JOHNS HOPKINS
MEDICINE

Module 3:
Oxygen Delivery Systems

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Objectives

Upon completion of this module, the learner will be able to:

- Review the basics of PaO2 vs. SaO2
- Identify common Supplemental Oxygen - Low Flow Systems

PaO2

- Partial pressure of dissolved O2 in arterial blood
- Normal range 80 to 100 mmHg
- Measured by arterial blood draw
- Decreased PaO2 seen with increased age and elevation (Denver residents: 65 to 80mmHg is normal)

Pulse Oximetry (SaO2)

- O2 combines with hemoglobin to form oxyhemoglobin
- Uses absorption of specific waveforms of light to compare oxyhemoglobin vs deoxyhemoglobin wavelengths
- SaO2 is ratio of oxygenated hemoglobin to total hemoglobin
- Indirectly measures PaO2. Less invasive

Oxyhemoglobin Dissociation Curve

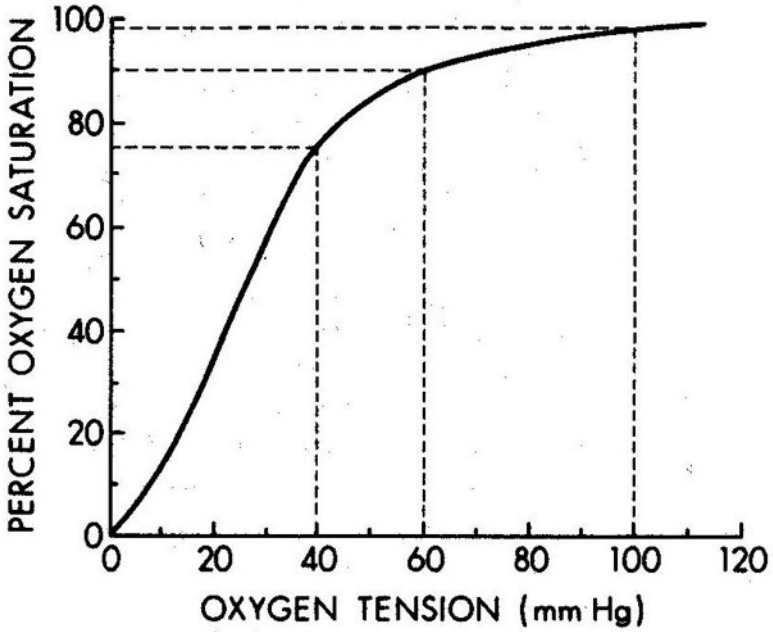


FIGURE 5.1. Oxyhemoglobin dissociation curve.

Korupolu R GJ, Needham DM. Contemporary Critical Care. 2009;6(9):1-11
Bailey P, Thomsen GE, Spuhler VJ, et al. Crit Care Med. Jan 2007;35(1):139-145.

Supplemental Oxygen
Low Flow Systems

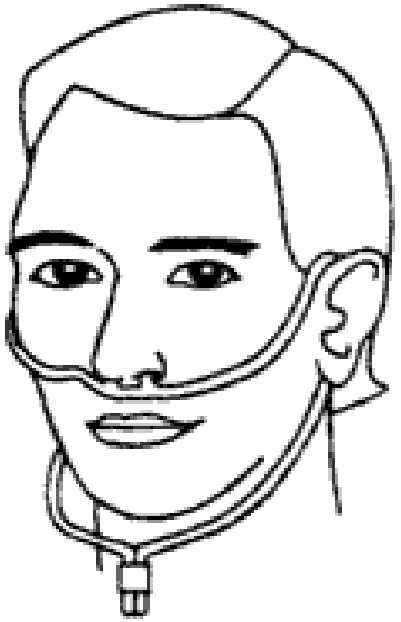
- Provides relatively stable FiO2 levels as long as respiratory rate and pattern are stable
- Can deliver high FiO2, but actual amount will vary from breath to breath
- Examples include nasal cannula, simple face mask, face tent & non-rebreather mask

Supplemental Oxygen High Flow Systems

- Indicated in patients with variable respiratory rate and pattern to provide appropriate FiO2 to meet a patients respiratory demand
- Examples include Venturi mask, nebulizer, high flow nasal cannula, and mechanical ventilation (generally utilize corrugated tubing)

Nasal Cannula

http://www.vitalitymedical.com/nasal-cannula.html



http://www.ozoneservices.com/products/OLP/med/inhalation/cannula.htm

Nasal Cannula

- Low flow device
- Most common device used for mild hypoxia
- Can be set between 1 and 6 LPM (24% to 40% FiO2)
- FiO2 increases approximately 4% with each liter of O2

Korupolu R GJ, Needham DM. *Contemporary Critical Care.* 2009;6(9):1-11 Bailey P, Thomsen GE, Spuhler VJ, et al. *Crit Care Med.* Jan 2007;35(1):139-145.

Simple Face Mask

https://www.indiamart.com/proddetail/simple-face-mask-10653961173.html

https://opentextbc.ca/clinicalskills/chapter/5-5-oxygen-therapy-systems/

Simple Face Mask

- Low flow device
- Can be set between 5 and 10LPM (35-55% FiO2)
- Useful when moderate amount of O2 needed

Korupolu R GJ, Needham DM. *Contemporary Critical Care.* 2009;6(9):1-11 Bailey P, Thomsen GE, Spuhler VJ, et al. *Crit Care Med.* Jan 2007;35(1):139-145.

Non-Rebreather Mask

https://medtree.co.uk/non-rebreathing-mask

http://www.beademing.eu/N_frame.html?http://www.beademing.eu/Non--rebreather-masker-Kind--N_art_46.html

Non-Rebreather Mask

- Low flow device with high FiO2
- Uses a reservoir bag to deliver a higher concentration of O2
- One way valve prevents patient from inhaling expired air
- Can be set between 10 and 15 LPM (80 to 95% O2)
- Useful in severely hypoxic patients who are ventilating well

Korupolu R GJ, Needham DM. *Contemporary Critical Care.* 2009;6(9):1-11 Bailey P, Thomsen GE, Spuhler VJ, et al. *Crit Care Med.* Jan 2007;35(1):139-145.

Venturi Mask

http://www.ecvv.com/product/2855402.html

Venturi Mask

- High flow device
- Allows precise measurement of O2 delivered
- Utilizes different sized ports to change amount of FiO2 (24% to 50%)
- Useful in COPD patients where precise O2 prescription is crucial

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Trach Collar

https://www.mountainside-medical.com/products/tracheostomy-mask-adult

Trach Collar

- High flow device
- Provides O2 or humidified room air to trach
- Settings similar to Venturi mask

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Humidifier

http://www.bawmed.com/Oxygen-Flowmeter-With-Humidifier-pl78762.html

Humidification

- Can be connected to any flow meter to provide moisture to O2
- Useful in long-term use of O2 or when high amount of O2 is required

Korupolu R GJ, Needham DM. *Contemporary Critical Care.* 2009;6(9):1-11 Bailey P, Thomsen GE, Spuhler VJ, et al. *Crit Care Med.* Jan 2007;35(1):139-145.