Someone Help Me! I can’t Breathe!
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Respiratory emergencies cover a broad spectrum of conditions and disease processes. They may present as the primary problem (upper airway obstruction) or secondary to another issue (non-cardiogenic pulmonary edema following electrocution). Whether presenting during triage or affecting a hospitalized patient, quick detection and intervention is key. A common thread among respiratory emergencies is the fragile nature of the patient and the potential for rapid decompensation and even death. Stress is the enemy of our dyspneic patient. We must be careful not to add to the anxiety and stress of our patients, or we will risk hastening the progression of their decline. To ensure we support and stabilize our patients, we must identify the underlying issue(s) while at the same time supporting their physiologic needs. Oxygen therapy will be central to the treatment of most dyspneic patients, but will likely be one of many treatment needs we will need to address to ensure the recovery of our patients. It is important to recognize that there can be many causes outside of the primary respiratory system that will affect our patient’s respiratory system and/or manifest themselves as a respiratory emergency. This can include cardiovascular emergencies, anemia, shock, metabolic, endocrine, acid/base and electrolyte derangements, neurologic impairment, etc.

The respiratory system comprises the head, neck, and thorax. It is directly linked to the circulatory system to ensure transportation and exchange of oxygen and carbon dioxide with tissue and cells throughout the body. The upper airway is generally considered to include the nares, mouth, oropharyngeal region, and trachea progressing caudally to the thorax. The lower airway can be thought of as the bronchi and increasingly smaller branching bronchioles and alveoli. The transfer of oxygen and carbon dioxide occurs at the alveoli through an extremely thin endothelial layer. Breathing is a complex active process that occurs generally seamlessly without any thought or conscious initiation. As the patient inhales, intercostal muscles help to expand the ribs cranially and laterally. At the same time, the diaphragm contracts flattening it and pulling it caudally. Both of these functions help to increase intrathoracic space and decrease intrathoracic pressure promoting air to enter the lungs and allowing for gas exchange to occur. Expiration promotes the opposite, driving air out of the lungs toward the environment.

Evaluation of the clinical signs, breathing pattern, and auscultation of breath sounds can help to determine or localize where our problem is occurring. In some cases, diagnostics such as radiography (x-rays), computed tomography (CT), ultrasound (thoracic focused assessment in sonography for trauma [TFAST]), and/or other modalities may be required to identify the location and severity of dysfunction. We can evaluate our patient’s oxygenation status with pulse oximetry (SpO2) and oxygenation/ventilation with arterial blood gases (PaO2, PaCO2, A-a gradient, etc).

It is important to remember that the respiratory rate is not a specific clinical sign solely to the respiratory system, but rather is affected by a multitude of body systems. A patient may have an increased respiratory rate due to stress, pain, endocrine disorders, acid/base disorders, even for the purpose of temperature regulation (in dogs). The most common clinical sign associated with respiratory emergencies is tachypnea, with or without increased effort observed. Tachypnea is defined as an increased respiratory rate, and needs to be differentiated from panting in dogs. For most canine and feline patients, this can be considered greater than 40 breaths per minute. Tachypnea is common in
cases of congestive heart failure, pleural effusion, anemia, pneumothorax, etc. A shallow respiratory pattern may indicate an issue in the ability of the lungs to expand. For instance, in cases of pleural effusion or pneumothorax, the lungs may not be able to adequately expand within the thoracic cavity. The air or fluid in the third space of the pleural cavity causes increased intrathoracic pressure and reduces pulmonary expansion as would otherwise occur during inhalation. The body attempts to compensate by taking rapid shallow breaths to maximize gas exchange. However, this reduces the amount of time available for gas exchange within the alveoli. This can lead to hypoxemia and deterioration of the patient’s status. Slow, deep breaths may be seen during instances of upper airway obstruction and tracheal collapse. During laryngeal paralysis, increased inspiratory stridor may be observed. Long, deep breaths may be attempted to maximize the amount of air that can be brought through the narrowed larynx. Consider the scenario of attempting to breathe through a straw while exerting yourself. Your respiratory requirements will likely quickly exceed your abilities. Auscultation of the thorax can yield helpful clues to the underlying pathology. Thorough yet efficient/timely examination should be made when possible. Remember to listen for sounds both cranially and dorsally on both sides. Examples of respiratory sounds in our veterinary patients can be found at: http://www.cvmbs.colostate.edu/clinsci/callan/index.html. Orthopnea is the physical positioning of the body to maximize the intrathoracic space for respiration. This involves the patient abducting their elbows away from their body, and stretching out their head and neck. This is a sign of severe respiratory distress and should always prompt an immediate response to provide oxygen support and determine how to alleviate the underlying issue.

It may be necessary to stage examination and diagnostic procedures to alleviate stress and reduce the risk for the patient. Anxiolytic drugs, bronchodilators, sedatives, and anesthetic agents should be considered to assist the respiratory compromised patient. It is imperative to minimize the stress for the patient. Restraint can be very stressful, particularly if our handling of the patient puts them into a position that decreases their ability to breathe. This can include turning them on their back and side. It is possible that diagnostics may need to be postponed while other interventions are taken to ensure the safety of the patient. For example, this might include performing a thoracocentesis for a pneumothorax prior to radiographs being taken in a severely dyspneic patient.

Oxygen support should always be provided to any respiratory compromised patient until it is proven they do not require such support. Oxygen therapy should be administered in the least stressful method available that meets the patient’s needs. This can be by flow-by, oxygen mask, nasal cannula, oxygen cage, oxygen hood, etc. Intubation and positive pressure ventilation may be needed in severe cases. This can be facilitated through use of an ambubag, anesthetic reservoir bag, or mechanical ventilator. Different methods will encompass their own advantages and disadvantages and each should be evaluated for risk to the patient, while also assessing if it meets the needs for that patient. The technical abilities of the facility and team members present must also be evaluated to ensure optimal level of care is being provided without taking undue risks that you aren’t prepared to handle. Regardless of the method of oxygen delivery chosen, humidification of some type is important to prevent drying and irritation of the mucus membranes in the respiratory tract.

When assessing a patient with a respiratory (or any) emergency, we want to start with our ABC’s. We want to identify and “treat first what kills first”. The ABC’s stand for airway, breathing, and circulation. They are the cornerstone of emergency triage and intervention. A patent airway is required to sustain life. Foreign body, mass/neoplasia, inflammation, paralysis of airway structures, and anatomical issues (brachycephalic breeds) can all cause/contribute to an airway obstruction. Care must be taken when evaluating the airway on any patient that is awake/conscious. If the airway is compromised, or
suspected of being compromised, rapid sequence induction with anesthetic agents may be required to secure the airway. Endotracheal intubation should be attempted, but if unsuccessful, emergency tracheostomy may be required. A laryngoscope can be extremely useful to help visualize the oropharyngeal region while attempting endotracheal intubation. Suction should be ready and available to help clear mucus, blood, or debris from the oropharyngeal region. Forceps/hemostats may be beneficial to grasp foreign objects and assist in their removal. Be careful not to push the foreign body deeper into the airway. You should not attempt to blindly “poe around” as you may cause iatrogenic trauma to the trachea. If tracheostomy is required, one should attempt to be as sterile as possible. However, if the patient is actively dying, one may need to balance sterility with timeliness of action to try and save the patient. If tracheostomy tubes are not available, one can “create” their own temporary tracheostomy tubes by cutting down a traditional endotracheal tubes (ET). Choose an ET tube one size smaller then you would have selected for orotracheal intubation. Remove the connector for the anesthesia circuit (side opposite the cuff). Cut down the length of the tube on each side to shorten it to the desired length. To retain the ability to inflate the cuff (if desired), you will want to ensure you do not cut through or past the joining of the inflation channel to the tube. Insert the connector into your shortened ET/now tracheostomy tube to facilitate connection to an ambubag or anesthesia circuit.

If the airway is patent, we can move on to assess their ability to breathe and ventilate. It still may be required to sedate/intubate the patient to provide the necessary ventilation, but with a patent airway comes additional options to provide supplemental oxygen. One of the least stressful methods to provide oxygen support can be through the use of an oxygen cage or chamber. This allows for the patient to receive oxygen with no restraint or interaction with the patient being required. Commercial models are available to help control the fraction of inspired oxygen (FiO₂), temperature, humidity, etc. Do it yourself setups can be created, but should only be used for immediate/short time use, as you will not be able to adequately control for carbon dioxide buildup, FiO₂, temperature, etc. Large, clear storage containers can be utilized for this purpose. With an appropriate drill bit, a hole can be made that will allow for oxygen tubing/anesthesia tubing to connect to the container. This can be very useful as a temporary oxygen support system for small cats and dogs, and pediatric patients. A patient that is otherwise not tolerating restraint and or oxygen therapy can quickly be placed in such a container with a high FiO₂ achieved rapidly. This can help to give you time to plan how to better manage the patient, i.e. setting up an oxygen cage, trying an e-collar/oxygen hood, setup for interventions such as thoracocentesis, etc. Remember, this type of setup is not good for long term management as you could have dangerous amount of CO₂ buildup, increased temperatures, etc.

Nasal oxygen therapy can be very beneficial to the hospitalized patient. It can be tolerated by a variety of patients, and its technique is easy to learn. A key benefit of oxygen therapy over an oxygen cage is the ability to interact with that patient without interrupting the oxygen support the patient receives. Red rubber feeding tubes make for ideal nasal cannulas, as they are flexible enough to allow for bending around the patient’s face, without kinking off the inner tubing. Administration of a local anesthetic such as proparacaine can help to decrease irritation during placement. Measure the length from the tip of the nares to the medial canthus of the eye and mark the tube. Suturing the tube in place using a finger trap technique (or simple interrupted) is preferred. Staples tend to dislodge, while tissue glue can be irritating and less reliable for long term management. An Elizabethan collar should be employed at all times that a nasal catheter is in place to prevent accidental removal by the patient. Oxygen flow rates should be set to 50-100 ml/kg Oxygen per minute.

In some respiratory emergencies, you may find decreased or absent breath sounds during auscultation. These normal sounds could be masked by increased respiratory sounds from the upper airway (referred
upper airway noise). They could be lacking due to a space occupying mass or consolidation of the lung lobe precluding normal movement of air in that region. Pleural effusion and pneumothorax are both causes of decreased or absent lung sounds, and may warrant an immediate thoracocentesis to help stabilize the patient. Pleural effusion may be seen with heart failure (particularly in cats), neoplasia, anticoagulant rodenticides, infections (pyothorax, FIP), trauma, and more. Pneumothorax can be commonly seen in cases of blunt force trauma (hit by car, penetrating bite wounds), but can also occur secondary to bulla, neoplasia, or even spontaneous. A tension pneumothorax is an emergent condition requiring immediate thoracocentesis to reduce the intrathoracic pressure that has built up around the lungs preventing expansion and gas-exchange. Oxygen support should be provided during the procedure. The patient should be placed sternally to promote maximal removal of air or fluid from the pleural space. Ultrasound guided thoracocentesis (TFAST) is optimal for guidance, but not required in emergent situations. Lack of breath sounds combined with knowledge of appropriate anatomy can guide the technician/veterinarian. The sixth to ninth intercostal space will usually be your preferred markers. Fluid is usually found more sternally, while air will accumulate more dorsally. Equipment needed for a thoracocentesis is minimal: butterfly catheter or needle of appropriate gauge/length, extension tubing, syringe (10-60 ml), 3 way stopcock, sterile gloves, and surgical prep. Sterile technique should be employed to prevent iatrogenic contamination. Insertion of your needle/butterfly should occur just cranial to the rib to avoid the nerve and vascular supply running just caudal to each rib. In cases of hemothorax causing severe respiratory distress (secondary to anticoagulant rodenticide ingestion or trauma), one might consider auto transfusion to help reduce the patients need for supplemental blood products. Addressing the coagulopathy should be attempted prior to thoracocentesis if at all possible as a life threatening bleed may occur. Thoracocentesis in a coagulopathic patient should only be performed when respiratory compromise/failure is imminent.

In some cases, the fluid or air accumulation around the lungs may continue to occur depressing respiratory function. Repeat thoracocentesis may be necessary, and in some situations, placement of a thoracostomy tube may be ideal. Thoracostomy tubes may be placed to allow for intermittent removal of air/fluid, or may be connected to a suction system to maintain continuous drainage. Chest tubes should be placed in an appropriate critical care setting including the ability to provide 24 hour intensive care monitoring. Commercially available thoracostomy kits are available. There are generally two types of thoracostomy tubes that can be placed percutaneously: using a seldinger type guidewire technique, or the traditional trocar technique. The trocar based systems may be better suited for larger patients and/or patients requiring connection to a constant suction system. Pleur evac, Thora-seal, and other continuous drainage collection devices are available to help regulate and manage continuous drainage patients. The seldinger type kits may be ideal for practices that do not have experience and/or equipment to support the more traditional chest tubes. The seldinger type kits are also useful in patients that are not ideal for general anesthesia, as some patients may tolerate local anesthetics and/or sedatives to help facilitate placement.

Monitoring and nursing care for the respiratory emergency is of critical importance. It is not enough to simply turn on some oxygen, and then walk away expecting the problem is solved or that the patient is now stable. The approach to the respiratory patient must be multimodal, including immediate support of the patient’s needs through all available and appropriate means including oxygen therapy, drug therapy, and clinical procedures as indicated. Diagnostics may need to be postponed or minimized until the stability of the patient can be ensured, with a risk analysis considered for each test being desired. Definitive treatment for the underlying cause should be started as soon as possible. Ongoing monitoring including thoracic auscultation, vitals, pulse oximetry, arterial blood gases, etc, should be tailored to your patient’s specific needs, while minimizing unnecessary stress. Planning ahead and managing the
patient in increments can help to reduce stress for the patient. It is important to remember that these patients can decompensate quickly. Know the owners wishes in regards to resuscitation and be prepared to intervene at a moment’s notice. Veterinary technicians can impact patient care with early detection through identification of clinical signs, and the knowledge of how to intervene/treat their patient in a variety of circumstances.

References:

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