19. UPPER RESPIRATORY INFECTIONS\(^1\)

Eve Kerr, M.D., M.P.H., and Mark Schuster, M.D., Ph.D.

We conducted a MEDLINE search of the medical literature for all English-language review articles published between 1990 and 1995 for the following topics: pharyngitis, common cold, influenza, rhinovirus, bronchitis—acute, cough, and rhinitis. We selected articles from the MEDLINE results and references from the review articles were obtained in areas of controversy. In addition, we consulted two medical texts (Panzer et al., 1991; Barker et al., 1991) for general clinical approaches to respiratory infections.

Respiratory tract infections account for more than 10 percent of all office visits to the primary care physician (Perlman and Ginn, 1990). According to the 1993 National Health Interview Survey (NHIS), over 250 million cases of respiratory infections occur in the U.S. yearly (NCHS, 1994b). Respiratory infections include the common cold, influenza, pharyngitis, sinusitis, bronchitis, and pneumonia. Influenza and the common cold account for the majority of cases. Children under 5 years had 424.7 restricted activity days per 100 persons per year due to acute respiratory conditions; this represents 49 percent of all restricted activity days for acute conditions for children in this age category (NCHS, 1994b). Children age 5 to 17 had 295.2 restricted activity days per 100 persons per year for acute respiratory conditions, or 47 percent of all restricted activity days due to acute conditions for this age group (NCHS, 1994b).

\(^1\) Portions of this chapter (the sections on acute bronchitis, influenza, nasal congestion and rhinorrhea, acute sinusitis, and chronic sinusitis) were originally prepared for the Women's Quality of Care Panel.
PHARYNGITIS IN CHILDREN AND ADOLESCENTS

Mark Schuster, M.D., Ph.D.

This review is based primarily on textbooks of pediatrics (El-Said in Oski et al., 1994; Hammerschlag in Oski et al., 1994), pediatric primary care (Niederman and Marcinak in Dershewitz, 1993; Widome in Hoekelman et al., 1992), pediatric infectious disease (Cherry in Feigin and Cherry, 1992), and adolescent medicine (Krilov in Friedman et al., 1992; Biro in McAnarney et al., 1992). We have also used the American Academy of Pediatrics’ (AAP's) book of infectious disease recommendations (AAP in Peter, 1994). This review covers people up to 18 years old.

IMPORTANCE

Acute pharyngitis is the third most common diagnosis made by office-based pediatricians after otitis media and undifferentiated upper respiratory tract infections (Widome in Hoekelman et al., 1992). It peaks during ages 5-8 years (Niederman and Marcinak in Dershewitz, 1993).

Pharyngitis can be caused by bacteria, viruses, or fungi (Hammerschlag in Oski et al., 1994), though bacteria and viruses account for most cases (Widome in Hoekelman et al., 1992). In normal, healthy children, over 90 percent of cases are caused by (in order of decreasing frequency): Group A beta-hemolytic Streptococcus (GABHS); adenoviruses; influenza viruses A and B; parainfluenza viruses 1, 2, and 3; Epstein-Barr virus; enteroviruses; Mycoplasma pneumoniae; and Chlamydia pneumoniae (Hammerschlag in Oski et al., 1994).

EFFICACY/EFFECTIVENESS OF INTERVENTIONS

Diagnosis

History and Physical Examination

Since many causes of pharyngitis are not susceptible to treatment, the diagnostic challenge is to determine which cases are due to a treatable cause, primarily GABHS. Because GABHS can have significant
complications, it must be considered in all cases of acute pharyngitis (Cherry in Feigin and Cherry, 1992; Hammerschlag in Oski et al., 1994). The major complication of GABHS is acute rheumatic fever (ARF), which can cause serious long-term heart disease. About 1 to 5 percent of untreated GABHS throat infections are followed by ARF (El-Said in Oski et al., 1994).

Age is a major factor in the epidemiology of and thus diagnosis of pharyngitis. GABHS accounts for about 25-50 percent of cases of acute pharyngitis in primary school-aged children (Widome in Hoekelman et al., 1992). It is uncommon in children less than 3 years old, though outbreaks have been reported in child care settings (AAP in Peter, 1994). Only 3 to 4 percent of cases of pharyngitis in children younger than 2 years old are due to GABHS (Widome in Hoekelman et al., 1992).

In one study, viruses were responsible for 42 percent of all cases of pharyngitis in children aged 6 months to 17.9 years (Hammerschlag in Oski et al., 1994). Viral etiologies (e.g., influenza and parainfluenza) predominate in pre-school children (Widome in Hoekelman et al., 1992).

Pharyngitis can be divided into two categories: with nasal symptoms (nasopharyngitis) and without (pharyngitis or tonsillopharyngitis). Nasopharyngitis is almost always caused by a virus, most typically adenovirus, influenza, or parainfluenza (Cherry in Feigin and Cherry, 1992; Hammerschlag in Oski et al., 1994). Nasopharyngitis will not be addressed further in this review.

Pharyngitis is an inflammatory illness of the mucous membranes and underlying structures of the throat. Diagnosis requires objective evidence of inflammation (i.e., erythema, exudate, or ulceration) (Cherry in Feigin and Cherry, 1992). While sore throat is always present with pharyngitis, it does not guarantee that pharyngitis is present. Children with colds without evidence of pharyngeal inflammation may report sore throats (Cherry in Feigin and Cherry, 1992; Hammerschlag in Oski et al., 1994). In addition to sore throat, pharyngitis is often accompanied by fever, headache, nausea, vomiting, anorexia, some degree of lessened activity, and sometimes abdominal
pain. Cervical lymph nodes may be enlarged and tender (Cherry in Feigin and Cherry, 1992).

Pharyngitis in children is almost always acute and self-limited. Cases with viral etiology generally last 4-10 days, while those caused by GABHS last slightly longer when untreated (Cherry in Feigin and Cherry, 1992).

In one study of children with acute febrile exudative tonsillitis, the only clinical clues to the nature of the infecting agent were cough and rhinitis, both of which were observed in 45 percent of patients with viral disease and in only 10 percent of children with GABHS (Hammerschlag in Oski et al., 1994).

GABHS usually has an acute onset and is characterized by a sore throat (often with dysphagia), fever (often above 101 F), pharyngeal and tonsillar erythema, and tonsillar exudate. Anterior cervical lymph nodes are enlarged and tender. Erythema of the soft palate and an enanthem of doughnut lesions on the soft palate suggest GABHS. Headache, abdominal pain, and vomiting are common. Upper respiratory tract symptoms such as cough, rhinorrhea, and conjunctivitis reduce the possibility of GABHS (Niederman and Marcinak in Dershewitz, 1993). Evidence of lower respiratory tract disease suggests parainfluenza and mycoplasma (Widome in Hoekelman et al., 1992).

Other etiologies of pharyngitis can cause similar symptoms. Nonetheless, given the possible complications of GABHS, the diagnosis should be considered in a child older than the appropriate cutoff age who has pharyngitis with or without exudate in the absence of a cold (Widome in Hoekelman et al., 1992).

There is some disagreement about the age below which it is not necessary to diagnose or treat GABHS. Widome (in Hoekelman et al., 1992) says the diagnosis should be considered in children older than 2 years who have appropriate signs and symptoms, while the AAP (in Peter, 1994) and Hammerschlag (in Oski et al., 1994) put the cutoff at 3 years old. The AAP (in Peter, 1994) specifies that diagnosis and treatment are not important under 3 years old because ARF is not of concern in this age group.
Scarlet fever has a characteristic sandpaper-like rash, which is caused by one or more of the several erythrogenic exotoxins produced by GABHS strains. With the exception of rare cases of severe scarlet fever with systemic toxicity, the epidemiology, symptoms, sequelae, and treatment of scarlet fever are the same as for GABHS pharyngitis (AAP in Peter, 1994).

Gonococcal pharyngitis may present as an acute inflammatory, exudative tonsillopharyngitis or as a chronic sore throat (Niederman and Marcinak in Dershewitz, 1993). However, in adolescents with N. gonorrhoeae infection, the pharynx is the sole site in only 1-4 percent of cases, and over 90 percent of pharyngeal infections are asymptomatic. C. trachomatis also appears to be an uncommon cause of pharyngitis. Only 2 percent of adolescents presenting with pharyngitis had C. trachomatis on culture, and none in an asymptomatic group did (Biro in McAnarney, 1992). While N. gonorrhoeae should be considered in sexually active adolescents, most abused children with N. gonorrhoeae isolated from the nasopharynx are asymptomatic (Hammerschlag in Oski et al., 1994).

Infectious mononucleosis (due to Epstein-Barr virus) may present as pharyngitis, with or without exudative tonsillitis. Fever is common, although children rarely appear very ill. Cervical or more general lymphadenopathy, palatal petechiae, splenomegaly, and edema of the eyelids support this diagnosis. Signs of upper respiratory tract infection, including rhinitis and cough, are more common in children younger than 4 years old. The child may also have a macular erythematous rash (Niederman and Marcinak in Dershewitz, 1993).

**Laboratory Tests**

Throat culture is the standard method of diagnosing GABHS. Throat cultures have up to 10 percent false-negatives (usually due to improper collection or transport) (Niederman and Marcinak in Dershewitz, 1993) and up to 50 percent false positives, which are not associated with an antibody rise, suggesting the presence of a different etiologic agent with coincident carriage of GABHS (Widome in Hoekelman et al., 1992).

If the child has obvious viral infection (e.g., pharyngoconjunctival fever consistent with adenovirus, herpangina), antibiotics
would not be needed so culture is not necessary (Hammerschlag in Oski et al., 1994).

Rapid Streptococcal identification tests can permit identification of infection during the visit. Though it is generally agreed that these tests have high specificity (AAP in Peter, 1994; Cherry in Feigin and Cherry, 1992; Hammerschlag in Oski et al., 1994; Krilov in Friedman et al., 1992; Niederman and Marcinak in Dershewitz, 1993; Widome in Hoekelman et al., 1992). Reports of sensitivities range from 85-90 percent (Widome in Hoekelman et al., 1992) to lower than 50-70 percent (AAP in Peter, 1994), with Hammerschlag (in Oski et al., 1994) reporting that sensitivities are not always as high as reported because some researchers use as a reference culture methods with lower than desired sensitivities. Many patients with negative rapid tests have true infection (indicated by a rise in convalescent antibody titers) (Hammerschlag in Oski et al., 1994; Widome in Hoekelman et al., 1992). Hammerschlag (in Oski et al., 1994) reports that false-negative rates average around 15 percent. Therefore, a culture should be sent if results of a rapid screen are negative (AAP in Peter, 1994; Hammerschlag in Oski et al., 1994; Niederman and Marcinak in Dershewitz, 1993; Widome in Hoekelman et al., 1992).

Gram stain examination is not an accurate way to identify GABHS, *N. gonorrhoeae*, or *C. haemolyticum* (Hammerschlag in Oski et al., 1994). However, a gram-stained smear from an exudative area may be useful if anaerobic agents are suspected (Cherry in Feigin and Cherry, 1992).

Cultures for organisms other than GABHS should be reserved for unusual situations, such as persistent symptomatology, indicative epidemiology, or other pertinent historical data (Cherry in Feigin and Cherry, 1992). In the sexually active adolescent, gonococcal pharyngitis with appropriate culture methods should be considered (Krilov in Friedman et al., 1992).

The heterophil antibody test should be used when infectious mononucleosis is suspected (Hammerschlag in Oski et al., 1994; Niederman and Marcinak in Dershewitz, 1993; Widome in Hoekelman et al., 1992). However, it may be negative in children younger than 4 years and also early in the course of illness. The mono spot test can remain positive
for several months (Niederman and Marcinak in Dershewitz, 1993). Differentiation of infectious mononucleosis from streptococcal pharyngitis by looking for atypical lymphocytes in a Wright-Giemsa-stained smear of pharyngeal exudate is an inferior method (Hammerschlag in Oski et al., 1994).

Blood counts have little diagnostic value in distinguishing among the causes of pharyngitis unless infectious mononucleosis is suspected. Patients with infectious mononucleosis have a relative and absolute lymphocytosis, with 10-20 percent Downey cells (basophytic, vacuolated, and foamy cytoplasm) (Widome in Hoekelman et al., 1992). A peripheral lymphocytosis greater than 50-60 percent or atypical lymphocytosis greater than 10 percent is suggestive of mononucleosis (Niederman and Marcinak in Dershewitz, 1993).

If a retropharyngeal abscess is suspected, a lateral x-ray of the neck may reveal a posterior pharyngeal mass, sometimes with gas (Niederman and Marcinak in Dershewitz, 1993).

**Treatment for GABHS**

The primary purpose of treatment for GABHS pharyngitis is prevention of subsequent development of ARF (Widome in Hoekelman et al., 1992). In recent outbreaks of ARF in the United States, many of the patients had had an illness suggestive of pharyngitis within one month of onset of ARF symptoms, but had received either no antibiotics or less than a 10-day course (Hammerschlag in Oski et al., 1994). During epidemics, as many as 3 percent of untreated patients with acute GABHS pharyngitis may develop ARF. With endemic infections, the attack rates are lower but still constitute a risk. The risk of ARF can be virtually eliminated with adequate treatment of the antecedent infection (AAP in Peter, 1994).

In addition to preventing ARF, antibiotic treatment can shorten the duration and severity of symptoms (Niederman and Marcinak in Dershewitz, 1993; Widome in Hoekelman et al., 1992). It also prevents suppurative complications (e.g., otitis media, lymphadenitis, peritonsillar abscess (Niederman & Marcinak in Dershewitz, 1993)) and prevents spread of illness to contacts. It also eliminates the streptococci from the
pharynx and prevents a rise in titers of the streptococcal antibodies. It has not been proven that treatment affects the incidence or severity of acute glomerulonephritis (Widome in Hoekelman et al., 1992).

If the rapid screen is positive, the person should be treated. Otherwise, treatment can generally await culture results since rheumatic fever can be prevented if treatment is started as late as the ninth day of symptoms. However, a physician might choose to treat immediately if the clinical evidence strongly suggested streptococcal infection and there was concern that the family would not follow through for subsequent treatment (Widome in Hoekelman et al., 1992). While Cherry (in Feigin and Cherry, 1992) agrees that there may be clinical situations in which one may treat immediately because one cannot be certain of follow-up, he warns that early treatment may also result in a decreased desirable antibody response allowing reinfection with type-specific organisms. However, Krilov (in Friedman et al., 1992) reports that other studies have not borne out the theory that early therapy might abort host antibody response, making the individual more susceptible to recurrent infection.

Treatment options include intramuscular benzathine penicillin G or procaine penicillin, oral potassium penicillin V for 10 days, or if the patient is allergic to penicillin, erythromycin for 10 days (Hammerschlag in Oski et al., 1994; Niederman and Marcinak in Dershewitz, 1993; Widome in Hoekelman et al., 1992). These treatments will be about 90 percent effective (Hammerschlag in Oski et al., 1994). First generation cephalosporins are acceptable for individuals allergic to penicillin. However, tetracyclines and sulfonamides should not be used for treating GABHS pharyngitis because many strains are resistant to the former and because the latter does not eradicate the organism (AAP in Peter, 1994).

Follow-up

Routine follow-up cultures after treatment for GABHS are generally unnecessary (Widome in Hoekelman et al., 1992).
Persistent or Recurrent GABHS Infection

Bacteriologic treatment failures with or without clinical relapse occur in up to 25 percent of patients. This is due to either failure to take medication, reinfection from close contacts, antimicrobial tolerance and the coexistence in the pharynx of beta-lactamase-producing bacteria (e.g., *Bacteroides fragilis, Bacteroides melaninogenicus* (Hammerschlag in Oski et al., 1994), or carrier state (Widome in Hoekelman et al., 1992).

Carriers are people who have colonization but not infection. They have neither an antibody response nor a risk of rheumatic fever. They are not very contagious (Widome in Hoekelman et al., 1992). Up to 50 percent of children symptomatic with sore throats and positive GABHS cultures do not have serologic evidence of streptococcal infection. The failure rate for penicillin is high for asymptomatic carriers. Penicillin and rifampin are more efficacious in eradicating carriage (Niederman and Marcinak in Dershewitz, 1993).

With clinical relapse, a second course of treatment should be given, and cultures of family members may be appropriate. With repeated relapse or persistent failure to eradicate streptococci from the throat, a beta-lactamase-resistant antibiotic may be effective (Widome in Hoekelman et al., 1992). Beta-lactamase-resistant and antistaphylococcal medications (e.g., amoxicillin-clavulanate, narrow-spectrum cephalosporins, dicloxacillin, and clindamycin) can be useful in retreatment of people who have failed penicillin treatment (AAP in Peter, 1994; Hammerschlag in Oski et al., 1994).

Treatment for Gonorrhea

Pharyngitis caused by *N. gonorrhoeae* can be treated by intramuscular ceftriaxone or oral amoxicillin plus probenicid. Contacts must be checked, and in children, sexual abuse must be considered (Widome in Hoekelman et al., 1992). See Chapter 21 for indicators on treatment of gonorrhea.
Treatment for Viral Pharyngitis

In viral pharyngitis, antibiotics do not affect the course of disease and have not been shown to prevent secondary bacterial infection (Widome in Hoekelman et al., 1992).

Aspirin should not be used in children and teenagers with pharyngitis because of its etiologic role in influenza-associated Reye's syndrome and because it can be difficult to differentiate influenza viral infections from other respiratory viral infections (Cherry in Feigin and Cherry, 1992; Widome in Hoekelman et al., 1992).

Household contacts of a patient with streptococcal pharyngitis who have recent or current symptoms suggestive of streptococcal infection should be cultured. Culturing asymptomatic household contacts is not recommended except during outbreaks or in other unique epidemiologic situations, such as presence of a person in the family with rheumatic heart disease or streptococcal toxic shock syndrome (AAP in Peter, 1994).

Bronchitis, Acute

Eve Kerr, M.D., M.P.H.

Importance

Acute bronchitis is an inflammatory disorder of the tracheobronchial tree that results in acute cough without signs of pneumonia (Billas, 1990). Preschool children had an estimated 22 million episodes of acute bronchitis in 1992, while school-aged children and adolescents had 1.9 million episodes of acute bronchitis in 1992 (NCHS, 1994b).

Efficacy and/or Effectiveness of Interventions

Diagnosis

The causative organism of acute bronchitis is usually viral, but a variety of bacterial organisms may cause or contribute to bronchitis (e.g., Mycoplasma pneumoniae, Chlamydia pneumoniae, B. catarrhalis, and
Bordetella pertussis) (Billas, 1990; Barker et al., 1991). Cough may be nonproductive initially but generally becomes mucopurulent. The duration of cough is two weeks or less. Sputum characteristics are not helpful in distinguishing etiology of cough (Barker et al., 1991). Pharyngitis, fatigue and headache often precede onset of cough. Examination of the chest is usually normal, but may reveal rhonchi or rales without any evidence of consolidation. A detailed history must be obtained to rule in or out other possible causes for acute cough. Acute cough is defined as lasting less than three weeks (Pratter et al., 1993). Bronchitis, sinusitis, and the common cold are probably the most common causes of acute cough. Cough secondary to irritants (e.g., tobacco smoke) and allergies (e.g., from allergic rhinitis) are the next most common causes of cough (Zervanos and Shute, 1994).

**Treatment**

Most authorities agree that treatment with antibiotics in patients who are otherwise healthy and free of systemic symptoms is not useful (Barker et al., 1991; Billas, 1990). Orr et al. (1993) conducted a review of all randomized placebo-controlled trials of antibiotics for acute bronchitis published in the English language between 1980 and 1992. Four studies showed no significant benefit of using antibiotics, while two studies (one using erythromycin and the other using trimethoprim sulfa) did show benefit in decrease of subjective symptoms.

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**INFLUENZA**

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**IMPORTANCE**

Children under 5 had 11 million episodes of influenza and children from 5-17 had 28 million episodes in 1992 (NCHS, 1994b). Most influenza symptoms are caused by the influenza A virus, which is dispersed by sneezing, coughing, or talking. Among school-aged children and adolescents, the clinical presentation of influenza is similar to that
found in adults. In younger children and infants, the illness is an undifferentiated febrile upper respiratory illness (Cherry in Oski, 1994). While generally a self-limited disease, pandemics of influenza have caused heavy death tolls (Wiselka, 1994). Influenza causes between 10,000 and 20,000 deaths in the United States annually, especially among infants, the elderly, and those with chronic medical conditions (Piebach and Beckett, 1994). In addition, influenza can cause complications such as pneumonitis, secondary pneumonia, Reye's syndrome, myositis and myoglobinuria, myocarditis, and neurologic sequelae (Wiselka, 1994; Barker et al., 1991). Influenza takes its toll in restricted activity days, amounting to 158 million restricted activity days per 100 persons per year for children under 5 and 143 million restricted activity days per 100 persons per year for those age 5-17 (NCHS, 1994c).

Efficacy and/or Effectiveness of Interventions

**Diagnosis**

Uncomplicated influenza has an abrupt onset of systemic symptoms including fever, chills, headache and myalgias. The fever generally persists 3-4 days, but may persist up to 7 days. Respiratory symptoms (e.g., cough, hoarseness, nasal discharge, pharyngitis) begin when systemic symptoms begin to resolve. Physical findings include toxic appearance, cervical lymphadenopathy, hot skin watery eyes and rarely, localized chest findings (e.g., rales).

**Treatment**

Treatment for uncomplicated influenza is generally symptomatic, with rest, fluid intake, and aspirin (in adults only) or acetaminophen. Dyspnea, hemoptysis, wheezing, purulent sputum, fever persisting more than 7 days, severe muscle pain, and dark urine, may indicate onset of influenza complications (Barker et al., 1991). Amantadine has been shown to decrease virus shedding and shorten duration of influenza symptoms if treatment was started within 48 hours of symptom onset. Common side-effects include headache, light headedness, dizziness and insomnia. Amantadine should be considered for use in children who are
severely ill or hospitalized if the illness is likely to be caused by the influenza A virus (Cherry in Oski, 1994).

**Prevention**

Yearly influenza vaccination is recommended for children who are at high risk for complications, including those who:

- have chronic bronchopulmonary disease (e.g., TB, cystic fibrosis, asthma, bronchiectasis); or
- have cardiovascular disorders (e.g., rheumatic, congenital, or hypertensive heart disease); or
- have chronic metabolic diseases (e.g., diabetes mellitus, chronic glomerulonephritis, and chronic neurologic disorders that affect the respiratory muscles (Cherry in Oski, 1994).

**NASAL CONGESTION AND RHINORRHEA**

*Eve Kerr, M.D., M.P.H.*

**IMPORTANCE**

Over 8 million visits for nasal congestion as the principal reason for patient visit occurred in 1991 across all age groups in the United States (NCHS, 1994c). More than half of those visits (4.5 million) were for children under age 15. Nasal congestion may be due to a variety of causes, the principal of these being acute viral infection (i.e., common cold), allergic rhinitis and infectious sinusitis (acute or chronic) (Canadian Rhinitis Symposium, 1994). Other common causes include vasomotor rhinitis and rhinitis medicamentosa. Appropriate treatment rests in making distinctions among these causes. Other less common reasons for rhinitis include atrophic rhinitis and hormonal rhinitis and mechanical/obstructive rhinitis. For a more detailed discussion of allergic rhinitis, see Chapter 3.

The Canadian Rhinitis Symposium convened in January of 1994 to develop a guide for assessing and treating rhinitis (Canadian Rhinitis
Symposium, 1994). While the guidebook is extensive, essential elements for diagnosis and treatment are discussed below.

EFFICACY AND/OR EFFECTIVENESS OF INTERVENTIONS

Diagnosis and Treatment

The following may serve to differentiate between (1) allergic rhinitis, (2) infectious viral rhinitis (common cold) and (3) sinusitis.

**Allergic rhinitis**

**Symptoms:** Nasal congestion, sneezing, palatal itching, rhinorrhea with or without allergic conjunctivitis. Symptoms are seasonal or perennial and may be triggered by allergens such as pollens, mites, molds, and animal danders.

**Physical exam:** nasal mucosa is pale or hyperemic; edema with or without watery secretions are frequently present.

**Treatment:** Treatment of allergic rhinitis should include antihistamines, nasal cromolyn and/or nasal glucocorticoid sprays. Oral decongestants may be used for symptomatic relief. If prescribed, topical nasal decongestants are indicated for short term use only.

**Infectious viral rhinitis**

**Symptoms:** Nasal congestion and rhinorrhea. Other symptoms of viral infectious rhinitis include mild malaise, sneezing, scratchy throat, and variable loss of taste and smell. Colds due to rhinoviruses typically last one week, and rarely as long as two weeks (Barker et al., 1991). Symptoms are generally of acute onset, unless chronic sinusitis is present (see Section F of this chapter). Symptoms of coexisting acute sinusitis may also be present (see Section E of this chapter).

**Physical exam:** Mucosa hyperemic and edematous with or without purulent secretions; physical exam should include nasal cavity and sinuses (for presence of sinusitis) and ears (for presence of otitis media) (Barker et al., 1991). Sinus tenderness and fever may be present with sinusitis.
Treatment: Treatment of infectious viral rhinitis without sinusitis is symptomatic. Use of oral decongestants or short term nasal decongestants is appropriate but not necessary. For coexisting sinusitis, treatment should be with antibiotics in addition to decongestants (see Section F of this chapter).

Sinusitis
Symptoms/Physical Exam/Treatment: See discussions below on acute and chronic sinusitis (Sections E and F, respectively).

SINUSITIS, ACUTE
Eve Kerr, M.D., M.P.H.

IMPORTANCE—ACUTE AND CHRONIC SINUSITIS
According to the 1991 National Ambulatory Medical Care Survey, chronic sinusitis was the eighth most common diagnosis rendered by physicians for office visits in 1991. This translates to 1.7 percent of all visits among children and adults. Patients frequently mentioned symptoms which could be attributable to sinusitis—headache in 1.5 percent of visits and nasal congestion in 1.3 percent of visits. In children under 15 years of age, sinusitis accounted for 2.5 percent of visits; for persons age 15 to 24 years, allergic rhinitis accounted for 1.9 percent (NCHS, 1994c). While little data exists on the incidence of acute sinusitis, chronic sinusitis was reported by over 37 million persons (about 5 million of whom were under age 18) in the 1992 NHIS (NCHS, 1994b).

EFFICACY AND/OR EFFECTIVENESS OF INTERVENTIONS

Diagnosis
Acute sinusitis is a complication in about 1 to 5 percent of upper respiratory tract infections (Wald in Oski, 1994). By definition, acute sinusitis has a duration of less than 4 to 6 weeks (Wald in Oski, 1994).
Symptoms that may increase the likelihood of acute sinusitis being present in children include persistence of rhinorrhea, cough lasting more than 10 days, mild periorbital swelling, and malodorous breath. Headache is a less common symptom among children as compared to adults and is most often seen in children over age 5. Transillumination may improve the accuracy of diagnosis for maxillary sinusitis, but its usefulness is operator sensitive (Williams and Simel, 1993).

**Treatment**

Treatment is based on controlling infection and reducing tissue edema. Ten to fourteen days of antibiotics should be instituted for treatment of acute sinusitis; if full recovery has not occurred, antibiotics may be continued for another week (Wald in Oski, 1994). The use of oral or topical decongestants in children has not been adequately studied and is not generally recommended (Wald in Oski, 1994). Antihistamines, because of their drying action on the nasal mucosa, have no role in the treatment of most patients with acute sinusitis, except when patients also manifest symptoms of allergic rhinitis (thin, watery rhinorrhea, and sneezing) (Stafford, 1992).

**Follow-up**

If symptoms fail to improve after 48 hours, clinical re-evaluation of the patient is recommended and an alternate antibiotic may be required (Wald in Oski, 1994). If symptoms persist after 2 courses of antibiotics, referral to an otolaryngologist and/or more definitive diagnostic studies (e.g., x-ray, sinus CT, nasal endoscopy) is indicated (Stafford, 1992).
SINUSITIS, CHRONIC
Eve Kerr, M.D., M.P.H.

EFFICACY AND/OR EFFECTIVENESS OF INTERVENTIONS

Diagnosis

Chronic sinusitis is common among children with asthma or allergic rhinitis and is sometimes missed (Simons in Oski, 1994). Chronic sinusitis generally presents with nasal discharge, post-nasal drip, nasal obstruction, chronic cough, and loss of taste or smell (Simons in Oski, 1994).

Conditions that commonly predispose to chronic sinusitis include nasal foreign body, previous acute sinusitis, allergic rhinitis, environmental irritants, nasal polyposis, and viral infection (Godley, 1992).

Diagnosis rests on history, evaluation by nasal endoscopy, and CT scanning (Bolger and Kennedy, 1992). In general, if the history is strongly suggestive of chronic sinusitis, one should treat first with antibiotics (see below). If medical therapy is unsuccessful or if disease recurs repeatedly, referral to an otolaryngologist for endoscopic examination is indicated (Bolger and Kennedy, 1992).

Endoscopic examination is more specific for chronic sinusitis than is CT scanning. If endoscopic findings are equivocal, a CT scan may demonstrate underlying sinus disease. However, a CT is best performed four to six weeks after optimal medical therapy is instituted to optimize specificity (Bolger and Kennedy, 1992).

Treatment

Medical treatment should be attempted first. First-line therapy for chronic disease is amoxicillin or trimethoprim-sulfamethoxazole three times daily for 21 to 28 days (Simons in Oski, 1994). Amoxicillin/clavulanate or a second- or third-generation cephlasporin is recommended if β-lactamase-producing H. influenzae or M. catarrhalis is suspected (Simons in Oski, 1994). Other medications that may be used
include topical oral decongestants, nasal steroids, and antihistamines for patients with an allergic component.

Surgical treatment is reserved for cases when medical therapy fails. Currently, endoscopic surgery is the method of choice (Bolger and Kennedy, 1992). Endoscopic examination and debridement of the operative cavity are required once or twice weekly for four to six weeks to promote healing and prevent stenosis of the sinus ostia. Complications of surgery include CSF rhinorrhea, diplopia, blindness and meningitis. However, the rates of complications are very low among experienced surgeons. In studies reporting success rates of surgery in consecutive patients, up to 93 percent of patients reported substantial symptomatic improvement in two-year follow-up, and subsequent revision surgery is reported in 7-10 percent (Bolger and Kennedy, 1992). It should be noted that no randomized controlled trials or case-controlled studies for endoscopic surgery have been performed.
**Recommended Quality Indicators for Upper Respiratory Infections**

These indicators apply to all children aged 2-18.

**Diagnosis**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Quality of evidence</th>
<th>Literature</th>
<th>Benefits</th>
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<td><strong>Pharyngitis</strong></td>
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<tr>
<td>1. All patients with sore throat should be asked about presence or absence of fever.</td>
<td>III</td>
<td>Inferred from Niederman &amp; Marcinak in Dershewitz, 1993</td>
<td>Prevent ARF. Prevent suppurative complications of strep throat.* Reduce symptoms. Prevent spread of GABHS.</td>
<td>Presence of fever increases the probability of GABHS.</td>
</tr>
<tr>
<td>2. All patients with sore throat should be asked about nasal symptoms.</td>
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<td>Inferred from Cherry in Feigin and Cherry, 1992</td>
<td>Prevent ARF. Prevent suppurative complications of strep throat.* Reduce symptoms. Prevent spread of GABHS.</td>
<td>Nasal symptoms decrease the probability of GABHS.</td>
</tr>
<tr>
<td>3. If a rapid streptococcal test is negative, a culture should be sent within 24 hours.</td>
<td>III</td>
<td>AAP in Peter, 1994; Hammerschlag in Oski et al., 1994; Niederman &amp; Marcinak in Dershewitz, 1993; Widome in Hoekelman, 1992</td>
<td>Prevent ARF. Prevent suppurative complications of strep throat.* Reduce symptoms. Prevent spread of GABHS.</td>
<td>Follow-up culture decreases false-negative results. In practice, it should generally be sent immediately, since the most efficient way to perform the sequence is to send two throat swabs at the same time, one for the rapid test and one for culture if the rapid test is negative.</td>
</tr>
<tr>
<td>4. Diagnosis of GABHS, <em>N. gonorrhoeae</em>, or <em>C. haemolyticum</em> by gram stain in the absence of culture or rapid test is not appropriate.</td>
<td>III</td>
<td>Hammerschlag in Oski et al., 1994</td>
<td>Prevent allergic reactions from antibiotics. Prevent resistance. Prevent ARF. Prevent suppurative complications.* Prevent spread of GABHS, gonorrhea, and chlamydia.</td>
<td>Gram stain is not sufficiently sensitive or specific for making these diagnoses, though it is useful if anaerobic agents are suspected. Use of antibiotics involves allergy risk, contributes to community resistance, and has associated expense and inconvenience.</td>
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<tr>
<td><strong>Bronchitis/Cough</strong></td>
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<td>5. The history of patients presenting with cough of less than 3 weeks’ duration should document presence or absence of preceding viral infection (e.g., common cold, influenza).</td>
<td>III</td>
<td>Zervanos and Shute, 1994</td>
<td>Decrease cough. Prevent allergic reactions from antibiotics.</td>
<td>If preceding viral infection were present and the patient has no other complications (e.g., fever, shortness of breath), a diagnosis of viral bronchitis is likely. This diagnosis is self-limited and antibiotics are not necessary. No preceding viral infection would lead one to search for non-viral causes of bronchitis.</td>
</tr>
<tr>
<td>6. The history of patients presenting with cough of less than 3 weeks’ duration should document presence or absence of fever and shortness of breath (dyspnea).</td>
<td>III</td>
<td>Barker et al., 1991</td>
<td>Decrease cough. Decrease shortness of breath. Prevent development of empyema. Prevent development of sepsis.</td>
<td>These symptoms are consistent with possible pneumonia, which would require antibiotic treatment. If the cause is viral, then antibiotics are not required.</td>
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<td><strong>7.</strong> Patients presenting with acute cough should receive a physical examination of the chest for evidence of pneumonia.</td>
<td>III</td>
<td>Barker et al., 1991</td>
<td>Decrease cough. Decrease shortness of breath. Prevent development of empyema. Prevent development of sepsis.</td>
<td>Signs of consolidation would lead one on a different diagnostic and treatment path.</td>
</tr>
<tr>
<td><strong>8.</strong> Patients presenting with acute cough and with evidence of consolidation on physical exam of the chest (dullness to percussion, egophony, etc.) should receive a chest x-ray to look for evidence of pneumonia.</td>
<td>III</td>
<td>Barker et al., 1991</td>
<td>Decrease cough. Decrease shortness of breath. Prevent development of empyema. Prevent development of sepsis.</td>
<td>Presence of pneumonia would necessitate different treatment and follow-up plans.</td>
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<td><strong>Nasal Congestion</strong></td>
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<td><strong>9.</strong> If a patient presents with the complaint of nasal congestion and/or rhinorrhea not attributed to the common cold, the history should include: seasonality of symptoms, presence or absence of sneezing, facial pain, fever, specific irritants, use of topical nasal decongestants.</td>
<td>III</td>
<td>Canadian Rhinitis Symposium, 1994</td>
<td>Decrease nasal congestion. Decrease rhinorrhea.</td>
<td>Nasal congestion can result from multiple causes in addition to the common cold. The most important of these, because of availability of treatment, are allergic rhinitis, sinusitis, and topical nasal decongestant abuse (rhinitis medicamentosa). If the practitioner does not attribute symptoms to the common cold, symptoms specific to these alternate diagnoses should be elicited.</td>
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<tr>
<td><strong>Acute Sinusitis</strong></td>
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<td><strong>10.</strong> If the diagnosis of acute sinusitis is made, symptoms should be present for a duration of less than 3 weeks (e.g., fever, malaise, cough, nasal congestion, purulent nasal discharge, ear pain or blockage, post-nasal drip, dental pain, headache, or facial pain).</td>
<td>III</td>
<td>Barker et al., 1991; Williams &amp; Simel, 1993</td>
<td>Decrease nasal congestions, fever, post-nasal drip, headache and facial pain.</td>
<td>Acute sinusitis is defined as lasting less than 3 weeks. If symptoms last longer, the patient may have chronic sinusitis, which is more difficult to treat and requires longer duration of antibiotic therapy.</td>
</tr>
</tbody>
</table>
### Treatment

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Quality of evidence</th>
<th>Literature</th>
<th>Benefits</th>
<th>Comments</th>
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<tbody>
<tr>
<td><strong>Pharyngitis</strong></td>
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<td>11. Patients with documented or presumed streptococcal infection should be treated with intramuscular benzathine penicillin G or procaine penicillin, oral potassium penicillin V for 10 days, or (if the patient is allergic to penicillin) erythromycin for 10 days. First generation cephalosporins are acceptable for individuals allergic to penicillin.</td>
<td>III</td>
<td>AAP in Peter, 1994; Hammerschlag in Oski et al., 1994; Widome in Hoekelman et al., 1992</td>
<td>Prevent ARF. Prevent supplicative complications of strep throat. Reduce symptoms. Prevent spread of GABHS.</td>
<td>Penicillin is the standard treatment for GABHS; erythromycin is the preferred alternative for patients allergic to penicillin.</td>
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<tr>
<td>12. Tetracyclines and sulfonamides should not be used for treating GABHS pharyngitis.</td>
<td>III</td>
<td>AAP in Peter, 1994</td>
<td>Prevent ARF. Prevent supplicative complications of strep throat. Prevent spread of GABHS.</td>
<td>Many strains are resistant to the former, and the latter does not eradicate the organism.</td>
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<tr>
<td>13. No antibiotics should be used for a patient with a diagnosis of viral pharyngitis (unless antibiotics were prescribed before culture results were obtained).</td>
<td>III</td>
<td>Widome in Hoekelman et al., 1992</td>
<td>Prevent allergic reactions. Prevent resistance.</td>
<td>Given that antibiotics will sometimes be prescribed at the time of culture because the clinician is not confident the patient will return or be reachable if culture results are positive, it may be difficult to notify the patient that continuation of the full course of antibiotics is unnecessary.</td>
</tr>
<tr>
<td>14. Antibiotics should only be prescribed in a patient with conjunctivitis and pharyngitis if a rapid streptococcal test or throat culture is obtained.</td>
<td>III</td>
<td>Hammerschlag in Oski et al., 1994</td>
<td>Prevent allergic reactions. Prevent resistance.</td>
<td>While this is not specified by any particular source, strong evidence of adenovirus (i.e., the combination of sore throat and conjunctivitis) should strongly reduce suspicion of GABHS. If the clinician is nonetheless concerned enough about the possibility of GABHS to treat, he/she should investigate this with a culture. Use of antibiotics involves allergy risk, contributes to community resistance, and has associated expense and inconvenience.</td>
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<tr>
<td>15. Beta-lactamase-resistant and antistaphylococcal medications (e.g., amoxicillin-clavulanate, narrow-spectrum cephalosporins, dicloxacillin, and clindamycin) should be prescribed in patients who have had four episodes of documented or presumed and treated Strep throat in a one-year period.</td>
<td>III</td>
<td>AAP in Peter, 1994; Hammerschlag in Oski et al., 1994</td>
<td>Prevent future GABHS infections. Reduce disability/school loss days. Prevent ARF.</td>
<td>Some persons with frequent episodes of Strep throat despite therapy with penicillin have resistant strains. Children &lt; 2 years old do not require treatment for GABHS because ARF is not observed in this age group.</td>
</tr>
<tr>
<td>16. Aspirin should not be used in children and teenagers with pharyngitis.</td>
<td>III</td>
<td>Cherry in Feigin and Cherry, 1992; Widome in Hoekelman et al., 1992; PDR, 1995</td>
<td>Prevent death from Reye's syndrome. Prevent neurologic deficits from Reye's syndrome.</td>
<td>Aspirin has been associated with Reye's syndrome.</td>
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<td>17. If a diagnosis of infectious mononucleosis is made, it should be on the basis of a positive heterophil antibody test or other EBV antibody tests.</td>
<td>III</td>
<td>Hammerschlag in Oski et al., 1994; Widome in Hoekelman et al., 1992</td>
<td>Prevent delayed diagnosis of hematologic malignancy. Prevent rupture of spleen.</td>
<td>Use of the heterophil test decreases false positive diagnosis, in which case more serious illness might be missed, and false negative diagnosis, in which case a patient might not get proper symptomatic care and might not avoid activities that could lead to serious consequences (e.g., rupture of spleen because athletic activities were not avoided).</td>
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<tr>
<td>Bronchitis/Cough</td>
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<td>18. If an antibiotic is prescribed for acute cough, documentation of drug allergies should be in the chart.</td>
<td>III</td>
<td></td>
<td>Avoid allergic reactions.</td>
<td>Allergy to antibiotics is relatively common. Approximately 2% of persons treated with penicillin derivatives develop an allergic reaction. Since alternative antibiotic regimens usually exist, it is wise to be aware of patients’ allergy status before prescribing antibiotic.</td>
</tr>
<tr>
<td>19. If the history documents cigarette smoking in a patient with acute cough, encouragement to stop smoking should be documented.</td>
<td>III</td>
<td>Barker et al., 1991</td>
<td>Prevent future bronchitic episodes. Prevent smoking-related morbidity and mortality.</td>
<td>Smokers are predisposed to bronchitis. Symptomatic patients present a window of opportunity to counsel regarding smoking cessation.</td>
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<tr>
<td>Nasal Congestion</td>
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<td>20. If nasal decongestants are prescribed, duration of treatment should be for no longer than 4 days.</td>
<td>II</td>
<td>Stafford et al., 1992; Barker et al., 1991</td>
<td>Prevent rhinitis medicamentosa.</td>
<td>Long-term treatment with topical decongestants can cause rebound congestion (rhinitis medicamentosa).</td>
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<tr>
<td>Acute Sinusitis</td>
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<td>21. Treatment for acute sinusitis should be with antibiotics for 10-14 days.</td>
<td>I-III</td>
<td>Williams et al., 1995</td>
<td>Decrease nasal congestion. Decrease fever. Prevent development of chronic sinusitis.</td>
<td>Antibiotics have proven benefit but the length of treatment is somewhat controversial.</td>
</tr>
<tr>
<td>22. If an antibiotic is prescribed for acute sinusitis, documentation of presence or absence of drug allergies should be in the chart.</td>
<td>III</td>
<td></td>
<td>Avoid allergic reactions.</td>
<td>Allergy to antibiotics is relatively common. Approximately 2% of persons treated with penicillin derivatives develop an allergic reaction. Since alternative antibiotic regimens usually exist, it is wise to be aware of patients’ allergy status before prescribing antibiotic.</td>
</tr>
<tr>
<td>23. In the absence of symptoms of allergic rhinitis (thin, watery rhinorrhea, and sneezing), antihistamines should not be prescribed for acute sinusitis.</td>
<td>III</td>
<td>Stafford et al., 1992</td>
<td>Prevent antihistamine side effects.</td>
<td>Therefore, they should only be used if allergic symptoms are present. No RCTs have been done in this area.</td>
</tr>
<tr>
<td>24. If symptoms fail to improve after 48 hours of antibiotic treatment, clinical re-evaluation and therapy with another antibiotic should be instituted.</td>
<td>III</td>
<td>Simons in Oski, 1994</td>
<td>Decrease nasal congestion. Decrease fever. Prevent development of chronic sinusitis.</td>
<td>Response should be within 48 hours; if not, alternative diagnosis and therapy should be considered.</td>
</tr>
<tr>
<td>25. If the patient does not improve after two courses of antibiotics, referral to an otolaryngologist for a diagnostic test (CT, x-ray, ultrasound of the sinuses) is indicated.</td>
<td>III</td>
<td>Stafford et al., 1992</td>
<td>Decrease nasal congestion. Prevent development of chronic sinusitis.</td>
<td>Reevaluation of diagnosis and/or surgical treatment may be indicated.</td>
</tr>
</tbody>
</table>
### Chronic Sinusitis

<table>
<thead>
<tr>
<th>Statement</th>
<th>Quality</th>
<th>Reference</th>
<th>Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. If a diagnosis of chronic sinusitis is made, the patient should be treated with at least 3 weeks of antibiotics.</td>
<td>III</td>
<td>Stafford et al., 1992</td>
<td>Decrease nasal congestion and other symptoms of chronic sinusitis.** Prevent recurrence of sinusitis.</td>
<td>It is generally agreed that a longer duration of treatment for chronic sinusitis is necessary than for acute sinusitis. However, the exact number of days has not been defined in RCTs. The literature cites 3 weeks as standard of care.</td>
</tr>
<tr>
<td>27. If patient has repeated symptoms after 2 separate 3 week trials of antibiotics, a referral to an otolaryngologist should be ordered.</td>
<td>III</td>
<td>Bolger and Kennedy, 1992</td>
<td>Decrease nasal congestion and other symptoms of chronic sinusitis.** Prevent recurrence of sinusitis.</td>
<td>While medical treatment is still first-line therapy, surgical treatment may be indicated if two course of antibiotics fail to relieve symptoms.</td>
</tr>
<tr>
<td>28. If topical or oral decongestants are prescribed, duration of treatment should be for no longer than 4 days.</td>
<td>II</td>
<td>Stafford et al., 1992; Barker et al., 1991</td>
<td>Prevent rhinitis medicamentosa.</td>
<td>Long-term treatment with topical decongestants can cause rebound congestions (rhinitis medicamentosa).</td>
</tr>
<tr>
<td>29. In the absence of symptoms of allergic rhinitis (thin, watery rhinorrhea, and sneezing), antihistamines should not be prescribed.</td>
<td>III</td>
<td>Stafford et al., 1992</td>
<td>Prevent antihistamine side effects.</td>
<td>Antihistamines may be detrimental to treatment secondary to drying properties. Therefore, they should only be used if allergic symptoms are present. No RCTs have been done in this area.</td>
</tr>
</tbody>
</table>

*Suppurative complications include otitis media, sinusitis, peritonsillar abscess, and suppurative cervical adenitis.

**Symptoms of chronic sinusitis include nasal congestions, fever, headache, facial pain, toothache, rhinorrhea, and purulent nasal discharge.

**Quality of Evidence Codes:**

- **I:** RCT
- **II-1:** Nonrandomized controlled trials
- **II-2:** Cohort or case analysis
- **II-3:** Multiple time series
- **III:** Opinions or descriptive studies

*The table and text are from an academic or clinical source focusing on the management of chronic sinusitis.*
REFERENCES - UPPER RESPIRATORY INFECTIONS


