COVID-19: WHAT EVERY HEALTH CARE PROVIDER MUST KNOW

Treating the Mild Dyspneic Patient

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LEARNING OBJECTIVES

At the end of this lecture, the learner will be able to:

1. Describe optimal positioning for a patient with dyspnea
2. List 3 requirements for supplemental oxygen delivery and options for each
3. Explain re-assessment of patients after initial therapy
4. Recognize pitfalls and safety issues

LECTURE OVERVIEW

I. Position

II. Provide Supplemental Oxygen

III. Reassess

IV. Avoid pitfalls

V. Safety issues

I. POSITION

1. Upright position

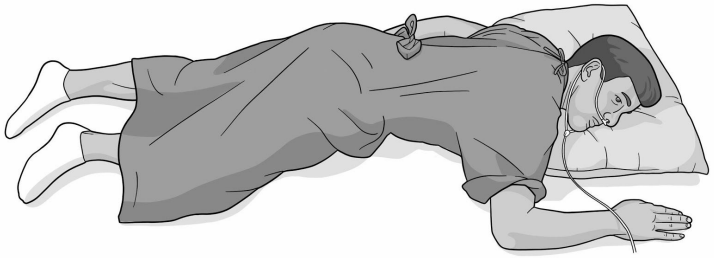
- Traditional approach: Place the patient in the upright position
- Why? Allows patients to maximize their lung volume and improve air exchange

Patient in upright position

2. Prone position

- Many patients with COVID-19 infections are being placed in the prone position – that is, turned on to their stomachs
- Prior research has demonstrated prone positioning leads to decreased rates of intubation and improved outcomes in patients with ARDS
- How to prone:
    1. Have patient turn themselves into the prone position and maintain it for 30-120 min
    2. Then, turn onto the left lateral decubitus position for 30-120 min
    3. Then, the right lateral decubitus position for 30-120 min
    4. Then, the upright position
    5. If the patient does not clinically improve in the new position after 5-10 min, do not maintain this position
- *Caputo ND et al. Early self-proning in awake, non-intubated patients in the emergency department: a single ED's experience during the COVID-19 Pandemic. Acad EM 2020*
    - Study conducted in New York
    - Examined 50 patients with a median O_2 saturation of 80% on presentation
    - After placement of O_2, their median $_{O2}$ saturation improved to 84%
    - After being placed in the prone position for 5 min, their median O_2 saturation improved to 94%

Patient in prone position



II. PROVIDE SUPPLEMENTAL OXYGEN

Give supplemental oxygen therapy immediately to patients with respiratory distress, hypoxemia, or shock— there are no absolute contraindications to the administration of supplemental oxygen.

Supplemental oxygen therapy is ineffective for patients who are not breathing—a patient who is not breathing needs bag-mask ventilation followed by endotracheal intubation.

3 requirements for emergency oxygen delivery: 1) Oxygen source 2) Pressure regulator with flow meter and 3) Delivery devices

1. **Oxygen source**

O2 cylinder

Wall source

Concentrator

2. **Pressure regulator with flow meter**

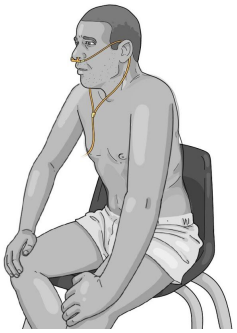
Oxygen Tank Regulator with Flow Meter

Oxygen Wall Regulator with Flow Meter

Oxygen Concentrator Flow Meter

3. Delivery devices

1. Nasal cannula
   - o Flow Rate: 1-6 L/min
   - o Delivers FiO_2 24-44%
   - o A humidification device is recommended for flows greater than 4 LPM to prevent nasal dryness and bleeding



Nasal Cannula

2. Simple face mask
   - o Flow Rate: 6-10 L/min
   - o Delivers FiO2 40-60%
   - o Has ports on each side which allow room air to be drawn in during inhalation and mixed with the oxygen being supplied to the mask

Simple Face Mask

3. Non-rebreather
   - o Flow Rate: 12-15 L/min
   - o Delivers FiO2 90-100%
   - o Combines mask with reservoir bag, filled with oxygen.
   - o When the patient inhales, they draw pure oxygen from the reservoir bag
   - o When they exhale, air escapes through small exhalation ports on the side of the mask, not back into the reservoir bag.
   - o O2 flow rate needs to be at least 12-15 L/min to ensure that the reservoir bag does not collapse during inhalation

Non-rebreather mask

4. Nasal cannula + Non-rebreather
    - Another approach is to place a non-rebreather mask over a nasal cannula, which delivers an effective FiO2 of 100% by preventing the inadvertent accumulation of CO2 in the hypopharynx and nasopharynx

Nasal cannula + Non-rebreather mask

General guidelines for starting oxygen – A stepwise approach

1. Start with nasal cannula or simple face mask
2. If the patient fails to improve, then apply a non-rebreather mask (or non-rebreather over a nasal cannula)
3. If the patient does not improve with the non-rebreather mask, consider high-flow oxygen via nasal cannula (HFNC) or the initiation of noninvasive ventilation (NIV). These will be discussed in the next lecture.

III. REASSESS

- **Clinical Assessment**
    - Following any interventions to treat dyspnea, such as positioning the patient or providing supplemental oxygen, reassess the patient's clinical condition
    - Clinical re-assessment includes evaluating the patient's own assessment of their condition (whether they feel better or not), their work of breathing, and their vital signs, specifically their respiratory rate and oxygen saturation.
    - If they are improving, it suggests that your interventions are working for the moment.
    - If they are not improving, it means that you need to think about additional interventions, like repositioning the patient, or high flow nasal cannula, or intubation and mechanical ventilation
- **Target Oxygen Saturation**
  As per WHO guidelines, following positioning, supplemental oxygen and stabilization
    - The target O_2 saturation in adults is > 90%
    - The target O_2 saturation for pregnant adults is ≥ 92–95%
    - It is not necessary to achieve an oxygen saturation of 100%, so titrate the amount of oxygen to achieve these O_2 saturation targets

IV. AVOID PITFALLS

1. **Avoid benzodiazepines or narcotics in agitated patients**
    - If a patient with dyspnea is agitated, think of hypoxia or respiratory failure first —ensure that you appropriately evaluate and treat these conditions
    - Administering a benzodiazepine or narcotic analgesic medication to a patient with agitation from hypoxia or respiratory failure could be lethal.
2. **Be careful with COPD or chronic respiratory insufficiency**
    - These patients often have hypercarbia, so the over administration of oxygen (especially for an extended period of time) can reduce their respiratory drive — leading to further hypercarbia, altered mental status and even respiratory collapse.
    - It's okay to administer oxygen to these patients but you need to titrate the oxygen to their specific needs — rather than just apply the maximum amount of O_2.
3. **Ensure oxygen is flowing**
    - Masks and nasal cannulas can become disconnected from their oxygen supplies.
    - Oxygen tanks have a limited supply of oxygen that can run out over time.
        - Replace the oxygen cylinder when the pressure falls to 200 PSI or lower

IV. SAFETY ISSUES

1. **Oxygen cylinders falling**
    - Be careful when using oxygen cylinders
    - Do not stand them upright unless they are well secured.
    - Under the right conditions, if they fall over, they have the potential to become a rocket and cause injuries.
2. **Flames and oxygen**
    - Oxygen represents a fire hazard because it allows other materials to ignite at a lower temperature, and burn hotter and faster.
    - Always keep combustible materials away from the oxygen cylinder, regulators, fittings, valves, and tubing.
    - Never let anyone to smoke or light a flame in the vicinity of oxygen cylinders.
3. **Aerosolization risk**
    - All forms of supplemental oxygen and respiratory support may potentially aerosolize respiratory pathogens, such as COVID-19.

- That means that a patient on oxygen from a nasal cannula, face mask or non-rebreather mask could spread viral particles into the air around them.
- *Hui et al. Aerosol dispersion during various respiratory therapies: a risk assessment model of nosocomial infection to health care workers. Hong Kong Med J 2014*
    - This study suggests that a nasal cannula at 5L could disperse particles about 42 cm from the patient
    - That a simple face mask at 10L could disperse particles about 40 cm
    - That a non-rebreather mask at 12L could disperse particles about 10 cm
- *Li J et al. High-flow nasal cannula for COVID-19 patients: low risk of bio-aerosol dispersion. Eur Respir J 2020*
    - Another study from 2020 found that dispersion of particles was 11-12 cm for a simple mask at 15L and 25-27 cm for a NRB mask at 10L.
- *Leonard S et al. Preliminary Findings of Control of Dispersion of Aerosols and Droplets during High Velocity Nasal Insufflation Therapy Using a Simple Surgical Mask: Implications for High Flow Nasal Cannula. CHEST 2020*
    - Another recent study, that modeled the velocity of exhaled gas flow, found that a well-fitting standard surgical mask can significantly reduce aerosolization when placed over low or high flow nasal cannula.
    - For this reason, consider placing a surgical mask over any patient receiving oxygen therapy by nasal cannula to significantly reduce the degree of dispersion of viral particles from exhalation.

SUMMARY

I. Position
II. Provide Supplemental Oxygen
III. Reassess
IV. Avoid pitfalls
V. Safety issues

REFERENCES/SUGGESTED READING:

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