

What to do when your patient's Blue!  
Oxygen Supplementation for dogs and cats  
Megan Kaplan DVM DACVECC  
ISVMA 2023

Oxygen uptake and distribution throughout the body at the cellular level is essential for all mammals. In this discussion, we will review some of the diseases that necessitate oxygen supplementation as well as how to provide it effectively and safely to dogs and cats.

Oxygen is found in our natural environment at an FIO<sub>2</sub> of about 21% (at sea level). Maximum supplementation is up to 100% but there are techniques described below in which we can provide different levels of FIO<sub>2</sub> to a dyspneic patient. Due to oxygen toxicity at high levels of FIO<sub>2</sub>, it is best to titrate the oxygen concentration to the least amount of FIO<sub>2</sub> that will improve the patient's dyspnea/hypoxia.

### **Indications for oxygen supplementation**

#### Clinical Signs

- Dyspnea
- Cyanosis
- Collapse
- Obtunded/Comatose
- Hypoxemia
  - data value showing low O<sub>2</sub> in blood (PaO<sub>2</sub> or SPO<sub>2</sub>)

#### Diseases that can lead to above clinical signs

- Hypoventilation
  - Anesthesia/sedation
  - CNS disease (brain, C3-C5)
  - Carbon monoxide, toxicities
- Upper airway obstruction/disease
  - Laryngeal paralysis
  - Collapsing Trachea
  - Brachycephalic syndrome
  - Neoplasia
  - FB
- Lower Airway disease
  - Pneumonia/Pneumonitis
  - Pulmonary edema (CHF, NCPE)
  - Neoplasia
  - Fungal disease
  - Asthma
  - Pulmonary hypertension

- Pleural Space disease
  - Pneumothorax, pleural effusion, DH, PPDH
- Shock
  - Cardiogenic (pericardial effusion, CHF, DCM)
  - Distributive (GDV, splenic torsion)
  - Hemorrhagic (hemoabdomen, trauma)
  - Septic
  - Metabolic (Hypoglycemia, endocrine dz)
  - Hypoxic shock (Anemia) - Severe Anemia

#### Differences between dogs and cats

##### Cats:

- More easily stressed and should have MINIMAL handling until sedation is on board if in respiratory distress.
- Small enough that oxygen cage is really the only ongoing method of supplemental delivery short of intubation.

##### Dogs

- More tolerant of face mask and handling than cats but still important to consider sedation before any major handling.
- Depending on size, multiple options available (see below) to deliver oxygen support.


#### Ways to administer oxygen supplementation

- Face mask
  - FIO<sub>2</sub>
    - If flow at 2-3L/min FIO<sub>2</sub> = 25 – 40%
  - Pros
    - Can access patient for treatments/diagnostics
    - Easy to provide (loose fitting face mask, hose, and oxygen drop down)
  - Cons
    - Can NOT be tight fit → need to allow CO<sub>2</sub> expiration
    - Wasteful oxygen → more expensive to clinic
- Oxygen cage
  - FIO<sub>2</sub>
    - adjustable up to 60%
  - Pros
    - Can give quiet, quarantined environment
    - If left closed, can reach FIO<sub>2</sub> 60%
  - Cons
    - Loose oxygen the minute you open cage
    - Unable to handle patient w/out interrupting O<sub>2</sub> supply
    - Expensive to buy/maintain
    - Wasteful of oxygen supply
    - Safety risk

- Oxygen hood
  - FIO<sub>2</sub>
    - once flooded 0.5-1L/min = FiO<sub>2</sub> 30-40%
  - Pros
    - Can take place of oxygen cage in a pinch
    - Can handle patient while not interrupting oxygen supplementation
  - Cons
    - Wasteful of oxygen
    - Need to make sure allow opening for ventilation which is not perfect since
    - Can cause hyperthermia
    - Requires air humidification
  
- Nasal cannula
  - FIO<sub>2</sub>
    - 50-150ml/kg/min = FiO<sub>2</sub> 30-70%
  - Pros
    - Easy to place
    - Can access patient for tx/dx w/out interruption of oxygen
    - Less wasteful of oxygen
    - More direct/higher FIO<sub>2</sub>
    - Can use for high flow
    - Minimally invasive
  - Cons
    - Technically skills required
    - Requires monitoring
    - Avoid if coagulopathy
    - Patient comfort? (limit 3L/min)
    - Requires air humidification
  
- Intubation
  - FIO<sub>2</sub>
    - 100%
    - Can only titrate if on mechanical ventilator
  - Pros
    - Can administer 100% FIO<sub>2</sub> oxygen
    - Can secure airway and treat upper airway acute obstruction
    - Only way to facilitate treatment for hypoventilation
    - Least wasteful of oxygen gas
  - Cons
    - Requires skillset
    - Patient must be anesthetized or unconscious
  - When to intubate?
    - Need FIO<sub>2</sub> > 60%
    - Fatigue concerns

- $PCO_2 > 60\%$
- $PaO_2 < 60\%$
- Severe upper airway obstruction
  - Laryngeal paralysis
  - Brachycephalic airway

How do you know when it is enough supplementation?

- Enough to improve clinical signs of dyspnea, cyanosis, hypoxemia
- Start at low  $FIO_2$ 
  - If No improvement,   $FIO_2$  gradually