Respiratory Triage:
Differentiating Upper Airway Disease from Lower Airway Disease
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The triage examination is the initial and brief examination that occurs in the first few minutes after a patient presents to the emergency room. The triage examination is crucial to assessing a patient and determining if life-threatening problems are present.

The triage examination
Veterinarians have to be information gatherers in order to put the pieces of the puzzle together regarding emergency patients. One of the first pieces of the puzzle is the information gathered from the initial physical examination, or triage examination. The most basic systems that should be assessed during the triage examination are the respiratory system, cardiovascular system, neurologic system, and abdomen (GI and urogenital systems). These notes will focus on the parts of the examination that are associated with the respiratory system.

Mucous membrane color
Cyanosis
Cyanosis indicates severe hypoxemia. By definition, cyanosis means greater than 5 g/dL of hemoglobin is desaturated, which correlates to an oxygen saturation (SaO2) of about 75% and a partial pressure of oxygen (PaO2) of approximately 40 mmHg. Hypoxemia to this degree is life-threatening. Therefore, if cyanosis is present, it indicates severe hypoxemia and oxygen therapy needs to be instituted immediately!

White/pale
White or pale mucous membranes typically indicate vasoconstriction or anemia. Both of these conditions may lead to decreased oxygen delivery to the tissues.
- Vasoconstriction is usually a result of hypovolemic or cardiogenic shock. Vasoconstriction is technically caused by release of norepinephrine and subsequent stimulation of the peripheral alpha receptors, leading to vasoconstriction.
- Animals that have pale or white mucous membranes secondary to anemia can present differently depending on if it is acute or chronic anemia. Acute anemia (i.e. hemorrhage) will typically cause hypovolemic shock (tachycardia, tachypnea, hypotension, dull mentation, etc.). Chronic anemia patients (e.g. cats with FeLV) usually tolerate their anemia very well. They may be slightly tachycardic, tachypneic, or weak, but won’t usually be hypotensive or in shock.

Grey/muddy
Grey or muddy mucous membranes usually indicate poor tissue perfusion and tissue hypoxia. Shock or hypoxemia should come to mind in patients with grey or muddy mucous membranes.

Brown
Brown mucous membranes may indicate methemoglobinemia, which decreases the oxygen carrying capacity of hemoglobin, leading to decreased O2 delivery. The most common cause of methemoglobinemia in veterinary medicine is Tylenol toxicosis in cats.

Bright red/injected
Bright red mucous membranes may indicate decreased cellular utilization of oxygen (seen with cyanide poisoning or sepsis), decreased oxygen-hemoglobin binding (seen with carbon monoxide poisoning), or vasodilation (frequently seen with sepsis or heat-stroke).

Petechia/ecchymoses
May indicate a coagulation abnormality, especially a platelet disorder.

Capillary refill time
Capillary refill time is an assessment of capillary perfusion. If you blanch the mucous membranes and they refill very slowly, this indicates that the pre-capillary arteriolar tone is very high (as seen with norepinephrine release and vasoconstriction). If the mucous membranes refill very quickly after blanching, it indicates that pre-capillary arteriolar tone is very low (i.e. as seen with vasodilation). Quick capillary refill times (i.e. <1 sec) indicates vasodilation or a hyperdynamic state. A fast CRT should raise a red flag that a patient may be septic or in septic (distributive) shock. However, patients that have recently exercised, have heat stroke, or have evidence of the systemic inflammatory response syndrome (SIRS) also frequently have a fast CRT.

Slow capillary refill times (i.e. >2.5 sec) indicate vasoconstriction or low cardiac output (seen frequently with hypovolemic, traumatic, or cardiogenic shock).
Respiratory patterns

- Much can be gained from proper assessment of the respiratory system. Simply observing an animal’s respiratory pattern (even prior to auscultation) can lead to tremendous insight into the cause of the breathing pattern. In fact, this part of the examination can be done as you approach the animal during triage.
- Upper airway disease or obstruction usually presents with increased airway noise on inspiration (stridor), increased inspiratory time, and increased inspiratory effort.
- Lower airway disease commonly has an increased expiratory effort with an “abdominal push”.
- Severe lower airway disease, combination upper and lower airway disease, metabolic disease, and neurologic disease may have both increased inspiratory and expiratory effort.
- Eupnea is the term used to describe a normal breathing rate and pattern.
- Dyspnea is the term frequently used to describe an animal in respiratory distress. However, some clinicians prefer the term “respiratory distress” over dyspnea. This is because in people, the term dyspnea is associated with the feeling/emotion of respiratory distress versus the actual pattern.
- Tachypnea is an abnormally fast respiratory rate and is commonly seen with many lower airway disorders, pain, pleural space disease, and metabolic acidosis.
- Bradypnea is an abnormally slow respiratory rate and is commonly seen with central neurological disorders or drug induced respiratory depression.
- Coughing may be present with upper or lower airway disease. Productive versus non-productive coughing may help localize from where the cough is originating.
- A Kussmaul breathing pattern consists of deep, rapid breathing that is commonly associated with metabolic acidosis.
- Biot’s respiration pattern consists of deep, constant rate breathing interspersed with periods of abrupt apnea, usually seen with elevated intracranial pressure.
- Cheyne-Stokes respiration is a pattern of gradually increasing respiratory rate followed by gradually decreasing respiratory rate, ending in periods of apnea. This pattern is commonly seen with coma and disruption of the medullary breathing control centers in the brain.
- An ataxic breathing pattern is one that is very erratic and has no particular pattern. Ataxic breathing is usually associated with brainstem lesions.
- An apneustic breathing pattern is a “breath holding” pattern seen after inspiration and commonly is seen with brain stem disease.
- Agonal breathing consists of gasps, followed by periods of apnea, followed by more gasps and indicates severe brain stem hypoxia and near death.

Body posture

- Body posture/position can help the veterinarian determine the seriousness of a problem.
- Animals in respiratory distress commonly present with an orthopneic posture, which consists of an extended head/neck and standing with elbows abducted in order to expand their chest cavity.
- Animals in shock are commonly laterally recumbent and have decreased mentation.
- Animals with neurologic disease may be ataxic, comatose, stuporous, obtunded, or seizuring.
- Animals with an acute abdomen may have a hunched posture or sit in a “praying” position.

Auscultation

Pulmonary auscultation should be performed in all lung fields. Thorough lung auscultation will help define respiratory disease even more specifically, especially when used in conjunction with breathing pattern. Auscultation over the trachea should also be performed to determine if abnormal lung sounds are due to referred upper airway noises.

- Fine crackles: Associated with opening and closing of collapsing alveoli, usually due to fluid in the alveoli (commonly seen with pulmonary edema, pulmonary contusions, and pneumonia).
- Course crackles: Indicates large airway disease or pulmonary fibrosis.
- Increased bronchial or bronchiolar sounds: Indicates increased movement through the large airways. May be normal in a panting dog, or may indicate bronchial/bronchiolar or interstitial disease. Some people refer to these lung sounds as being “harsh”. Referred upper airway noises should be ruled out.
- Dull lung sounds: Commonly associated with pleural space disease. Distribution of dull sounds may help differentiate inciting cause of pleural space disease. Dull lung sounds dorsally commonly indicate pneumothorax, potentially a diaphragmatic hernia, or a space occupying mass. Dull lung sounds ventrally commonly indicated fluid accumulation, a space occupying mass, or a diaphragmatic hernia.
• Pleural friction rubs: Associated with pleural fibrosis or pleuritis.
• Wheezes: A squeaking or whistling noise associated with air movement through a narrowed opening. Commonly heard with narrowed tracheobronchial airways in asthma or during tracheal obstruction.

Using the triage examination to differentiate upper vs. lower airway disease can be very helpful, as described above. An animal with upper airway disease needs very different diagnostics than one with lower airway disease. The animal with upper airway disease may need an oral exam, laryngeal exam, rhinoscopy, fluoroscopy, or head/neck imaging. The animal with lower airway disease may need thoracic radiographs, fluoroscopy, echocardiogram or ultrasound. Differentiating which diagnostic route to take early on not only decreases stress to the animal, but may decrease cost and increase satisfaction to the owner. The triage and physical exam will aid in determining the correct diagnostic path to take.