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Upper Respiratory Infections

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KEYWORDS
• Pharyngitis • Sinusitis • Upper respiratory infection

KEY POINTS
• Upper respiratory infections (URIs) are infections of the mouth, nose, throat, larynx (voice box), and trachea (windpipe). URIs include nasopharyngitis (common cold), sinusitis, pharyngitis, laryngitis, and laryngotracheitis.
• Nasopharyngitis (common cold) is a frequent cause of URIs, and most patients with this diagnosis present with nasal congestion (80%). Nasopharyngitis rarely presents with a fever. Causes are predictably viral, and determining the exact viral pathogen is usually unnecessary. Treatment of the common cold is symptomatic, and hand washing is the best prevention.
• Sinusitis is a common diagnosis seen in primary care. The diagnosis and differentiation between bacterial and viral sinusitis is made clinically, based on the history and examination. Augmentin is the antibiotic preferred by the Infectious Diseases Society of America for empiric treatment of bacterial sinusitis. Nasal steroids are highly effective for both viral and bacterial acute sinusitis.
• Identifying the cause of pharyngitis, especially group A β-hemolytic streptococcus (GABHS), is important in preventing potential life-threatening complications. Group A streptococcal infection (GAS) pharyngitis accounts for 15% to 30% of infections in children and 5% to 15% in adults. The Centor criteria are useful prediction rules for the evaluation and management of possible GAS pharyngitis. Penicillins are the drugs class of choice for streptococcal pharyngitis.
• Acute laryngotracheobronchitis (LTB) is an infectious-induced inflammatory condition affecting the larynx, trachea, and bronchi. It occurs most often in children ages 6 months to 6 years, with the peak age at 2 years. Recommended imaging for suspected croup includes anterior-posterior views of the neck, which show edematous subglottic walls converging to create a characteristic “steeple sign.” The cornerstone of medical management of LTB is nebulized epinephrine and dexamethasone.

INTRODUCTION

Upper respiratory infections (URIs) are located in the upper respiratory tract, defined as the mouth, nose, throat, larynx (voice box), and trachea (windpipe). URIs can be one of the following conditions:
• Nasopharyngitis (common cold)
NASOPHARYNGITIS (COMMON COLD)

The common cold is a frequent cause of URIs and can be defined as inflammation of the nasal passages owing to a respiratory virus. The vast majority of these infections are self-limited and resolve without treatment. Frequency of the common cold varies per age group (Table 1).

Although URIs can happen at any time, they are most common in the fall and winter months, from September until March, because these are the usual school months when children and adolescents spend a lot of time in groups and indoors. Furthermore, many URI viruses thrive in the low humidity of the winter. Signs and symptoms of the common cold are listed in Table 2.

Causes of the common cold are predictably viral, with the majority of these viruses falling into 1 of 200 virus strains from 6 main families; rhinovirus, influenza A/B/C, parainfluenza, respiratory syncytial virus, coronavirus, and adenovirus.

Determining which virus is the causal agent is unnecessary in the overwhelming number of cases because symptomatic therapy and “tincture of time” usually result in a full resolution of the infection. The diagnosis of a common cold is almost always based on clinical findings. Distinguishing a common cold from a more potent viral illness, such as the influenza virus, is a matter of knowing the common symptoms and signs of the flu and comparing them with those of the common cold. In rare cases, virus is cultured from nasal washings, or identified by enzyme-linked immunosorbent assay or radioimmunoassay methods (Table 3).

Prevention

Hand washing is the single most important activity that can reduce the risk of URI. Numerous studies have confirmed that washing with soap or using hand sanitizer lowers the risk of transmission of URI and respiratory infections.1,2 Alcohol-based hand rubs are the most efficacious agents for reducing the number of bacteria on the hands of hospital and health care personnel. Antiseptic soaps and detergents are the next most effective, and nonantimicrobial soaps the least effective.3,4

Treatment of the Common Cold:
- Rest, fluids, and symptomatic measures
- Reassurance that the usual course is 6 to 10 days
- Humidification of inspired air
- Saline nasal rinse or Neti pot

| Table 1 |
| Age-specified incidence of the common cold |
| --- |
| Age | Incidence/Year |
| Preschool | 6–10 episodes |
| Elementary | 7–12 episodes |
| Adolescents | 2–4 episodes |

Data from Turner RB. The common cold. In: Goldman L, Schafer Al, editors. Cecil medicine. 24th edition. Philadelphia: Saunders Elsevier; 2011. Chapter 369.
Discontinue any tobacco or alcohol
Raise head at night with extra pillow to allow nasal passages to drain, as needed
For infants use bulb suction, position mattress at 45°, use saline nasal drops

Patient Education
- Reassurance
- Spread is primarily hand-to-hand transmission of contaminated nasal secretions
- Aerosolized particles (cough, sneeze) do not travel far and contain little virus
- Individual susceptibility to colds depends largely on preexisting antibodies
- Advise patients to contact you if they develop dyspnea, productive cough, or temperature >102°F (39°C)

Drugs of Choice5,6
- Topical decongestants: reduce edema and swelling of the nasal mucosa, promote drainage; fewer side effects than oral agents (phenylephrine: Afrin, Neosynephrine)
- Topical anticholinergics: control rhinorrhea but do not relieve congestion or sneezing (Atrovent nasal spray)

### Table 2
**Signs and symptoms of the common cold**

| Sign or Symptom          | Likelihood of Having with a Cold (%) |
|--------------------------|-------------------------------------|
| Nasal congestion/obstruction | 80–100                           |
| Sneezing                 | 50–70                              |
| Sore or scratchy throat  | 50                                 |
| Cough                    | 40                                 |
| Hoarseness               | 30                                 |
| Headache                 | 25                                 |
| Fatigue/malaise          | 20–25                              |
| Fever                    | 0.1                                |

*Data from Lauber B. The common cold. J Gen Intern Med 1996;11:231.*

### Table 3
**URI versus influenza: symptom presentation**

| Symptom                  | Common Cold                        | Seasonal Flu                                      |
|--------------------------|------------------------------------|---------------------------------------------------|
| Cough                    | Moist and productive               | Dry cough (may also be productive)                |
| Itchy/watery eyes        | Common                             | Uncommon                                          |
| Fever                    | Uncommon but may occur occasionally in children | Common                                          |
| Exhaustion/fatigue       | Mild tiredness may occur           | Very common                                       |
| Headache                 | Common; usually due to sinus pressure | Common                                          |
| Sore throat              | Common, but typically mild         | Uncommon                                          |
| Body aches               | Minor                              | Severe                                            |
| Vomiting/diarrhea        | These are not symptoms of the common cold | Uncommon, but may occur occasionally in children |
| Onset of symptoms        | Gradual                            | Sudden                                           |
• Oral decongestants: longer duration of action, lack of local irritation, no risk of rhinitis medicamentosa (pseudoephedrine: Sudafed; phenylephrine: found in many over-the-counter cold and sinus remedies)
• Antihistamines: safe and effective in alleviating sneezing and rhinorrhea (diphenhydramine: Benadryl; chlorpheniramine: Chlor-Trimeton)
• Cough suppressants: useful if cough interferes with sleep or normal activities; codeine and dextromethorphan have similar efficacy (Robitussin D)
• Expectorants: commonly used but efficacy not proven (guaifenesin)
• Throat lozenges: may provide temporary relief from scratchy throat

Medication Precautions
• Oral decongestants: may increase blood pressure and glucose levels; can cause arrhythmias, headache, nervousness, sleeplessness, dizziness
• Antihistamines: nasal blockage and sinus congestion can worsen
• Cough suppressants: misuse and dependence can occur
• Expectorants: can contain high concentrations of alcohol

Alternative Drugs
• Zinc: prevents viral replication in vitro; efficacy not proven
• Vitamin C: no preventive effects and very modest symptom reduction
• Echinacea: no proven efficacy
• Probiotics: efficacy not proven

Possible Complications
• Lower respiratory tract infection
• Bronchial hyperreactivity/asthma flare
• Otitis media (5%–19%)
• Acute sinusitis
• Pneumonia

ACUTE SINUSITIS

Acute (rhino)sinusitis (AS) is defined as inflammation of the nasal mucosa and sinuses. AS is very common. According to a recent national health survey, approximately 1 of 7 adults are affected and diagnosed per year.

Diagnosis

Distinguishing between the common cold and AS is often a matter of symptom duration. Typical common colds are self-limited and last 7 to 10 days, whereas AS can last for up to 4 weeks. Symptoms of AS are similar to those of the common cold and include nasal congestion and discharge, facial pain over the sinuses, decreased sense of smell, and cough. The waxing and waning phenomenon of symptoms sets AS apart from the common cold, usually with a mild improvement of symptoms after 5 to 7 days, followed by a worsening of symptoms, including new-onset fever, headache, and/or increased nasal discharge.

A bacterial origin is generally suspected and diagnosed if the following symptoms or signs are present:
• Purulent nasal discharge
• Maxillary tooth or facial pain
Diagnosis of acute bacterial sinusitis (ABS) can be made if there are 2 major or 1 major and 2 minor markers, and symptoms persist beyond 7 to 10 days, start out severe, and last at least 3 to 4 consecutive days or worsen after 5 to 7 days (Table 4).12

According to the Institute for Clinical Systems Improvement (ICSI), plain sinus radiographs and other radiographic images are usually not necessary for diagnosis of sinusitis, and provide poor sensitivity and specificity.14 Nasal endoscopy or antral puncture and culture of secretions are ideal tests, but are not feasible for the general practitioner and should be relegated to otolaryngologists, usually in the setting of diagnosing a chronic sinusitis.

**Treatment**

Discriminating between bacterial and viral AS is one of the most important determinants of treatment, Table 4 is helpful for diagnosing bacterial AS that would warrant antibiotic treatment.

Bacterial causes of AS include:

- *Streptococcus pneumoniae*
- *Haemophilus influenzae*
- *Moraxella catarrhalis*

Selecting the appropriate antibiotic will help mitigate complications. Table 5 provides guidance.

Duration of antibiotic therapy has been studied. A meta-analysis of 12 randomized controlled trials found no statistically significant difference between long-term and short-course antibiotics for cure or improvement of symptoms.15 Five to 7 days of treatment with the appropriate antibiotic is considered effective for patients with uncomplicated ABS.

Other treatments are listed in Table 6, along with their usefulness.

Additional comfort measures for treating AS include:

- Maintain adequate hydration (6–10 glasses of liquids per day)
- Apply warm facial packs (warm wash cloth, hot water bottle, or gel pack for 5–10 minutes 3 or more times a day to help with pain relief)

| Table 4 | Signs and symptoms of acute bacterial sinusitis |
|---------|-----------------------------------------------|
| **Major Markers** | **Minor Markers** |
| Purulent nasal discharge | Headache |
| Purulent postnasal discharge | Ear pain/pressure/fullness |
| Nasal obstruction/congestion | Sore throat |
| Facial congestion/fullness | Halitosis |
| Focal facial pain/pressure | Dental pain |
| Hyposmia/anosmia | Cough |
| Fever (temperature 102°F [39°C]) | Fever (<102°F) |

*Modified from* Chow AW, Benninger MS, Brook I, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Dis 2012;54(8):e78.
Eliminate environmental factors that could trigger allergic reactions (cigarette smoke, pollution/fumes, swimming in contaminated water, and barotraumas).

Obtain adequate rest and sleep with head of bed elevated.

Avoid extremely cold or dry air.

Engage in fastidious and frequent hand washing.

**PHARYNGITIS**

**Introduction**

Pharyngitis is one of the most common conditions encountered by the family physician. The optimal approach for differentiating among various causes of pharyngitis requires a problem-focused history, a physical examination, and appropriate laboratory testing. Identifying the cause of pharyngitis, especially group A β-hemolytic streptococcus (GABHS), is important in preventing potential life-threatening complications.

**Definition**

Inflammation of the pharynx, caused by one of many different viruses and/or bacteria.
Acute pharyngitis is one of the 20 most reported reasons for outpatient office visits. Peak season is late winter and early spring. Transmission of typical viral and Group A streptococcal (GAS) pharyngitis occurs mostly by hand contact and has an incubation period of 1 to 3 days (35% transmission).

Pharyngitis is most likely caused by virus or bacteria. Also caused by reflux, rhinitis and postnasal drip, persistent cough, and allergy. NB. Consider testing for infectious mononucleosis if the patient is between 10 and 25 years old.

GAS pharyngitis accounts for 15% to 30% of infections in children and 5% to 15% in adults. GAS is the most common cause of bacterial infection. Physical signs of GAS include:
- Pharyngeal erythema and swelling
- Tonsillar exudates
- Edematous uvula
- Palatine petechiae
- Anterior cervical lymphadenopathy

Determining how likely a pharyngitis is due to GAS infection has been studied. Criteria have been developed to assist the practitioner in making a clinical diagnosis (Table 7).

### Table 6: Therapeutic options for AS

| Class of Drug/Modality                  | Efficacy                              | Notes                                      |
|----------------------------------------|---------------------------------------|--------------------------------------------|
| Intranasal steroids                    | Decreases nasal inflammation          | Highly recommended<sup>14</sup>            |
| Antihistamines                         | Increases viscosity of nasal secretions| Not recommended<sup>16</sup>               |
| Oral decongestants                     | Decrease amount of nasal secretions and edema | Caution in patients with uncontrolled hypertension, hyperthyroidism, coronary artery disease, diabetes, glaucoma, and benign prostatic hypertrophy; not indicated for children <6 y old |
| Topical decongestants                  | Decrease amount of nasal secretions    | Use for no more than 3 d to lessen the risk of rebound nasal congestion Found to be more effective than oral decongestants<sup>10</sup> |
| Mucolytics                             | Thin nasal secretions                  | Useful adjunctive therapy<sup>10</sup>     |
| Analgesics                             | Decrease headache and sinus pressure   | Dose per manufacturer’s guidelines         |
| Saline nasal irrigation/ humidity and Neti pot | Thin nasal secretions/improve nasal clearance | Increases comfort<sup>10</sup> |

Data from Refs.<sup>10,14,16,17</sup>
Untreated, GAS pharyngitis lasts 7 to 10 days. These patients are infective during the acute phase of the illness and for 1 additional week, and are also at risk of suppurative complications (see later discussion).

Effective antibiotic treatment decreases the infectious period to 24 hours, decreases symptoms, and prevents most complications.

Complications of GAS

- Rheumatic fever: rare in the United States
- Peritonsillar abscess: toxic appearance, fluctuant peritonsillar mass, and deviation of uvula
- Poststreptococcal glomerulonephritis
- Scarlet fever: sandpaper-like exanthem

Other Bacterial Causes of Acute Pharyngitis Include:

- Gonorrhea
- Chlamydia
- Mycoplasma
- Diphtheria

Management of GAS Pharyngitis

The Infectious Diseases Society of America (IDSA) reiterates 2 principles of management:

1. Use of clinical and epidemiologic features to distinguish who may have GAS pharyngitis (see Table 7)
2. Antibacterial treatment of cases confirmed with a laboratory test (culture or rapid antigen testing)

Antibiotic Therapy for GAS Pharyngitis

- GAS is universally sensitive to penicillin. Drug of choice: penicillin V for 10 days or 250 mg 3 times daily for pediatrics, or 500 mg 2 times daily for adults
- Benzathine G PCN injection for compliance problems

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**Table 7**

| Points | LR+ | Pretest prevalence of GABHS (%) | Posttest probability of GABHS (%) |
|--------|-----|---------------------------------|----------------------------------|
| 0      | 0.16| 1 , 2 , 5                      | 14                              |
| 1      | 0.3 | 2 , 3 , 9                      | 23                              |
| 2      | 0.75| 4 , 8 , 20                     | 43                              |
| 3      | 2.1 | 10 , 19 , 41                   | 68                              |
| 4      | 6.3 | 25 , 41 , 68                   | 86                              |

One point for each: history of fever, anterior cervical adenopathy, tonsillar exudates, absence of cough.

Abbreviation: LR+, positive likelihood ratio.

Data from Ebell MH, Smith MA, Barry HC, et al. The rational clinical examination. Does this patient have strep throat? JAMA 2000;284:2916.
• Amoxicillin
  ○ Suspension tastes better

Alternative therapies include:
• Erythromycin
• First-generation cephalosporins
• Clindamycin
• Macrolides: resistance ranges from 13% to 31%\textsuperscript{21}

**LARYNGOTRACHEITIS/LARYNGOTRACHEOBRONCHITIS (CROUP)**

**Definition**
Acute laryngotracheobronchitis (LTB) is an infectious-induced inflammatory condition affecting the larynx, trachea, and bronchi.

**Prevalence**
• Most common in children ages 6 months to 6 years, with the peak at 2 years\textsuperscript{22}

**Symptoms**
• Hoarseness of voice followed by paroxysms of nonproductive, harsh, seal-like cough that ends with a characteristic inspiratory stridor. Fever, rhinorrhea, sore throat, and cough usually precede this. Symptoms may vary in intensity and last approximately 3 to 4 days if mild.
• Anterior-posterior radiograph view of the neck shows the subglottic obstruction.

**Etiology**
LTB is caused mostly by viruses, primarily parainfluenza virus types I and II, although others, such as influenza type A or B, respiratory syncytial virus (RSV), and adenovirus are also implicated. *H influenzae* type B is now a rare cause, thanks to routine immunization. Occasionally *Mycoplasma pneumoniae* can cause LTB.\textsuperscript{22}

**Clinical Findings**
• Patients appear apprehensive and tend to lean forward
• The child may have tachypnea and might be using accessory respiratory muscles
• Inspiratory or expiratory stridor is prominent\textsuperscript{23}
• Pulmonary examination may reveal rhonchi, crepitations, or wheezing
• Breath sounds may be diminished if upper airway obstruction is severe and air entry is greatly decreased

Severity of attack can be determined based on the Westley Croup Scale\textsuperscript{24}:

2 or less: mild
3 to 7: moderate
8 or more: severe

Level of consciousness: Normal, including sleep = 0; disoriented = 5
Cyanosis: None = 0; with agitation = 4; at rest = 5
Stridor: None = 0; with agitation = 1; at rest = 2
Air entry: Normal = 0; decreased = 1; markedly decreased = 2
Retractions: None = 0; mild = 1; moderate = 2; severe = 3
Laboratory Findings

- The white blood cell count may be normal or mildly elevated.
- Noninvasive pulse oximetry to monitor the oxygen saturation is recommended.\textsuperscript{25} Arterial blood gas assessment shows hypoxemia and/or hypercapnia, depending on the severity of the disease.
- Microbiologic diagnosis can be established by serology, viral or bacterial cultures from the pharynx, or rapid antigen detection enzyme immunosorbent assays such as for RSV or influenza type A.

Imaging

Lateral neck radiographs show overdistended hypopharynx, subglottic narrowing that is wider on expiration than inspiration, thickened vocal cords, and a normal epiglottis. Anterior-posterior views of the neck show edematous subglottic walls converging to create a characteristic “steeple sign.”\textsuperscript{26} There may also be diffuse narrowing of the trachea and bronchi.

Differential Diagnosis

Acute epiglottitis is a major differential diagnosis to be considered when a child presents with these symptoms. Radiographs of the neck can easily help differentiate the 2 conditions. Other causes of similar symptoms include foreign-body aspiration, which can be determined by history, radiographs, or endoscopic evaluation. Membranous croup or bacterial tracheitis should also be considered if the child presents with a clinical picture similar to croup but appears more toxic and has subglottic narrowing on radiographs of the neck. In milder cases, a simple URI is more likely. If sore throat is prominent, ensure adequate visualization of the tonsils to confirm absence of peritonsillar abscess. Allergic reactions (angioedema) and airway anomalies such as trachea/laryngomalacia should also be entertained.\textsuperscript{22,24}

Complications

Severe croup, as may occur with influenza type A, may require tracheotomy or intubation in approximately 13% of patients and have an associated mortality of 0% to 2.7%.\textsuperscript{15} A small percentage of children with prolonged intubation or severe disease may develop subglottic stenosis. A few follow-up studies have shown an increase in hyperactive airways in children with a history of croup.

Outpatient management of croup in children is feasible, as noted in Fig. 1.

Treatment

The cornerstone of medical management is nebulized epinephrine and dexamethasone.\textsuperscript{24} Racemic or L-epinephrine may be used; its onset is 1 to 5 minutes and its effects last up to 2 hours. Dexamethasone in appropriate doses partners well with epinephrine, as its onset of action is 6 hours.\textsuperscript{17} Nebulized budesonide is also now a therapeutic option.\textsuperscript{27}

Oxygen may be administered, along with humidification, to avoid agitation and maintain oxygen saturation higher than 92%.\textsuperscript{28} Some children will fail medical management and require intubation. Intubation should be done in fully equipped units and preferably via the nasotracheal route. Extubation is usually attempted in about 5 to 7 days if extubation criteria are met. Extubation criteria include decreased secretions, decreased leakage around the endotracheal tube (which indicates decreased edema), and an alert child. Failure to extubate should prompt further endoscopic evaluation.\textsuperscript{22}
Fig. 1. Assessment and management of croup. (From Zoorob R, Sidani M, Murray J. Croup: an overview. Am Fam Physician 2011;83(9):1071; with permission.)
**Prognosis**

Croup is mostly a self-limited disease with complete uncomplicated resolution. As mentioned earlier, some children may develop hyperactive airways or become predisposed to recurrent croup. A few may develop subglottic stenosis caused by severe disease or prolonged intubation.

**Prevention and Control**

Good hand washing and cleanliness can help decrease transmission from an infected patient, particularly at day care centers or even in the home environment.

**SUMMARY**

URIs are infections of the mouth, nose, throat, larynx (voice box), and trachea (windpipe). Upper respiratory infections include nasopharyngitis (common cold), sinusitis, pharyngitis, laryngitis, and laryngotracheitis.

Nasopharyngitis (common cold) is a frequent cause of URIs, and most patients with this diagnosis will present with nasal congestion (80%). Nasopharyngitis rarely presents with a fever. Causes are predictably viral, and determining the exact viral pathogen is usually unnecessary. Treatment of the common cold is symptomatic, and hand washing is the best prevention.

Sinusitis is a common diagnosis seen in primary care. The diagnosis and differentiation between bacterial and viral sinusitis is made clinically, based on the history and examination. Augmentin is the IDSA-preferred antibiotic for empiric treatment of bacterial sinusitis. Nasal steroids are highly effective for both viral and bacterial acute sinusitis.

Identifying the cause of pharyngitis, especially GABHS, is important in helping prevent potential life-threatening complications. GAS pharyngitis accounts for 15% to 30% of infections in children and 5% to 15% in adults. The Centor criteria are useful prediction rules for the evaluation and management of possible GAS pharyngitis. Penicillins are the drugs class of choice for streptococcal pharyngitis.

LTB is an infectious-induced inflammatory condition affecting the larynx, trachea, and bronchi. It occurs most often in children ages 6 months to 6 years, the peak age being 2 years. Recommended imaging for suspected croup includes anterior-posterior views of the neck, which show edematous subglottic walls converging to create a characteristic “steeple sign.” The cornerstone of LTB medical management is nebulized epinephrine and dexamethasone.

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