**AIRWAY EMERGENCIES**

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Patients with airway obstruction may present to veterinary professionals in any setting. As with most emergencies, having a plan before a patient with an airway crisis presents can make the difference to result in a good outcome for the patient and minimal stress to the team. Fortunately, most hospitals and personnel already possess the medications, equipment, and skills to manage these patients successfully.

Regardless of the cause for airway obstruction, the steps will be the same if an animal is having an airway crisis:

1) Control yourself, the team, and the environment
2) Emergency stabilization
3) Establish a patent, secure airway
4) Remove or manage the cause for airway obstruction
5) Decide and execute the exit (discharge or transfer) plan

## PREPARATIONS

The best resuscitations begin before the patient arrives. A simple emergency airway kit should be assembled and stored in the location(s) it is likely to be needed. It should be easy to access, organized to allow rapid identification of the contents, and routinely inventoried/stocked. Team members should be familiar with the contents and use of the equipment. Suggestions for assembling an emergency airway kit are located at the end of these proceedings. Periodic refreshers about how the team should respond to an airway emergency (for example, periodic review during a staff meeting) will help keep everyone up to date on procedures and equipment.

## AIRWAY EMERGENCY MANAGEMENT

### Control yourself, the team, and the environment

Animals are careful observers of their environment and can recognize emotions in the humans around them. Loud, boisterous environments tend to ramp patients up, and it is easier to reduce an animal's distress in a calm, quiet environment. Patients with airway obstructions need a calm, cool environment during stabilization. Wherever possible, remove loud or distressed animals, owners, and staff members from the resuscitation area.

### Emergency stabilization

The key with all airway emergencies is to establish an open airway that is large enough to allow easy, effective gas exchange. Flow-by oxygen should be provided, however some patients will not tolerate the stream of oxygen in their face – gentle persistence with the flow-by oxygen is okay, however restraint to provide flow-by oxygen is generally not advised, and if it is causing the animal to become even more distressed just STOP. We are managing an upper airway obstruction, an interruption in the airway *above* the alveoli. Remember: there are no alveoli in the oropharynx!

In the initial stabilization phase, we need to address the basics of resuscitation. For patients with acute airway obstruction we commonly encounter problems with ventilation,

oxygenation, circulation (shock), and hyperthermia, and all need to be addressed early in resuscitation. Supplies for emergent intubation should be available at all times, but intubation may be delayed and often completely avoided with other interventions.

Reducing patient anxiety and the sensation of shortness of breath immediately can often help avoid intubation. Orally administered drugs will take too long to be effective in most emergencies therefore parenteral preparations are used in the hospital setting. Butorphanol (0.2-0.4mg/kg IV or IM) and/or acepromazine (0.005-0.01mg/kg IV or IM; high end for IM) intravenously or intramuscularly are effective and commonly available. Most patients will start to show improvement within 3-5 minutes (roughly double for IM).

As the patient begins to relax establish IV access and continue flow-by oxygen as tolerated. Most patients who have become hyperthermic due to their work of breathing will cool off rapidly once normal breathing patterns return. Directing a fan across the patient is reasonable if it does not cause the patient to become distressed. Room temperature IV fluid boluses (10-20mL/kg dogs or 10mL/kg cats) can help to cool the patient and restore normal circulation in hypovolemic patients. Refrigerated or chilled fluids are not necessary – room temperature will be 30-40 degrees Fahrenheit (20-25 degrees Celsius) cooler than the patient, which is sufficient.

<u>Establish a patent, secure airway</u>

For many patients simply reducing anxiety/sedating, cooling them off, and restoring normal circulation will result in acceptable, adequate ventilation without further intervention. These patients can then have their airway disorder managed in an urgent, rather than emergent, fashion. Patients who fail to improve or continue to worsen despite sedation will need emergent intubation. During the intubation perform an airway and oropharyngeal examination to identify the cause of airway obstruction.

Reasonable induction agents include ketamine (with midazolam or diazepam if these have not been given as premedication drugs), propofol, alfaxalone, or etomidate. Butorphanol and/or acepromazine should have already been administered in most cases, but if not, consider using premedication if the patient's condition allows. Administration of midazolam or diazepam as part of a premedication package along with the butorphanol/acepromazine can also be considered.

**Pitfall**: in emergencies there is a tendency to administer induction drugs very rapidly and in full/high doses. Cardiopulmonary arrest is a common consequence of this action in critically unstable animals. **Pearl**: begin with ¼ of your standard induction dose, wait 60 seconds, and titrate the remainder in ¼ dose increments every 60 seconds until the patient can be intubated.

Perform the following:

1) Verbalize the plan to the team, including how the patient will be induced, who will perform intubation, what will be done if the patient cannot be intubated, who is responsible for attaching monitoring equipment, who will monitor the patient, how will ongoing-sedation be maintained while the patient is intubated, etc.
2) Pre-oxygenate the patient.
3) Apply pulse oximetry and ECG to the patient if tolerated and gather the other monitoring equipment that will be used after the patient is intubated. This can all be done while pre-oxygenating the patient.

4) SLOWLY administer the induction agent.
5) Execute the emergency airway plan (see below).
6) Provide analgesia (intubation is not comfortable).
7) Provide ongoing sedation that keeps the patient sedate enough to tolerate intubation but still spontaneously breathing.
8) Monitor pulse oximetry, end tidal $CO_2$, blood pressure, ECG, heart rate, respiratory rate, and level of sedation – in other words, all the things you would monitor in an anesthetized patient.

The emergency airway plan is the things that will be done to establish an airway in a patient with airway obstruction. In most cases this will be a standard orotracheal intubation, however if that is not working many repeated attempts will only make matters worse. There should be a back-up plan in place before beginning intubation.

The emergency airway plan should be verbalized, and the team should hold everyone accountable for sticking to the plan. The plan below is a modification of the vortex method described for emergency airway procedures in human medicine. The plan is very simple. An individual who knows how to pass an endotracheal tube makes three attempts at orotracheal intubation (every time you poke at the glottis with the tube is one attempt). If that is not successful, or it is immediately obvious an expected-size tube will not be passed move to step two. Step two is to pass a smaller endotracheal tube, or if that is not possible, a small red rubber or polypropylene catheter is passed into the trachea. Three total attempts are made on step two. If that is not successful, perform an emergency tracheostomy.

The emergency airway plan (aka what tube does it get):

1) Orotracheal intubation with a standard endotracheal tube (3 attempts max)
2) Orotracheal intubation with small bore endotracheal, red rubber, or polypropylene tube with high-flow oxygen (3 attempts max)
3) Emergency tracheostomy (video and description at www.eccvetmed.com)

<u>Remove or manage the cause of airway obstruction</u>

There are many reasons for airway obstruction, but most will fall into one of three major categories:

1) Acute exacerbations of anatomic abnormality or dysfunction
2) Space-occupying disease
3) Severe facial and/or oropharyngeal trauma

<u>Acute exacerbations of anatomic abnormality or dysfunction: tracheal collapse, laryngeal paralysis, brachycephalic syndrome, etc</u>

Most of these patients breathe “normally” – or at least reasonably well, when they are not excited or hot. Successful treatment will consist of emergency stabilization, restoration of a patent airway, and treatment of the underlying cause for decompensation (cool them off, sedate them, etc). **Pitfall**: Animals with chronic airway abnormalities like brachycephalic syndrome, tracheal collapse, or laryngeal paralysis may progress to laryngeal collapse, can develop granulomas or tumors, etc. In other words: diseases can progress and ‘weird’ things come up. **Pearl**: Animals with a previously diagnosed airway disorder should have a new work-

up performed if airway crises suddenly increase in frequency or severity, or if owner notes change in breathing or voice at home.

Space-occupying disease (foreign body, tumor, abscess, hematoma, fibrosis etc)

Provide treatment as above, being particularly prepared to intubate emergently. Most of these patients do improve with anxiolysis or light sedation. However, some of these animals only have a patent airway when they hold their head in a very particular position and may no longer do this when sedated. **Pitfall**: Sedation may cause the patient to move into a position where he no longer has an open airway. **Pearl**: If the patient is maintaining the airway at presentation and is not distressed, calmly provide supplemental oxygen, if tolerated. Have everything ready to execute the emergency airway plan before giving drugs. Always have an emergency airway cart or box ready because not all patients can wait while we gather things from all over the hospital.

Once a patent airway is established, reduce the space-occupying disease: remove foreign bodies, drain hematomas or abscesses, etc. In some cases, such as an abscess with severe cellulitis or large tumors, a temporary or permanent tracheostomy may need to be performed prior to extubation to allow time for medications to reduce the size of the obstruction or provide a permanent bypass.

Remember that some of these conditions are very painful – particularly abscesses and severe cellulitis. Provide appropriate analgesia. Anti-inflammatory drugs such as NSAIDS or steroids should be considered where appropriate. Note that patients with abscesses and associated cellulitis will have rapid reduction in inflammation when given appropriate antibiotics and NSAIDS – steroids might be less desirable in these patients. Whenever possible obtain biopsy samples prior to administration of steroids.

Tracheal and bronchial foreign bodies are typically removed via tracheoscopy/bronchoscopy or surgery.

Severe facial and/or oropharyngeal trauma

These patients may have airway compromise either from anatomic destruction or due to pooling of blood, mucus, saliva, and other secretions in the airway. Repair of anatomic disruption will depend on the structures involved. Conscious patients who are in control of their airway should be given appropriate analgesia (fentanyl, methadone, etc) and otherwise be managed as a trauma patient, with the airway managed similar to patients with space-occupying disease. Be ready for emergency intubation and have suction ready to manage pooled secretions. Unconscious patients, or patients who cannot manage their airway should be urgently or emergently intubated using an emergency airway plan as described above.

Decide and execute the exit (discharge or transfer) plan

Once a patent airway is established (either by calming and cooling the patient or by placing a tube in the airway) and the patient's other physiologic derangements are corrected the exit plan needs to be determined.

When a patient is ready for discharge, discharge instructions should have clear, detailed, and graphic descriptions of what owners should be monitoring, what should prompt a phone call, what should prompt a visit to primary care, and what should prompt emergency presentation. They should also include similarly detailed instructions on how to help their pet in

a crisis while getting to emergency care. For example, remove stimuli or remove patient from stimulating environment, direct a fan onto the pet or transport in air-conditioned vehicle, etc.

Patients who have reasonable expectation of another crisis in the future should have contingency plans. For example, if a dog with tracheal collapse went into crisis because he was excited about visitors at a house party, the animal should be sent home with medications appropriate for use prior to the next house party (hydrocodone, trazodone, acepromazine, etc), and clear instructions on when and how to administer the medications.

Patients requiring transfer between facilities *during* a crisis present a particular challenge. Communication between the transferring and receiving facilities, doctor-to-doctor, is important and considerable effort should be made by both parties to make this communication happen. This allows both sides to be actively involved in making the transfer plan and the receiving team to act quickly if the patient decompensates during transfer. Things to consider when planning transfer include:

- Is the patient currently intubated? Might he still need to be intubated before transfer? What about during the transfer?
- Who will transport the patient – owner, veterinarian/veterinary staff, third party? Ability to administer drugs or intubate if a crisis during transport?
- Should the patient transfer intubated? If yes, what drugs to remain sedated, contingency plan for waking up/obstructing tube/unexpected extubation?
- How does the patient typically respond to car rides – should it be heavily sedated?
- How far is the receiving facility – time to travel is more important than distance
- Arrange transfer in an air-conditioned, pre-cooled vehicle if it is hot outside
- Avoid transfers during rush hour

**EMERGENCY AIRWAY KIT**

An emergency airway kit can be assembled using supplies most veterinary hospitals routinely stock. The container should be organized for rapid identification and access to contents, and stored in an easily accessible location. The team should know where the kit is stored and be familiar with use of the contents.

**Suggested contents:**

- Laryngoscope
- 4x4 gauze (hold tongue, remove secretions, etc)
- Large and small Carmalt forceps, sponge forceps (remove foreign bodies)
- Endotracheal tubes: 1 each of even sizes 3-10 (skip half-sizes)
- Cuff syringe
- Ties for endotracheal tubes (preferably already attached to the tubes)
- 8fr, 12fr red rubber tubes
- Polypropylene urinary catheters (1 Tom Cat & 1 for large dogs (12-20 inches); use as stylette or as small-bore endotracheal tube when unable to place standard endotracheal tube)
- Headlamp or other extra light source (cheap ones from grocery store work great)
- #10 Scalpel blades
- Handle for #10 scalpel blades (optional but recommended)
- Suction catheters, Yankauer suction handle, suction tubing

**Available on demand, located nearby:**

- Oxygen supply
- Suction unit
- Patient monitoring equipment

**References/Suggested Reading**

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