INTRODUCTION
Nasopharyngeal diseases are commonly seen in small animal medical practice. This lecture will review the diagnostic approach and current treatment recommendations for the most frequently seen disorders of the nasal cavity and posterior pharynx including the soft palate. The purpose of this manuscript is to introduce the diagnostic approach to patients with symptoms of nasopharyngeal disease. Treatments will be discussed during the course of the lecture.

Present Complaint
Sick animals often hide, or shrink away from frequent contact with the owner. The feline species is of course famous for disappearing for long stretches of time, especially if the cat is an “outdoor” pet. Clients often believe that their pet has “suddenly” stopped eating or playing when the disorder causing these signs has developed over a much longer period of time. This is an important consideration when evaluating a complaint related to the respiratory system. For example, sneezing and nasal discharge may be obvious to most clients, whereas increased inspiratory efforts and nasal flaring due to a slowly developing pleural effusion may be invisible to the owner. So, if we ask our clients “how long has fluffy been ill?” they may tell us “He just started sneezing” and we may miss important information. Instead, if we ask clients “when the last time fluffy was was normal?” they may reply “He really hasn’t seemed the same for about a month, but I was out of town a lot and I haven’t really seen him that much until this weekend.”

Additionally, it is important to determine 1) the duration of signs, 2) whether clinical signs are static or evolving, 3) if the patient has ever exhibited the presenting signs before, 4) if treatment was initiated in the past, and 5) the success or failure of such treatment.

PHYSICAL EXAMINATION
The physical state of the patient and the good judgment of the veterinarian will determine how thorough and for how long we perform a physical exam. Experienced clinicians know that the cat with open-mouthed breathing is not a candidate for a leisurely, prolonged physical examination. However, a sneezing but otherwise seemingly healthy animal should have a comprehensive examination during which all organ systems are thoroughly evaluated.

The most important part of the physical examination of the respiratory system is inspection, to determine whether the respiratory difficulty can be identified primarily during inspiration or during expiration. If this isn’t obvious during the exam, more subtle clues in evaluating abnormal breathing patterns include inspection of the nares for “flaring”, or abduction of the legs to increase the size of the thoracic cage. Even in situations in which the animal is in obvious respiratory distress, I rely upon

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the finding of inspiratory vs. expiratory difficulty to guide emergency interventions. Specifically, animals with noisy breathing during inspiration (stertor or stridor) or inspiratory difficulty most commonly have either upper airway obstruction or disease within the pleural space. Animals with labored breathing during expiration most commonly suffer from chronic bronchitis or asthma. Therefore, if a dog or cat has an increase in inspiratory respiratory effort with stertor you can make a presumptive diagnosis of nasal or pharyngeal disease. Similarly, a cat with an expiratory wheeze probably has bronchial obstruction, and should be treated for presumed bronchospasm even before the underlying cause is determined.

Animals with panting or open mouthed breathing are not so easily classified, and may suffer from nasal obstruction as well as more severe disorders such as congestive heart failure, pneumonia, pulmonary embolism or neoplasia. The veterinarian should also keep in mind that other, non-pulmonary causes of abnormal ventilatory patterns are common and may mimic signs of respiratory disease.

Oropharyngeal inspection is a crucial part of the exam of patients with nasal disease because the hard palate may deviate ventrally, suggesting a mass effect from above. Soft palate elongation may be easily appreciated during visual inspection of the posterior pharynx in many patients even without sedation.

Palpation of the nasal architecture may reveal a structural abnormality, including humps, divits or pain. Both inspection and palpation of the nasal planum and frontal bones may reveal asymmetry or enlargement, suggestive of bony distortion from neoplasia or mycotic infection.

Auscultation is a classic method of examining the patient with signs of respiratory disease. I don’t rely upon information gained by chest auscultation to make diagnoses of respiratory disease in small animals. Physicians always ask their human patients to breathe deeply with an open mouth, and this increases the quality and quantity of respiratory sounds. We can’t do that successfully with our patients, and the amount of air moving in and out of a resting animal is often not enough to produce audible sounds of diagnostic significance. Occasionally, by using the tip of one finger to occlude a nostril for four or five breaths, when you release the obstruction the pet will take a big breath in (and out) and this may augment breath sounds that were previously inaudible. This is also the technique I use to determine the relative amount of airflow occurring in each nostril.

**EVALUATION OF THE NASOPHARYNX**

Signs of nasopharyngeal disease include coughing, gagging, choking, sneezing, snorting, epistaxis, nasal discharge, reverse sneeze and facial deformity. Diagnostic techniques which are frequently used alone, or in conjunction with other tests to determine the cause(s) of these signs include, nasopharyngeal culture, cytology, biopsy, radiography and direct visualization.

**Radiography**

Dogs and cats with chronic nasal discharge or noisy breathing may have malignancy or fungal infection within the nasopharynx Definitive diagnosis usually requires rhinoscopy. In general practice it is often difficult to decide when rhinoscopy should be performed, because it is often not clear until late in the disease process that the underlying disease is likely to be malignancy or fungal infection. A single open mouth VD view of the maxilla, (or dental radiograph for cats) may demonstrate severe
loss of turbinate detail. This finding alone is justification to perform rhinoscopy or to refer the case for rhinoscopy.

**Culture**
Culture of the nasal cavity is rarely indicated for chronic sneeze, epistaxis, and/or nasal discharge. Small animals have a wide range of normal intranasal commensal bacterial flora, most notably Staph, Strep, E coli, Pasteurella and Bordetella. Therefore, bacterial culture of the nares is an unreliable tool in diagnosing the etiology of rhinitis.

**Cytology**
Cytological evaluation of cells within the nasal cavity may be indicated when there is a history of chronic sneeze, nasal discharge or epistaxis, the same indications that may be present for nasal culture. Neutrophils and other inflammatory cells may predominate in disorders caused by many different etiologies including foreign body, trauma, neoplasia, and infection. In general, the interpretation and cytological evaluation of material obtained by nasal swab is most likely to result in a reliable diagnosis if *fungal* organisms or malignant cells are recovered.

**Nasal biopsy**
Indications for nasal biopsy include gross facial deformity, or radiographic evidence of destruction or deviation of the intranasal structures, or loss of trabecular detail. The author strongly suggests visualized and guided biopsy during rhinoscopy. To perform this technique, a 3 mm rhinoscope is used to visualize the suspected area of disease, and a flexible biopsy instrument is passed through the biopsy port of the endoscope. The biopsy cup can be visualized in the nasal cavity and multiple tissue samples can be obtained. Bleeding may be controlled by simple pressure, use of q-tips within the bleeding area, or instillation of epinephrine at a concentration of 1:10,00.

**Naso/pharyngo/laryngoscopy**
Nasopharyngoscopy should be considered to evaluate signs of gagging, chronic sneezing, epistaxis, nasal discharge unresponsive to standard therapy, nasofacial deformity, change in meow or purr or bark and noisy breathing. Direct visualization of the lumen of the nares may be accomplished using an otoscope cone (distal aspect only) or rigid fiberoptic scope (1.7-3.3 mm outer diameter), and as described above for nasal biopsy. Small animals with the symptom of gagging or forced swallowing may have a pharyngeal polyp, or less commonly a foreign body such as a blade of grass dorsal to the soft palate. A non-traumatic forceps or hooked dental instrument can be used to retract the soft palate, and a dental mirror is placed within the posterior pharynx to visualize the area dorsal to the soft palate. However, a flexible fiberoptic scope retroflexed $180^\circ$ is the most appropriate instrument to visualize this area.

**PHYSICAL EXAMINATION**
Cats and dogs with disorders within the laryngeal or tracheal portion of the respiratory tract will exhibit noisy breathing or difficulty breathing primarily during the inspiratory phase of breathing. Experienced clinicians know that the patient with severe stridor is not a candidate for a leisurely, prolonged physical examination. However, for most patients, a comprehensive examination should be performed during which all organ systems are thoroughly evaluated.
Palpation of the larynx may reveal significant distortion, suggesting a malignant process. Similarly, palpation of the trachea may be valuable to elicit cough. The quality of the cough can help determine the cause of the cause. For example, the cough due to tracheal narrowing is usually high pitched and honking, while the cough due to pneumonia is soft and wet. It is important to recognize that any cause of cough will sensitize the trachea. Therefore, the fact that you can elicit cough by palpation of the trachea does not imply tracheal disease!

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**DIAGNOSTIC TESTS**

Signs of laryngeal and tracheal disease include noisy breathing, change in bark, exercise intolerance and coughing. Diagnostic techniques which are frequently used alone, or in conjunction with other tests to determine the cause(s) of these signs include, radiographic imaging and laryngoscopy or tracheoscopy. I emphasize that in many cases a strong presumptive diagnosis can be made by the history, signalment, clinical signs and plain film radiography.

**Imaging**

Plain film imaging is generally not useful to diagnose problems within the laryngeal vault. Tracheal disorders are of course more easily defined by radiography. In general, tracheal collapse can be identified with a single lateral view of the neck. It is important to consider that during imaging of the trachea using the standard right lateral approach, the esophagus often lies directly on top of the trachea. This may cause a shadow artifact thru the lumen of the trachea that mimics the appearance of tracheal collapse. If you can see the dorsal tracheal membrane dorsal to what appears to be a narrowed tracheal lumen, the esophageal shadow artifact may be occurring. If you are in doubt, reexamine the tracheal lumen with the patient in left lateral recumbency. In this position the esophagus often lies lateral to the trachea and the artifact is removed.

**Laryngoscopy and tracheoscopy**

Small animals with stridor or voice change should have laryngoscopy performed to determine if laryngeal dysfunction, including laryngeal neoplasia is present. To perform laryngoscopy, the animal should be lightly anesthetized. A laryngoscope blade or tongue depressor can be used to depress the epiglottis, and a pen light can be used to visualize the area. A diagnosis of laryngeal paresis or paralysis is reasonable if either or both laryngeal folds and/or associated arytenoids cartilages fail to abduct during normal breathing. It is important not to depress the epiglottis too forcefully, or tilt the head up at an acute angle, because normal laryngeal architecture can be artificially altered, resulting in an inappropriate diagnosis of laryngeal disease. When in doubt, it is appropriate to use Dopram, 1mg/kg i.v. to induce increased rate and depth of respiration. In this way you may avoid the confounding issue of anesthesia-induced respiratory depression that might reduce the normal movement of the vocal folds and associated cartilage.
Tracheoscopy

Culture

General Comments: bacteria may be found in material obtained from the tracheobronchial tree of most healthy dogs and cats. This apparent paradox is easily explained, the tracheobronchial tree is not routinely sterile.

As in almost all situations in clinical medicine, the culture results obtained from any of the methods described below should be interpreted in light of the patient's clinical history, physical signs, and other diagnostic test results.

Trans tracheal wash (TTW) is a time honored method of obtaining uncontaminated material from the airway for culture (to bypass the oropharyngeal flora). This technique was first described for use in conscious human patients, and is a suitable technique for medium to large sized dogs. Better methods than TTW exist for retrieval of airway material for culture (see below) and the author does not advocate the TTW technique in cats. If alternative methods are not feasible, TTW can be safely performed in small animals by placing a long dwelling 23 g catheter through the crycothyroid membrane to the level of the thoracic inlet, followed by injection of 0.5 cc/kg body weight of non-bacteriostatic saline (previously warmed to 37°C). Placement of the animals head and thorax in a dependent position makes it easier to retrieve the instilled fluid. Alternatively, a sterile endotracheal tube may be passed and used as the conduit for the flush solution.

Use of the guarded microbiology brush (Microvasive, Milford Mass) is an alternative to the TTW that is a reliable method of retrieving airway material for culture. The brush is designed to be passed through the biopsy port (2 mm diameter) of a previously positioned adult (5.0 mm outer diameter) bronchoscope. If a bronchoscope is not available the brush may be passed through a sterile endotracheal tube that has been previously placed in the anesthetized patient. The distance from the mouth to the thoracic inlet should be measured. The brush can then be passed this distance, or until any resistance is felt. The inside brush can then be extruded, gently massaged within the airways, and resheathed. Finally, the brush can be withdrawn from the bronchoscope and processed by cutting off the end of the brush into a sterile red top tube, with 0.25-0.5 ml non-bacteriostatic sterile water to prevent the brush from drying out.

Secretions obtained using this brush may be cultured routinely or in a quantitative fashion. Quantitative bacterial cultures have been used to distinguish colonization from infection in human beings with pneumonia. In these cases, bacterial growth at a concentration of less than $10^4$ CFU/ml is believed to represent non pathologic colonization and antibiotic therapy is not recommended. Healthy small animals may harbor an aerobic bacterial population within their main stem bronchi at a concentration of as high as $10^3$ CFU/ml.

Cytology

General comments: Cytological evaluation of respiratory secretions obtained from small animals with signs of tracheal disease is most helpful to confirm suspected infectious organisms and exfoliated neoplastic cells. In practice, I rarely perform TTW to collect cytology samples from patients with suspected pure tracheal disease.

Tracheoscopy

Tracheoscopy is indicated for animals with suspected tracheal disease when the symptoms of chronic cough is not responsive to standard treatment. This technique is valuable to visualize masses
within the trachea and to assess the structural integrity of the tracheobronchial tree. Additionally, abnormal mucus secretion, collapsing airways and mucosal appearance can be seen. Tracheoscopy can be performed with either a rigid or a flexible fiberoptic bronchoscope (FB). The rigid bronchoscope is usually less costly to purchase than a FB and requires little formal training to use. Additionally, the rigid scope is easily passed through an endotracheal tube adapter (Bodai Swivel "Y", Sontek Medical, Dallas TX.) so that gas anesthesia and oxygen may be administered during the procedure. In general, rigid scopes deliver a better visual image than FB’s, although the image seen through a FB is certainly adequate for any diagnostic study. In practice, FB’s are much more clinically useful. The adult sized FB (5 mm outer diameter) has a 2.0 mm channel that is wide enough to allow passage of biopsy, retrieval and culture instruments. It is very important to recognize that these FB’s occlude > 50% of the airway of small animals, these studies should be performed only by persons very familiar with their use. Pediatric sized FB (3.5 mm outer diameter) can be passed through a 4.5 FR endotracheal tube and cause less airway obstruction. Because these FB are smaller the operator can visualize smaller airway branches. The disadvantage of the pediatric FB is the smaller biopsy channel (1.3 mm) which permits only lavage.

The limitation of this procedure is the safety of the patient. These patients have often adopted a specific breathing strategy to minimize the dynamic airway collapse that occurs in the upper airway during forceful breathing during inhalation. During recovery from anesthesia they may breath with greater force and generate significant negative inspiratory pressures. This can cause a serious breathing disorder that can be life threatening. Therefore, tracheoscopy should be performed in these patients only by veterinarians that are well trained in this procedure.

CONCLUSIONS
Disorders of the larynx and trachea are commonly diagnosed in dogs and cats seen in general veterinary practice. In most cases, a strong presumptive diagnosis may be made by examination of the history, signalment, clinical signs, and simple radiographic imaging. In some cases, endoscopy is required to confirm the diagnosis. Most cases are successfully managed with appropriate medical or surgical intervention.