

TREATMENT PLAN

Many cases of uncomplicated, acute upper respiratory tract infection in cats and dogs can be managed without systemic antibiotics.

MANAGEMENT STRATEGIES

Antibiotic Stewardship in Canine and Feline Respiratory Infections

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Contagious upper respiratory tract infections are common in dogs and cats throughout the world, accounting for approximately 5% of all clinical presentations.^{1,2} In treating these infections, veterinarians are faced with the pressures of upholding their oath to relieve animal suffering by decreasing morbidity in their patients, as well as alleviating the fears and concerns of owners. In a recent survey of more than 5000 veterinary emergency room visits, treatment of respiratory disease was the third most common reason for use of antibiotics, representing 8.2% of prescriptions.³

Recent emergence of pathogens of significant clinical and public health concern, such as methicillin-resistant *Staphylococcus* and extended-spectrum β -lactamase-producing Enterobacteriaceae, has brought attention to the need for improved antibiotic stewardship in companion animal medicine. Antibiotic stewardship programs are emerging in clinical veterinary education and institutions, but veterinary practitioners need practical, real-world knowledge and tools to implement stewardship in routine cases.⁴ This article aims to give veterinarians the tools, knowledge, and confidence to reduce antibiotic use in patients with uncomplicated upper respiratory tract infections and to use antibiotics appropriately when indicated, particularly in accordance with the International Society of

Companion Animal and Infectious Diseases antibiotic use guidelines, for the treatment of respiratory infections in dogs and cats.⁵

GENERAL ANTIBIOTIC STEWARDSHIP

Antibiotic stewardship is vital to the health and wellbeing of society as a whole. In human medicine, it is estimated that at least 30% to 50% of antibiotic use is either unnecessary or inappropriate.⁶ Accurate statistics are unavailable for companion animal medicine, but rates of unnecessary or inappropriate use in this field may be similar.⁷ While no single clinical strategy can be expected to prevent all antibiotic resistance, antibiotic stewardship is a tool all clinicians can employ to combat antibiotic resistance and increase the likelihood of positive outcomes for their patients.⁸

Antibiotic stewardship is defined by the American Veterinary Medical Association as “the actions veterinarians take individually and as a profession to preserve the effectiveness and availability of antimicrobial drugs through conscientious oversight and responsible medical decision-making while safeguarding animal, public, and environmental health.”⁹ Clinical antibiotic stewardship is often described as using “the right antibiotic, at the right

dose, for the right duration, and at the right time while also reducing unnecessary antibiotic use.^{9,10}

TERMINOLOGY OF UPPER RESPIRATORY TRACT INFECTIONS

Acute upper respiratory tract infections in dogs and cats can be caused by a variety of viruses as well as primary and secondary bacterial pathogens. Most infections are viral in etiology and are not expected to respond to antibiotic therapy.⁵ Various terms are used to describe these infections; in dogs, they are commonly referred to as canine infectious respiratory disease complex (CIRDC), infectious tracheobronchitis, or kennel cough. In cats, they are commonly referred to as feline upper respiratory tract disease (URTD), feline infectious respiratory disease, feline respiratory disease complex, and feline upper respiratory infection.^{11,12} For simplicity, this article uses CIRDC and URTD.

GENERAL NONANTIBIOTIC TREATMENT

Clinicians should evaluate each patient within the context of its clinical presentation. For example, a dog that lives in a single-dog household and never leaves its home is unlikely to acquire a contagious respiratory disease, while a show dog has a lifestyle that presents a higher risk. In a shelter environment, the prevalence of upper respiratory tract infections can be very high (e.g., 25%).¹³ Many cases of uncomplicated, acute upper respiratory tract infection in cats and dogs can be managed without systemic antibiotics through the use of appropriate home nursing care, general nonantibiotic treatments, and the tincture of time.

Home Care

Practically all patients with upper respiratory tract infections can benefit from appropriate supportive care at home. Such care may include gently cleaning nasal and ocular discharges with a wet cloth, encouraging healthy food consumption by offering highly palatable and aromatic food (e.g., canned), and using measures to ease airway congestion, such as therapeutic steam inhalation, which can be as simple as allowing the patient to spend 15 minutes in a small bathroom while a hot shower is running.^{5,12} Nebulization of saline for inhalation may also ease airway congestion.¹⁴

This article aims to give veterinarians the tools, knowledge, and confidence to reduce antibiotic use in patients with uncomplicated upper respiratory tract infections and to use antibiotics appropriately when indicated.

Antitussives for Dogs

Antitussive therapy is a primary treatment for most cases of CIRDC without evidence of pneumonia; in dogs with suspected pneumonia secondary to CIRDC, it is considered contraindicated.¹¹ Various antitussives have been used in dogs, but hydrocodone and butorphanol are widely suggested in veterinary literature.^{11,15} Hydrocodone is likely the most commonly used antitussive opioid for suppressing the frequency and intensity of cough. Butorphanol is short acting and has antitussive, sedative, and antiemetic properties.¹⁶

Other antitussive agents are mentioned less frequently in the literature. Tramadol has been suggested as a possibly useful antitussive in veterinary species but has not been thoroughly studied.¹⁷ Anecdotally, the authors have used tramadol successfully as an antitussive in dogs with CIRDC. Dextromethorphan has also been suggested for antitussive therapy in dogs, but the authors do not recommend it as a first-line antitussive due to lack of supporting data, poor bioavailability, and short half-life.^{16,17} Maropitant has been suggested as a potentially useful antitussive for acute coughing in dogs but also has not been thoroughly studied.¹⁸

Corticosteroid therapy, such as triamcinolone with prednisolone, could be used at an anti-inflammatory dose as an antitussive, but corticosteroid therapy is usually reserved for corticosteroid-responsive noninfectious respiratory disease.¹⁴

When considering antitussive therapy, veterinarians should take into consideration the suspected cause of the cough and the impact of the cough on the patient's and owner's quality of life. Exercise should be limited and neck collars avoided to minimize inducing coughing episodes.¹²

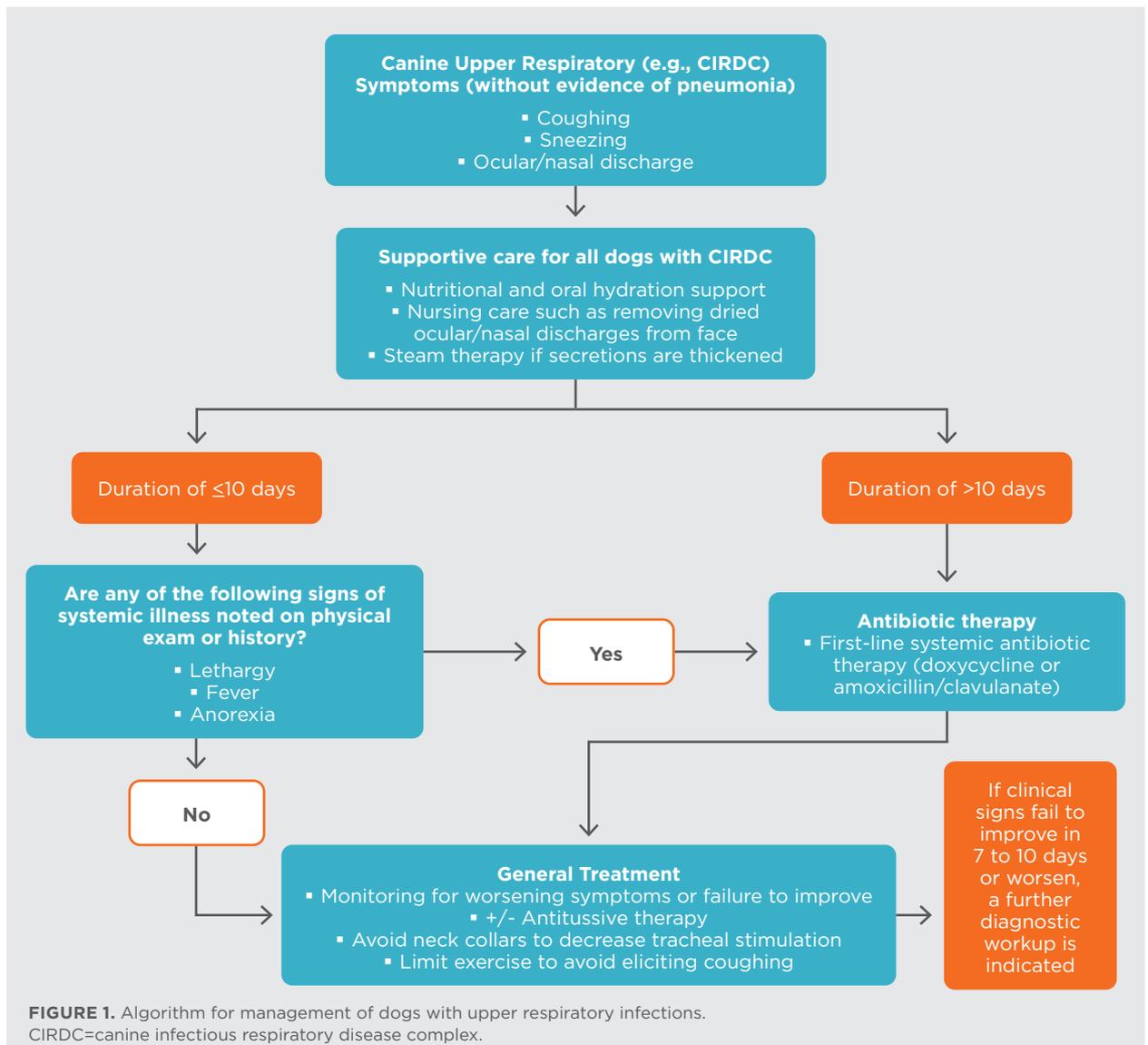
Appetite Stimulants and Hydration for Cats

General treatment and nursing care are crucial to successful management of cats with acute uncomplicated URTD. Nasal congestion is thought to decrease appetite, even without more severe illness such as pneumonia; therefore, appetite stimulation may be needed. Mirtazapine and capromorelin are both commonly utilized appetite stimulants.^{12,19} Application of antibiotic-containing solutions to the nasal passageways is not recommended, but topical administration of 0.9% saline may help clear nasal secretions.⁵ Since nasal and ocular secretions thicken when cats are dehydrated, rehydrating doses of subcutaneous fluids should be considered.²⁰ If oral

ulcers are present, analgesia (e.g., buprenorphine) should be strongly considered.²¹ Oral rinses containing sucralfate, diphenhydramine, and lidocaine may also provide pain relief.²⁰

Conjunctivitis Therapy for Cats

Comorbid conjunctivitis is common in cats with URTD and may be severe; therefore, artificial tears, such as mucinogenic tear replacement with hyaluronate, are encouraged to improve tear film and eye comfort.¹² Topical antibiotic therapy may benefit some cats with conjunctivitis due to a primary bacterial cause or a secondary bacterial infection. In cats with primary pathogens such as *Chlamydia felis*, topical antibiotic





therapy may not be as effective as systemic antibiotic therapy but could be considered as an adjunctive treatment.^{20,22} Oxytetracycline- and erythromycin-containing products have been recommended as first-line topical antibiotic therapy when indicated. Triple-antibiotic ointment (neomycin, polymyxin, and bacitracin) is discouraged since it is ineffective against primary feline conjunctivitis bacterial pathogens.^{12,23} The authors suggest relying on nonantibiotic supportive care for conjunctivitis relief in cats without evidence of systemic illness or other comorbid ocular lesions; topical antibiotic therapy should be reserved as an adjunctive treatment in cats with evidence of systemic illness and severe conjunctivitis or used as indicated based on other comorbid ocular lesions.

Antiviral Therapy for Cats

L-Lysine has been touted as an oral supplement to reduce viral shedding, but its efficacy in reducing clinical signs has come into question.²⁴ Antiviral medicines should be considered for cats suspected to have feline herpesvirus. Famciclovir has been shown to improve disease outcomes and is considered generally safe.²⁵ Topical antiviral therapy, such as idoxuridine or cidofovir, may help alleviate some ocular signs secondary to feline herpesvirus infection.¹²

Upper respiratory infections in shelter or cattery-housed cats present multifaceted problems that are beyond the scope of this article. Biosecurity, vaccination, overcrowding, and numerous other factors

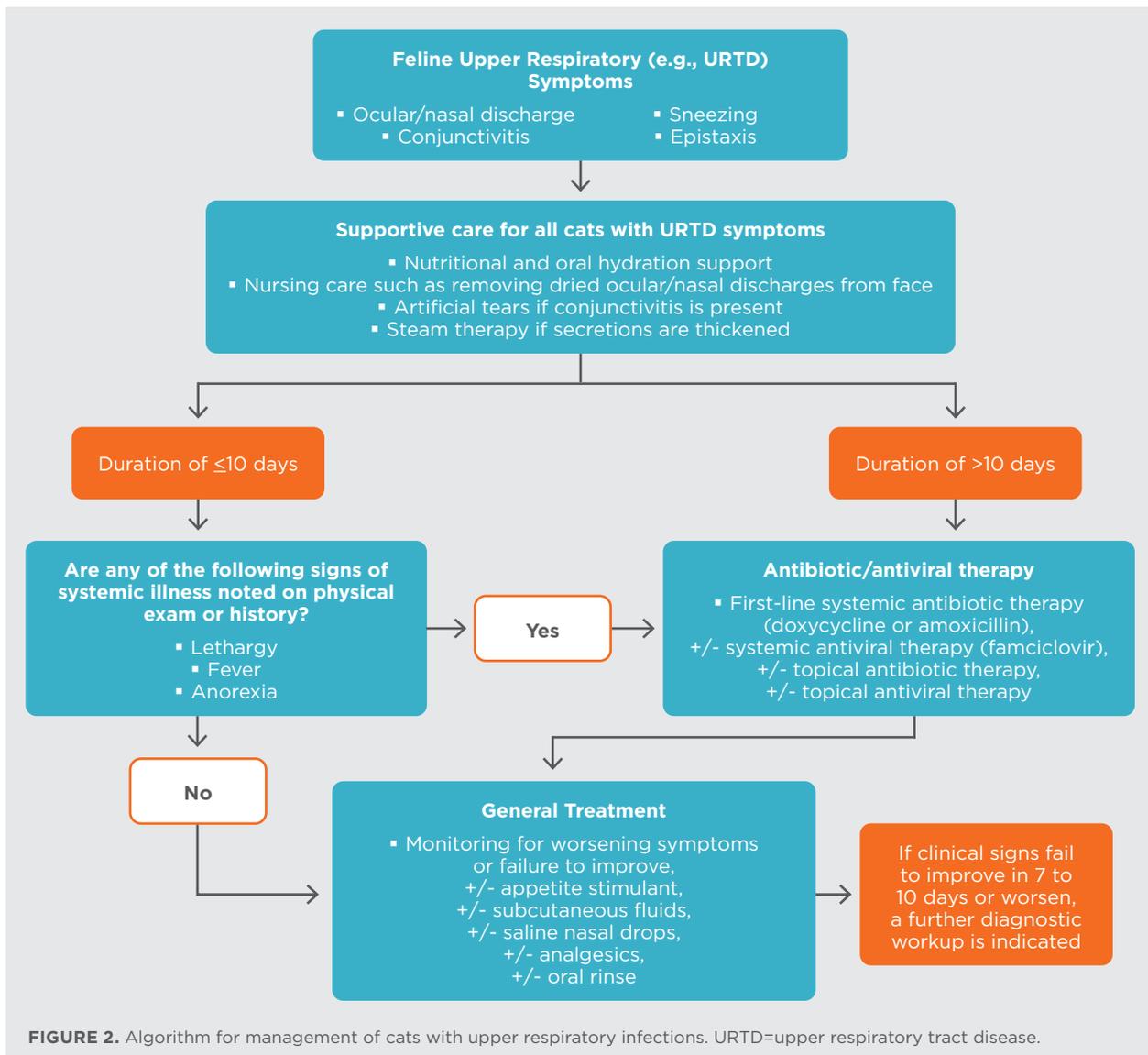


FIGURE 2. Algorithm for management of cats with upper respiratory infections. URTD=upper respiratory tract disease.

BOX 1 Potential Noninfectious Causes of Chronic Respiratory Signs

Dogs

- Heartworm disease
- Allergic disease
- Parasitic disease
- Fungal disease
- Neoplasia
- Foreign body
- Heart disease

Cats

- Feline leukemia virus
- Feline immunodeficiency virus
- Allergic disease
- Fungal disease
- Neoplasia
- Parasitic disease
- Foreign body
- Nasopharyngeal issues (polyps/stenosis, oronasal fistulas)

must be holistically managed to minimize the incidence and prevalence of URTD in shelter-housed cats.²⁶

DETERMINING WHEN SYSTEMIC ANTIBIOTIC THERAPY IS INDICATED

Differentiating between patients with legitimate indications for systemic antibiotic therapy and patients that will recover successfully with general nonantibiotic treatment is a core component of upper respiratory tract infection antibiotic stewardship. The presence of mucopurulent ocular or nasal discharge alone is not an indication for systemic antibiotic therapy for acute infections.⁵

Duration of clinical signs is a key factor when determining when antibiotic therapy and additional diagnostic tests are indicated. In dogs and cats with upper respiratory tract infection, acute clinical signs are defined as lasting up to 10 days, and chronic clinical signs are defined as lasting 11 or more days. In patients with acute clinical signs such as coughing (dogs) and ocular discharge (cats), other physical examination and historical data must be considered before deciding to prescribe an antibiotic. Antibiotics should not be prescribed for patients with acute disease if they do not exhibit signs of systemic illness such as lethargy, anorexia, fever, or evidence of pneumonia (crackles/

wheezes on thoracic auscultation). First-line antibiotic therapy and further diagnostics are indicated in patients with evidence of systemic illness, those that fail to respond to supportive care and general nonantibiotic therapy, or patients with clinical signs persisting beyond 10 days (FIGURES 1 AND 2).⁵

First-Line Systemic Antibiotic Therapy

Empiric antibiotic therapy for upper respiratory tract infections should be targeted toward both primary and secondary bacterial pathogens. Doxycycline is the preferred empiric treatment for canine and feline upper respiratory tract infections owing to its probable effectiveness against primary bacterial pathogens such as *Bordetella bronchiseptica*, *Mycoplasma* species, and *C. felis*, as well as numerous secondary bacterial pathogens. Furthermore, it is generally safe in patients as young as 4 weeks of age.⁵

However, doxycycline is associated with several challenges, especially in cats. Cats are at risk of esophageal strictures secondary to doxycycline administration; therefore, a small meal or water bolus should be given after administering doxycycline. Alternatively, doxycycline suspension, if available, could be used to reduce these risks in cats. Use of compounded doxycycline suspension is discouraged due to potential regulatory issues and reported loss of antibiotic activity after 7 days when compounded into an aqueous solution.^{5,17,27} Minocycline may be considered as an alternative if doxycycline is unavailable.⁵ Amoxicillin and amoxicillin/clavulanate are other reasonable empiric therapies in cats and dogs, respectively, when doxycycline is unavailable or unsuitable (TABLE 1).⁵

Indications for Diagnostic Testing

Since most cases of canine and feline upper respiratory tract infections are self-limiting, an extensive diagnostic workup is usually not indicated. However, any patient with evidence of pneumonia, chronic signs, or lack of response to initial therapy should be further evaluated and treated based on diagnostic test findings, rather than simply prescribing a course of a different antibiotic in the case of initial antibiotic treatment failure.⁵

Underlying noninfectious conditions that may be responsible for chronic respiratory signs are listed in BOX 1. In cats, a full diagnostic workup may require

tools such as advanced imaging, rhinoscopy, nasal/bronchial lavage, serology, polymerase chain reaction (PCR) testing, and histopathology of appropriate tissues. In dogs, thoracic radiographs, heartworm antigen testing, and fecal analysis for parasites may be indicated. Tracheal/bronchial lavage may be indicated to obtain samples for cytology and bacterial culture and susceptibility (BCAS) testing in cats with suspected *B bronchiseptica* infection, chronic bacterial infection, or allergies and in dogs with suspected bacterial/allergic bronchitis or pneumonia.^{5,11,12,15} Diagnostic testing to identify specific infectious agents (e.g., PCR, viral isolation, culture of upper respiratory secretions) in patients with acute disease can be considered, but results must be interpreted with caution since commensal and carrier-state infectious agents are indistinguishable from pathogens causing current disease. These tests may be more clinically useful in diagnosis and management of respiratory pathogens in groups of animals, such as animal shelters or breeding facilities.^{11,12,15,19}

Indications for Second-Line Antibiotic Therapy

Sometimes, antibiotics other than first-line therapy are indicated based on results of diagnostic tests (e.g., BCAS), a change in disease status, or unique circumstances. Fluoroquinolones and azithromycin are likely the most common antibiotics used as second-line therapy.⁵ Fluoroquinolones should be reserved for patients with a change in disease status, such as suspected pneumonia, or based on BCAS testing.^{5,11}

Azithromycin has been used to treat feline URTD successfully, but evidence suggests that it is not as effective as doxycycline at clearing some primary

The presence of mucopurulent ocular or nasal discharge alone is not an indication for systemic antibiotic therapy for acute infections.

bacterial pathogens.²⁸ Azithromycin does have the unique characteristic of a long dosing interval for both dogs and cats (recommendations vary, but q48h is preferred by the authors).^{12,17} Azithromycin could be considered for patients that are difficult to medicate orally or in animal shelter settings when biosecurity is a major component of disease control and handling sick patients to administer oral medications should be minimized.

While it may be tempting to treat CIRDC and feline URTD with cefovecin to avoid oral antibiotic administration, evidence suggests this antibiotic is ineffective against most of the primary bacterial pathogens associated with upper respiratory tract infections.^{5,29} Trimethoprim-sulfamethoxazole is not recommended unless specifically indicated on BCAS testing.⁵ Administration of antibiotics such as gentamicin via nebulization has historically not been recommended due to lack of evidence supporting this treatment modality.¹⁵ However, new evidence suggests this may be a viable treatment option in cases of ineffective systemic antibiotic therapy.³⁰ **TVP**

TABLE 1 First-line Antibiotics for Upper Respiratory Tract Infections

SPECIES	FIRST-LINE ANTIBIOTICS ⁵	DOSAGE	DURATION OF THERAPY ^{5,6}
Dogs	Amoxicillin/clavulanate	12.5-25 mg/kg PO q12h ¹⁴	7-10 days
	Doxycycline ^b	5 mg/kg PO q12h ⁵ or 10 mg/kg PO q24h	7-10 days
Cats	Amoxicillin	22 mg/kg PO q12h ⁵	7-10 days
	Doxycycline ^b	5 mg/kg PO q12h ⁵ or 10 mg/kg PO q24h	7-10 days

^aOptimal duration of therapy has not been established for upper respiratory tract infections in dogs and cats, and duration of therapy should be reassessed and determined based on the individual patient's response to therapy.

^bAuthors' preferred first-line drug.

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