- Variable F<sub>I</sub>O<sub>2</sub>'s at high flows
- **Oxygen Cylinders**
- Changing Regulators
- Identify/check cylinder contents
- “Crack” cylinder
- Attach the regulator
- Assure regulator is tight
- Open cylinder valve and read pressure
- Adjust appropriate flow
- **Cylinder Safety**
- Cylinders must be chained, or be secured in a cart or stand at all times
- Keep cylinders away from extreme heat or open flames
- Close valves when not in use
- Use no oil
- Do not lay cylinders on the floor
- **Calculation of Cylinder Duration**
- D, E and H cylinders are most common
- Others may also be used
- Cylinders are considered empty at  $\leq 500$  psi
- Each cylinder has a tank factor for estimating contents of a full or partially full cylinder using pressure
- H cylinder = 3.14
- E cylinder = 0.28
- D cylinder = 0.16
- Calculation of Cylinder Duration
- Formula for cylinder duration
  
- $\frac{\text{Cylinder pressure} \times \text{Tank factor}}{\text{Liter flow}} = \text{duration}$
- Calculation of Cylinder Duration
- 67 y.o. female on 3 liters via cannula. Needs to go to CT (30 minutes). E cylinder of oxygen with 1200 PSI pressure. How long will the tank last?
  
- $\frac{1200 \text{ psi} \times 0.28}{3 \text{ liters}} = 112 \text{ minutes}$
  
- **Plenty of time!**
- Calculation of Cylinder Duration

- 68 y.o. male on 4 liters via cannula. Needs to go to PT for 60 minutes. 5 minutes travel each way (70 minutes total). D cylinder with 900 psi. Will the tank last?
- $\frac{900 \text{ psi} \times 0.16}{4 \text{ liters}} = 36 \text{ minutes}$
- **Need a different tank!**
- Calculation of Cylinder Duration
- There will be an oxygen outage for two hours. You have an H cylinder with 900 psi to use on a patient who is on a 10 liter per minute aerosol. How long will the cylinder last?
- $\frac{900 \text{psi} \times 3.14}{10 \text{ liters}} = 282 \text{ minutes ( 4.7 hours)}$
- **GTG ( Good to go)!**
- **Do's and Dont's of Oxygen Therapy**
- **Do:**
  - Keep oxygen on at all times
  - Transporting
  - Bathroom
  - Report drops in SpO2
- **Don't:**
  - Use oils on any oxygen equipment
  - Allow smoking or open flames within 5 feet
  - Assume the patient is OK without their oxygen by assessment of color or patient report
- Conclusion
- Contact [milischr@westernnc.edu](mailto:milischr@westernnc.edu) if there were any problems with the presentation
- Please close this page and take the quiz for this presentation and move on to the next presentation