Inpatient Oxygen Delivery

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Oxygen is life saving in respiratory failure

BUT more (hyperoxia) is not better!

- Toxicity from free radical generation causes airway and parenchymal injury
  - In premature infants BPD and ROP
- Absorption atelectasis
- Can worsen hypercapnea in patients who chronically retain CO_2
- No longer recommended in ACS without hypoxia

Things to consider

Room air FiO2 is 21%

Normal minute ventilation about 6 to 8 L per minute at rest. Can rise to 40 to 60 L/min with exertion.

But we breath in a lot faster at rest - normal inspiratory flow rate about 25 to 30 L/min. Peak flow rate 40 to 70 L/min.

The Oxygen Source

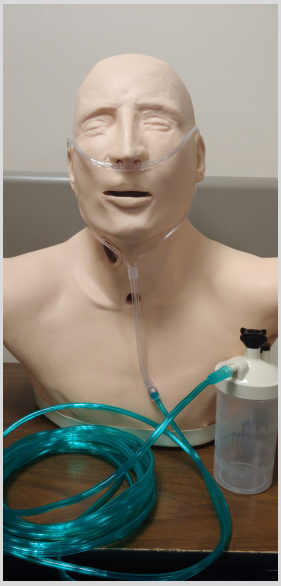
The humble nasal cannula

Flow rate up to 6 L/min

Each liter increases FiO2 by about 3% from 21% because most of the air is entrained from the room given the inspiratory flow rate of 25 to 30 L/min.

The high flow nasal cannula

Flow rate up to 15 L/min



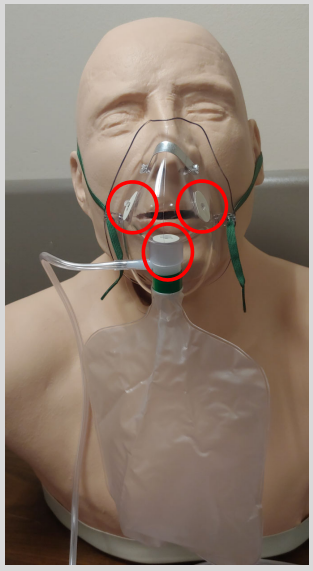
The aerosol mask

Variable fiO2 30 to 40%

The non-rebreather

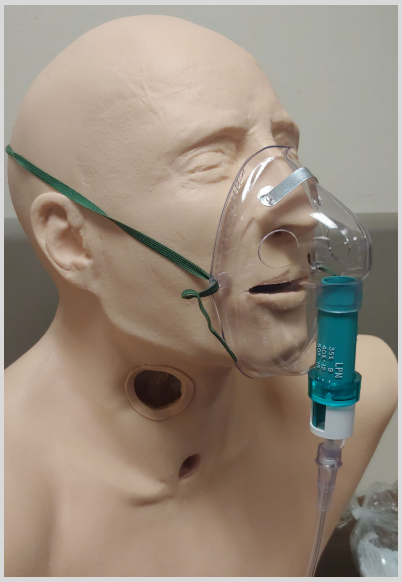
In perfect circumstances provides about 95% fiO2

Can support a MV of 15 L/min

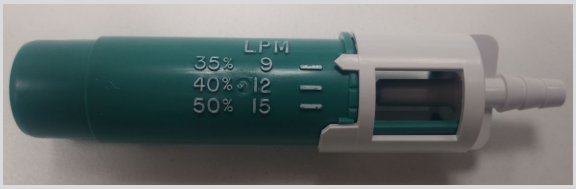


One way valves

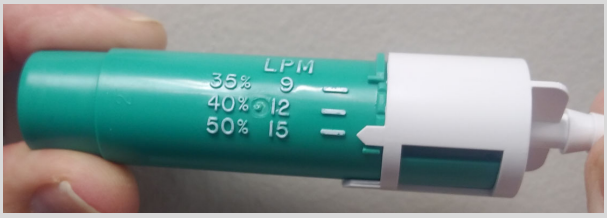
The venturi mask



Can provide 35% at 51 L/min

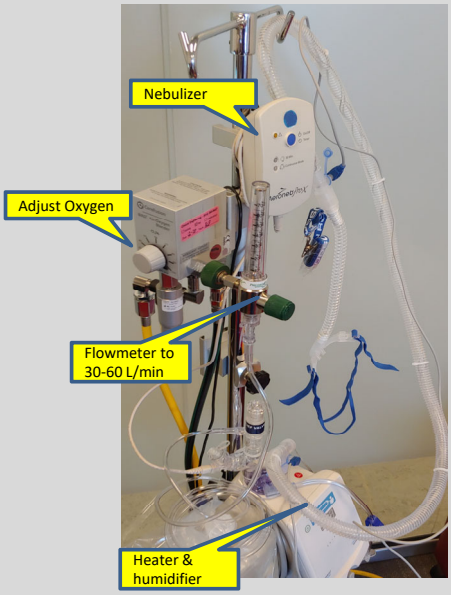


Can provide 50% at 41 L/min



Non-invasive positive pressure ventilation

Newest kid on the block - HHFNC



What about tracheostomies?

Selecting the correct inhaled oxygen concentration on a mechanical ventilator

Prescribing oxygen at the time of hospital discharge

Outpatient Oxygen

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Objectives

1. Outline the process of ordering oxygen

2. Discuss equipment used in the home

- > 1.5 million adults use supplemental oxygen

Oxygen Qualification at rest

- Pulse oximeter ≤ 88% at rest on room air
  - For example:
    - Resting saturation 85% on room air
    - Saturation 90% at rest on 2L/m

Oxygen Qualification with exertion

Pulse oximeter ≤ 88% with exertion

For example:
Resting saturation 90% on room air
Saturation 86% with exertion on room air
Saturation 92% with exertion on 2L/m

Oxygen Qualification for high flow at rest

- Pulse oximeter ≤ 88% at rest on room air
  - 80% on room air at rest
  - 84% on 2L/m at rest
  - 86% on 4L/m at rest
  - 87% on 6L/m at rest
  - 90% on 8L/m at rest

Oxygen Qualification for high flow with exertion

Pulse oximeter ≤ 88% with exertion

80% on room air with exertion
82% on 2L/m with exertion
84% on 4L/m with exertion
86% on 6L/m with exertion
88% on 8L/m with exertion
90% on 10L/m with exertion

The 6 minute walk test

- This does not qualify for oxygen
- Even if the saturation drops below 88%, this test does not add oxygen without an order for an oxygen titration
- This test measures distance walked in a 6 minute time frame
  - Useful for other circumstances, like transplant evaluation

Oxygen orders

Must include:
1. Oxygen liter flow – 2L/m with exertion and sleep
2. Equipment needed – small portable tanks, conserving device, portable concentrator, home oxygen concentrator
3. Date of face to face encounter. The face to face encounter must be within the past 30 days.
4. Qualification data
5. Statement of Certification that the patient is under your care, and that You or a Nurse Practitioner or Physician Assistant had a face to face encounter. Based on the findings, the equipment and supplies are medically necessary.
6. Send prescription to a DME (durable medical equipment) company

Definitions

- Concentrator
- Conserving device
- POC – portable oxygen concentrator
- Pulsed flow
- Continuous flow
- DME
- CMN

Variety of Cylinders

- E Cylinder 25 inches tall
- D cylinder 16.5 inches tall
- C Cylinder 11 inches tall

- M-9 Cylinder 15 inches tall
- M-6 Cylinder 12 inches tall

Soda Can 4.83 inches tall

Equipment

Portable system

Home Concentrators

Equipment- flow meter or conserving device

Concentrators are available in a variety of sizes

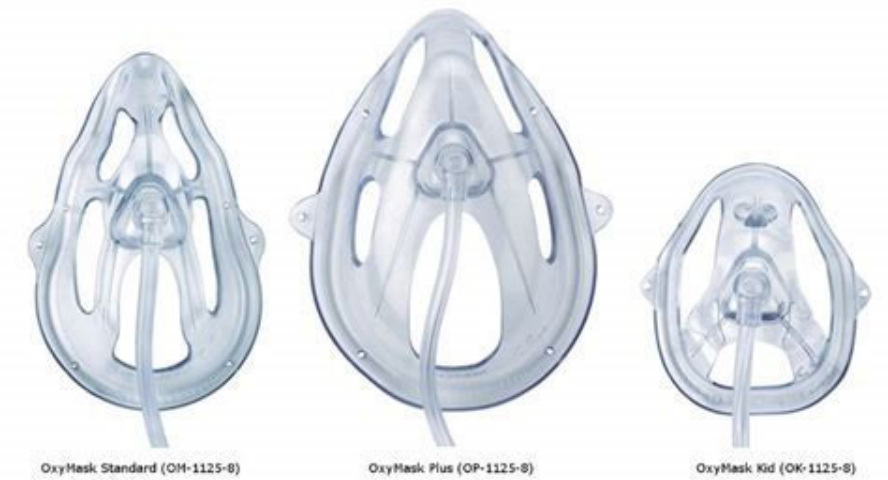
Oxygen cylinder	Weight	Liter flow	Hours of use	Cost
E tank	7.9 pounds Without a cart or a regulator	2 L/m pulse dose	17.2 hours	Cylinder only $50-100 Added cost for cart and regulator or oxygen conserving device Covered by insurance
		2L/m continuous dose	5.7 hours	
		3L/m pulse dose	11.5 hours	
		3L/m continuous dose	3.8 hours	

Oxygen cylinder	Weight	Liter flow	Hours of use	Cost
D tank	5.3 pounds without a regulator	2L/m pulse dose	10 hours	
		2L/m continuous dose	3.5 hours	
		3L/m pulse dose	7 hours	
		3L/m continuous dose	2.3 hours	

Oxygen cylinder	Weight	Liter flow	Hours of use	Cost
Portable oxygen concentrator	Vary, 5-10 pounds	Pulse dose	1.3 - 4 hours	$2000- $4000 Some insurance will not cover
		Continue dose	1-3 hours	

Oxymizer Pendant

Oxymizer Mask



Home Oxygen Therapy for Adults with Chronic Lung Disease

- Evidence based use of oxygen:

  COPD

  - **Strong** Evidence: COPD with resting hypoxemia- Oxygen use is recommended at least 15 hours per day
  - **Moderate** Evidence: COPD with exertional hypoxemia- The recommendation favors on oxygen with exertion. This includes activities like going up stairs, carrying objects > 5 pounds, showering, sexual activities.
  - **Low** Evidence: COPD with resting saturation of 89%-93% -Oxygen use is not recommended

Closing remarks

- Many things go into ordering oxygen
  - Qualification
  - Patient education
  - Availability of DME facilities and equipment
  - Continuing CMN
  - Patient work status
  - Patient travel status
  - Comorbid conditions