

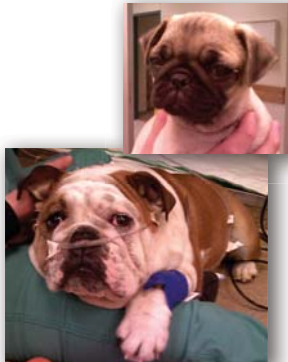
Acute Respiratory Emergencies

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The Emergency Respiratory Animal

- Acute presentation
- Acute OR chronic disease
- Fragile!!!
- Time of the essence
- Owners don't understand





Rule No. 1: STEP AWAY FROM THE PATIENT! (Hands-off observation first!)

- Tachypnea – hypoxemia?
 - Also: fear, pain, hyperthermia, CNS, metabolic acidosis, hypercapnea, hypotension, inhaled irritants, interstitial lung disease
- Hypoxemia = other clues?
 - “Dyspnea” = People
 - Orthopnea = body position
 - Cyanosis = Blue mucous membranes
 - Stertor = Nose
 - Stridor = Upper airway
 - Chest excursions normal?
 - Abdominal wall movement?
 - Normal inspiratory/ expiratory ratio?






Rule No. 2:
Dyspneic animals panic

- Examine with caution = Gather information without harm
 - Hands-off observation
 - Oxygen
 - Quiet environment
 - ABC's
 - Light sedation?

Rule No. 3: Oxygen may not help, but it hardly ever hurts.

- Noninvasive:
 - Flow-by
 - Face mask
 - Oxygen hood
 - Oxygen cage
- Invasive:
 - Nasal/ nasopharyngeal
 - Transtracheal

Question:

- What are the benefits and risks of supplemental oxygen therapy?
- How much benefit does supplemental oxygen therapy provide to blood oxygen content and tissue oxygen delivery?
 - $CaO_2 = (Hb \times 1.39 \times SaO_2) + (PaO_2 \times 0.003)$
- Which oxygen delivery methods reach 30% concentration? 40% concentration? >40%?

Flow-by Oxygen: ~30% FiO2



Oxygen Delivery Methods: ~ 40%



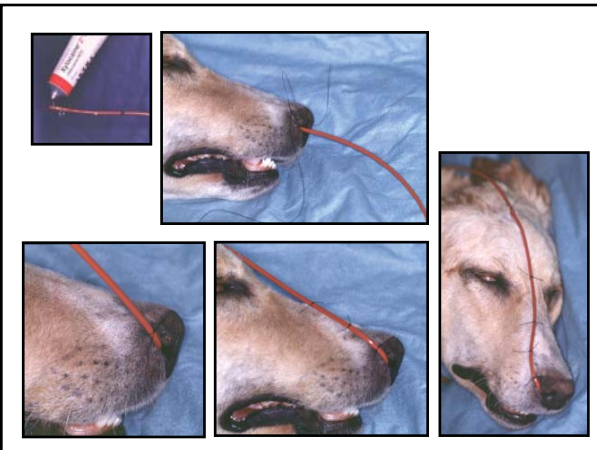
Oxygen Delivery Methods: ~ 40%




Intranasal
Oxygen: 40-60%

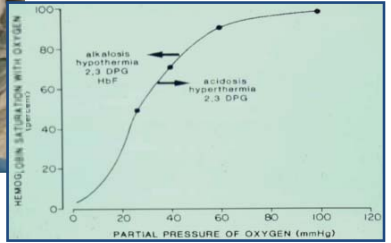






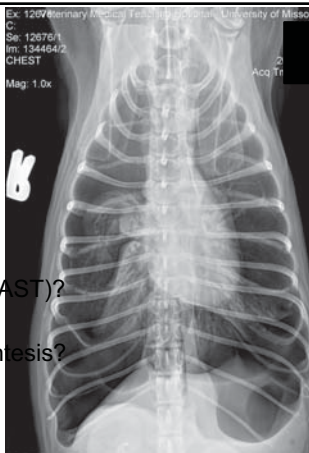


SpO2 vs. PaO2




Rule No. 4: No Radiographs Until Stable.

- Other diagnostics?
 - SpO2/ PaO2
 - PaCO2, PvCO2
 - Ventilatory failure
 - Chest ultrasound (T-FAST)?
 - Fluid or air?
 - Diagnostic thoracocentesis?



"Acute" Trauma: 6 Y/O M/C Boxer



- HBT (truck)
- Dog in respiratory distress
- Owner drove 3 hours to MU
- At arrival –
 - Severe respiratory distress, rapidly deteriorating (~10 min)
 - Poor air movement
 - Tachypnea, cyanosis
 - Coughing / spewing blood
 - Markedly increased lung sounds
- Plan?

Rule No. 5: It is much easier to keep an animal breathing than it is to “re-animate”.



- Respiratory failure imminent?
Capture airway
- IV catheter first!
- Have supplies ready
- Propofol induction
- Intubation
- Ambu-bag
- Dump airway fluid

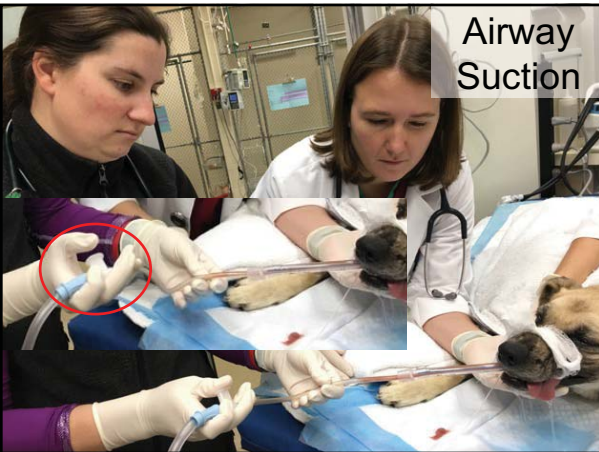
Managing Acute Upper Airway Obstruction



- Emergency endotracheal intubation (rapid anesthesia)
- Intratracheal oxygen
- Tracheostomy



Airway Suction



Rule No. 6: Meet the owner promptly

- Emergency = Scary!
- Rapid deterioration
- Keep it simple
- Owner permission
- ICU visit?

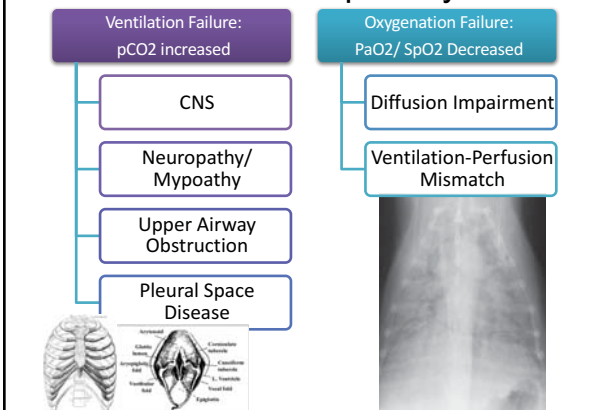


What Defines Respiratory Failure?

- $\text{PaO}_2 < 60 \text{ mm Hg}$ when $\text{FiO}_2 < 0.5$
- $\text{PaCO}_2 > 50 \text{ mm Hg}$



Mechanisms of Respiratory Failure



Ventilation Failure: Neurologic Causes



Severe CNS Depression:
Head trauma



Cervical Spinal Cord:
C 5, 6, 7



Peripheral neuromuscular

Ventilation Failure: Structural Abnormality

- Chest Wall
- Larynx
- Pleural Space
- Trachea





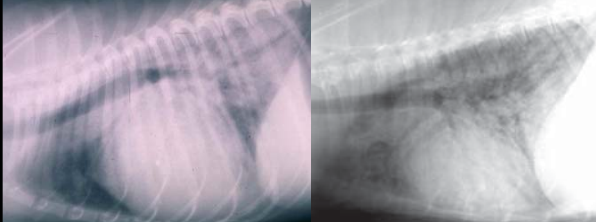
Oxygenation Failure: Lung Abnormality

- Pulmonary contusions
- Pneumonia/ Pneumonitis
– Aspiration, Hematogenous
- Pulmonary hemorrhage
- Pulmonary thromboembolism
- Smoke inhalation
- Interstitial lung disease



Mechanisms of Pulmonary Edema

Increased pressure = **Cardiogenic** Increased permeability = **Vascular leak**
(e.g. Non-cardiogenic, Neurogenic)



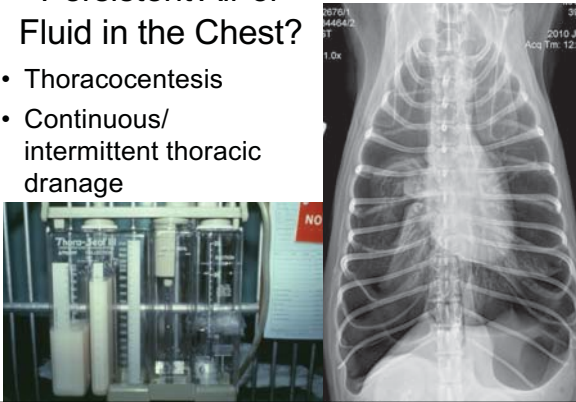
- Underlying cardiac disease
- Fluid overload (iatrogenic)
- Starling forces?
- ALI/ ARDS: 2° Any critical illness
- Drowning, strangulation, electrocution, contusions

Treatment: Ventilation Failure (PCO2 increase)

- Oxygen therapy alone does not correct ventilation failure
- Upper Airway Obstruction
 - Fixed (Foreign body, mass)
 - Intubate or Tracheostomy, remove obstruction if possible
 - Dynamic (Laryngeal paralysis, Tracheal collapse)
 - Very mild sedation (low-dose acepromazine 0.025 mg/kg +/- low-dose butorphanol)
- Excessive sedation/ anesthesia
 - Reverse drugs, ventilate

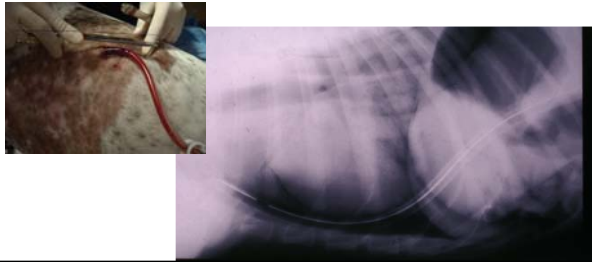
Persistent Air or Fluid in the Chest?

- Thoracocentesis
- Continuous/ intermittent thoracic drainage

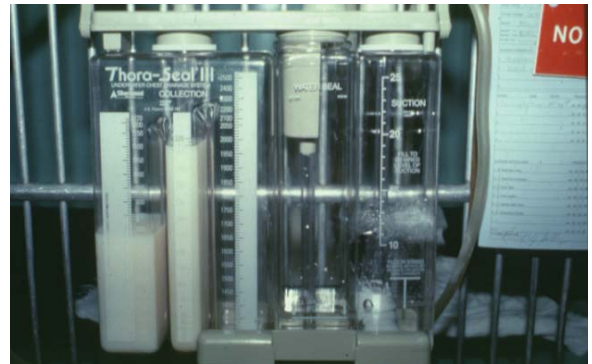


When to consider thoracostomy tube?

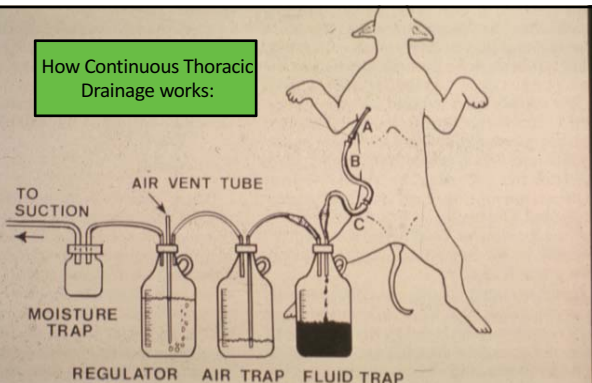
- Pneumothorax: Persistent without endpoint, or recurrent > 2 times
- Fluid: Unable to keep chest evacuated



3-Chamber System



How Continuous Thoracic Drainage works:



Ventilation Failure: Neurologic Disease

- Intubate / ventilate
- Correct underlying problem if possible
 - Not always possible



Treatment: Hypoxemic Failure


- Pulmonary edema from congestive heart failure
 - Acute medical management for heart failure
- Pulmonary contusions/ non-cardiogenic pulmonary edema
 - Oxygen therapy >40%
 - Conservative fluid therapy!
 - Watch for respiratory fatigue and failure
 - Mechanical ventilation

Treatment: Hypoxemic Failure

- Pneumonia
 - Appropriate antibiotic/ antifungal therapy
 - Oxygen supplementation
- Feline asthma
 - Bronchodilator therapy
- Canine chronic obstructive pulmonary disease
 - Minimize stress
 - Oxygen therapy?

Critical Care Ventilation

- Deliver 21-100% FiO₂
- Pressure- or Volume Controlled
- Allows for time for recovery if possible
 - Risk
 - Cost
 - Labor-intensive




Complications

Ventilator Therapy:	Disease:
<ul style="list-style-type: none">• Pneumothorax• Pneumonia• General anesthesia• Manage all bodily functions	<ul style="list-style-type: none">• Failure to respond to treatment• No treatment/ cure available• Co-morbidities/ Organ dysfunction/ Failure



Prognosis Depends on Cause

- Upper airway / neuromuscular disease: Px fair to guarded
- Acute lung disease, previously healthy: Px guarded
- Chronic pulmonary disease: Px poor to grave



Respiratory Management Summary:

- Response to oxygen?
 - Hypoventilation, diffusion impairment, low V/Q disorders (venous admixture)
- Response to anxiety relief?
 - Upper airway obstruction
- Response to analgesia?
 - Pain on chest excursions
- Respiratory failure?
 - Insure airway patency!
 - Ventilation is difficult long-term