Top 10 Mistakes to Avoid in Dyspneic Patients

Justine A. Lee, DVM, DACVECC, DABT
CEO, VetGirl
justine@vetgirlontherun.com

Garret Pachtinger, VMD, DACVECC
COO, VetGirl
garret@vetgirlontherun.com
Thanks to today’s SPONSOR!

AeroKat* Feline Aerosol Chamber
Trudell Medical International” Canine Aerosol Chamber
Introduction

Justine A. Lee, DVM, DACVECC, DABT
CEO, VetGirl

VETgirl
www.vetgirlontherun.com
Introduction

Garret Pachtinger, VMD, DACVECC

COO, VetGirl

www.vetgirlontherrun.com
VetGirl... on the go!

- The tech-saavy way to get CE credit!
- Subscription-based podcast service offering RACE-approved CE for $99/year
- VetGirl ELITE includes 12 hours of webinars

VETgirl

www.vetgirlontherun.com
Who likes seeing dyspnic patients?

Photo courtesy of Vicki Campbell, DVM, DACVA, DACVECC
English bulldog
Goals of the Talk

- Not knowing what a TFAST is
- Taking chest radiographs in dyspneic cats
- Not feeling comfortable performing a thoracocentesis
- Not smelling cats more
Goals of the Talk

- Not being able to interpret a pulse oximetry reading
- Being scared to control the airway
- Assuming it is congestive heart failure (CHF) if the HR is < 150-160 bpm
Goals of the Talk

- Underutilizing your patient’s signalment to guide your therapy

- Not understanding oxygen content (CaO$_2$): When to give oxygen vs. blood products
Goals of the Talk

- Not knowing what ARDS or ALI are
- Not using inhalers more frequently
- How to give oxygen!
Mistake #1: Not Knowing What a TFAST Is

FAST: Focused Assessment with Sonography for Trauma
FAST Exam

- **Focused Assessment with Sonography for Trauma**
- New standard of care, human ER
- 2-minute test
- Helps pay off your ultrasound machine
- Evidence of free abdominal fluid: look in 4 areas
FAST Locations

- Caudal to xiphoid process
- On midline over bladder
- Over most gravity-dependent area
- Right and left flank

Figure courtesy of Boysen SR from IVECCS proceedings 2006.
TFAST: Thoracic Focused Assessment with Sonography for Trauma

- Use the FAST exam for the chest
  - Pleural effusion
  - Pneumothorax
- Etch-a-sketch™
- The “Glide” sign (no pneumothorax!) 😊
Not Knowing What a TFAST Is
Mistake #2: Taking Chest Radiographs in Dyspneic Cats
Taking Chest Radiographs in Dyspneic Cats

TFAST instead! Benign chest tap!
Mistake #3: Not Feeling Comfortable Performing a Thoracocentesis
Thoracocentesis

**Supplies:**
- 20 cc syringe
- 3 way stopcock
- 16-22 ga. needle or butterfly catheter
- Extension setting
- Empty bowl
- +/- sedation
  - Butorphanol: 0.2-0.8 mg/kg IM or IV
  - Diazepam: 0.1-0.25 mg/kg IV
The exceptions to the “benign thoracocentesis?”

- Siamese cats
- Chronic cats:
  - Chylothorax
  - Asthma
Mistake #4: Not Smelling Cats More

- Siamese cats
- Acutely dyspneic
- Asthma
- Smoke smell
- Essential oil smell?
- www.Fritzthebrave.com
Mistake #5: Not being able to correlate a pulse oximetry reading well
Pulse oximetry

**Limitations**
- Excessive movement
- Pigmentation
- Jaundice
- Hypothermia
- Nail polish
- Extraneous light
- Decreased perfusion

**Accuracy?**
- ALWAYS perform arterial blood gas if concerned
- Matching HR
- Good wave
- VBG + pulse ox = ABG
Pulse ox 100% until it’s dead/pulseless

- Recognize limitations
- Anesthetized patients
Relying on your pulse oximeter under general anesthesia

You should expect the PO\textsubscript{2} to be higher with O\textsubscript{2} supplementation. Multiple by 5 to get your expected PaO\textsubscript{2}.

- i.e., FiO\textsubscript{2} of 21% X 5 = expected PaO\textsubscript{2} of 105
- i.e., FiO\textsubscript{2} of 40% X 5 = expected PaO\textsubscript{2} of 200
- i.e., FiO\textsubscript{2} of 60% X 5 = expected PaO\textsubscript{2} of 300
- i.e., FiO\textsubscript{2} of 100% X 5 = expected PaO\textsubscript{2} of 500
Mistake #6: Being Scared to Control the Airway
If Severe Dyspnea or Peri-arrest: Control the Airway!
Just Because the Gums Are Pink…

- Arterial vs. venous blood gas analysis
  - Normal:
    - $paO_2$ 80–100 mmHg
    - $paCO_2$ 30–35 mmHg
  - “50:50” rule

- Pulse oximetry
  - $SpO_2$ 95-100% → normal
  - $SpO_2$ < 93% → needs O$_2$
  - $SpO_2$ < 90% → horrible!
Being Scared to Control the Airway

**PROS:**
- Controls airway
- Allows one to do advanced diagnostics in a calm, controlled manner

**CONS:**
- Requires sedation
- Risks
- Requires preparation for positive-pressure ventilation (PPV)
- Expense
- Labor intensive
- Lung disease → pneumothorax?
Being Scared to Control the Airway

### When to do it:
- Respiratory fatigue
- Pending respiratory arrest
- Agonal
- Severe hemoptysis

### When not to do it:
- Not prepared
- For routine laceration repair in HBC
  - Possible pneumothorax
- Owner?
Mistake #7: Assuming it is CHF if the HR is < 150–160 bpm (canine)
Mistake #7: Assuming it is congestive heart failure (CHF) if the HR is < 150–160 bpm (canine)

Body’s goal: oxygen delivery

Increase HR to increase cardiac output (CO)
Assuming it is CHF if the HR is < 150–160 bpm (canine)

- With most heart failure, good contractility until failure
  - Exception: dilated cardiomyopathy (DCM)

- If HR < 160, likely not CHF!
Mistake #8: Underutilizing your Patient’s Signalment to Guide Your Therapy

- Sex
- Age
- Weight
- Breed
- Presenting complaint
Underutilizing your Patient’s Signalment to Guide Your Therapy

- **Sex:**
  - Male cats → HCM (hypertrophic cardiomyopathy)
  - DCM (dilated cardiomyopathy) → 73% male dogs

- **Age:**
  - 2 years old → HCM

- **Weight:**
  - DCM → > 15 kg

- **Breed:**
  - DCM → Dobermans
  - HCM → Maine coon
  - HCM → Ragdolls (UK)
Underutilizing Your Patient’s Signalment to Guide Your Therapy

- Doberman, 8-year-old MC
- 3-week history of exercise intolerance
- PC:
  - Cyanotic
  - Coughing
  - Crackles all fields
  - 1/6 heart murmur
  - HR 180
  - T: 36.8°C (98.2°F)
  - RR: 100
Underutilizing Your Patient’s Signalment to Guide Your Therapy

- 2-year-old MC Maine Coon cat
- 1-day history of open-mouth breathing, 10-day history of ↑ RR/RE

**PC:**
- Open-mouth breathing
- Dull lung sounds
- T 37.1°C (98.8°F)
- HR 200
- RR 100
- Muffled heart sounds
- No heart murmur
Underutilizing Your Patient’s Signalment to Guide Your Therapy

- Diagnostic plan?
- Shave, TFAST
- Thoracocentesis
- Post-tap chest radiographs
- Evaluate heart size
- Cytology
- Echocardiography
Underutilizing Your Patient’s Signalment to Guide Your Therapy

- 9-year-old FS Westie
- History:
  - Chronic cough X 2 months
  - Exercise intolerance X 2 months
  - Heartworm (–)
- PC:
  - Severe tachypnea
  - Cyanotic mm
  - Inspiratory crackles
  - T 38.8°C (101.8°F)
  - HR 120; 1/VI murmur?
  - Pulse quality good
  - RR 100
Underutilizing Your Patient’s Signalment to Guide Your Therapy

- 12-year-old miniature poodle, MC

- History:
  - DDX with heart murmur 3 years ago
  - No treatment
  - Chronic cough X 2 years with excitement (“honking” cough)

- Current meds:
  - Enalapril X 3 years
  - Hydrocodone X 2 years as needed
Underutilizing Your Patient’s Signalment to Guide Your Therapy

- PC:
  - Progressive tachypnea X 3 days
  - Tachypneic and dyspneic
  - T 37.9ºC (100.3ºF)
  - HR: 170
  - RR panting
  - Fine crackles

- Diagnostics:
  - Furosemide 2-4 mg/kg IM or IV trial, q 15 minutes until RR improved!
  - Oxygen therapy
  - Echocardiography
Mistake #9: Not Understanding Oxygen Content (CaO₂): When to Give Oxygen vs. Blood Products

- Buffy, 7 yo Cocker with IMHA
  - PCV of 9%

- Does she need **blood** or oxygen?
Not Understanding Oxygen Content (CaO₂): When to Give Oxygen vs. Blood Products

- Buffy, 7 yo Cocker with IMHA
  - PCV of 9%

\[
\text{CaO}_2 = \text{Hb} \times 1.34 \times \text{SaO}_2 + (0.003 \times \text{paO}_2)
\]
Mistake #10: Not Knowing What ALI and ARDS Are

- ALI: Acute Lung Injury
- ARDS: Acute respiratory distress syndrome
Mistake #10: Not Knowing What ALI and ARDS Are

Photos courtesy Dr. Monica Clare, DACVECC
Not Knowing What ALI and ARDS Are

Photo courtesy Dr. Monica Clare, DACVECC
Acute Lung Injury (ALI)

American-European Consensus Conference definition: (1994)

1. Acute onset in nature
2. Pulmonary artery occlusion pressure < 18 mmHg or lack of LA hypertension
3. Hypoxemia with a $\text{PaO}_2/\text{FiO}_2$ ratio < 300 mmHg
4. Radiographic evidence of bilateral infiltrates

Causes for ALI

- Prolonged hypotension
- Aspiration of gastric contents
- Sepsis
- Trauma
- Pancreatitis
- Neurogenic pulmonary edema
- Cirrhosis
- Toxic inhalation
- Lung resection
- Multiple transfusions
Treatment

- Conservative fluids
- Symptomatic and supportive
- Removing inciting nidus
- Turf!
Mistake #11: Not Using Inhalers More Frequently

- **Mainstay of emergency treatment: humans**
  - Acute asthmatic attacks
  - COPD
  - Cystic fibrosis
  - Anaphylaxis
  - Pneumonia
Benefits: Inhaled Medications

- Quick therapeutic response
  - Increase time to patient comfort
  - Decrease hospitalization time

- Fewer systemic side effects
  - Glucocorticoids

- Option for chronic therapy
Aerokat, Aerodawg, AeroHippus®

- Metered-dose inhaler (MDI) with spacer and small face mask
- Trudell Medical International, Canada
ANIMALS have ASTHMA too!

Animal owners around the world depend on products from Trudell Medical International to help their animals breathe easier.

Exclusive!

Flow-Vu* Indicator helps provide assurance that medication is delivered where it is needed – deep in the lungs.
Use of inhaled medication to treat respiratory diseases in small animals
Use of Valved Holding Chambers with Inhalers
**AeroKat** Feline Aerosol Chamber

**Valve** - Low resistance valves ideal for cats (low inspiratory flow)

**Flow-Vu** Indicator – moves with respiration and provides caregiver assurance that inhalation is performed correctly.

**Anti-Static Chamber** – provides consistent aerosol delivery and can be used right out of package (cloudy appearance)

**Universal backpiece** – can be used with all Metered Dose Inhalers

**Baffle** - breaks down particles to smaller size resulting in decreased oropharyngeal deposition

Two attachable facemasks designed specifically for felines (accommodate all breeds and sizes of cats)
Indications for Use

- **Cats**
  - Respiratory distress due to allergic bronchial disease
    - Bronchodilators
    - Corticosteroids: combine with parenteral use

- **Dogs**
  - Chronic bronchitis, pulmonary fibrosis
  - Anaphylaxis
  - Pneumonia?
Inhaled Medications

- Albuterol (β-agonist)
  - Bronchodilation
  - Toxicity in dogs when chewed!

- Fluticasone propionate (Flovent®)
  - 220 mcg inhaler, chamber inhaler system
  - Controls airway inflammation
  - BID dosing, taper to SID to EOD
However...

- If severe lung disease, *must* use systemic prednisolone first to treat underlying disease!

- Rescue therapy: inhaler therapy!
Mistake #12: Not Administering Oxygen Efficiently

- Face mask
- Flow by
- Hood/E-collar
- Intranasal
- Intra-tracheal
- Oxygen cage
- Tracheostomy tube
- Endotracheal tube (ETT)
- Positive pressure ventilation (PPV)
# Approximate FiO₂

<table>
<thead>
<tr>
<th>O₂ therapy</th>
<th>FiO₂</th>
<th>PaO₂ (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room air</td>
<td>0.21 (21%)</td>
<td>80–100</td>
</tr>
<tr>
<td>Oxygen cage</td>
<td>0.4–1</td>
<td>150–500</td>
</tr>
<tr>
<td>Nasal cannulas*</td>
<td>0.4–0.6</td>
<td>150–300</td>
</tr>
<tr>
<td>Intubation</td>
<td>1 (100%)</td>
<td>500</td>
</tr>
</tbody>
</table>

*Dependent on O₂ flow in L/min
Delivering Supplemental Oxygen to Dogs and Cats

B: Dr. Tim Crowe, Table 1, DVM NEWSMAGAZINE, Oct 2009.

<table>
<thead>
<tr>
<th>Method of supplemental oxygen delivery</th>
<th>% of oxygen concentration achievable</th>
<th>Time taken to reach %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal cannula</td>
<td>40%-50%</td>
<td>within seconds</td>
</tr>
<tr>
<td>Nasal catheter</td>
<td>40%-70%</td>
<td>within seconds</td>
</tr>
<tr>
<td>Nasopharyngeal catheter</td>
<td>60%-80%</td>
<td>within seconds</td>
</tr>
<tr>
<td>Nasotracheal catheter</td>
<td>60%-90%</td>
<td>within seconds</td>
</tr>
<tr>
<td>(Crowe) oxygen collar</td>
<td>50%-80%</td>
<td>within 1-2 minutes</td>
</tr>
<tr>
<td>Oxygen cages</td>
<td>30%-60%</td>
<td>up to 45 minutes</td>
</tr>
<tr>
<td>Non-rebreathing mask</td>
<td>90%-100%</td>
<td>within seconds</td>
</tr>
</tbody>
</table>

*Data based on size of cage or bag and flow rate*
Oxygen Therapy:
Flow By or Face Mask

**PROS:**
- Easy access to patient
- "Hands on"
- Can achieve high FiO$_2$
  - FiO$_2$ = 0.25-0.45 @ 6-8 L/min
  - FiO$_2$ = 0.7-0.8 @ 8-12 L/min

**CONS:**
- Can be stressful
- Face mask intolerant
- Oxygenating the room
Oxygen Therapy: Hood/E-collars

**PROS:**
- May be well tolerated
- $\text{FiO}_2 = 0.3-0.4 \, @ \, 0.2-0.5 \, \text{L/min}$

**CONS:**
- Hot, ↑$\text{CO}_2$?
- High delivery rate
- Inconsistent oxygen level
- Needs 24-hour supervision to make sure no suffocation!

[Photo courtesy of Dr. Tim Crowe]
Oxygen Therapy: Intranasal

- Excellent patient accessibility
- Stressful placement
- Usually well tolerated
- $\text{FiO}_2 = 0.40-0.60$
  - @50–100 mL/kg unilateral vs. bilateral

Photo courtesy of Dr. L Powell, DACVECC
Oxygen Therapy: Tracheostomy

**PROS:**
- Similar advantages as ETT
- Well tolerated in awake patients
- Bypasses upper airway
- 100% FiO$_2$ at 0.2 L/kg/min

**CONS:**
- Invasive!
- Placement requires anesthesia
  - Controlled environment
- Nursing care! Aseptic!
Oxygen Therapy: Endotracheal Tube

**PROS:**
- Allows maximal control
- Low pressure, high volume cuff
- Bypasses upper airway obstruction
- 100% FiO$_2$

**CONS:**
- Requires sedation
- Intensive care
- Tracheal necrosis
Positive Pressure Ventilation (PPV)

- Ventilator
- Anesthesia Ventilator
- Anesthesia Machine
- Baine’s Circuit
- Ambu Bag
So how do I give oxygen?

- Needs 24 hour care
- Use the safest modality for the patient
Conclusion

- Utilize TFAST more
- Limit chest radiographs to post-thoracocentesis
- Thoracocentesis → life-saving!
- Clues to diagnosis: signalment, HR
- Knowing when to give blood vs. oxygen
Who likes seeing dyspnic patients?
Questions?

@VetGirlOnTheRun
VetGirlOnTheRun

VETgirl

www.vetgirlontherun.com
Thanks to today’s SPONSOR!
VetGirl

Just released!

Subscription-based podcast service offering RACE-approved CE for $99/year

VetGirl ELITE includes 12 hours of webinars

www.vetgirlontherun.com