ICSI Institute for Clinical Systems Improvement

Health Care Guideline

Diagnosis and Treatment of Respiratory Illness in Children and Adults

How to cite this document:

Snellman L, Adams W, Anderson G, Godfrey A, Gravley A, Johnson K, Marshall P, Myers C, Nesse R, Short S. Institute for Clinical Systems Improvement. Diagnosis and Treatment of Respiratory Illness in Children and Adults. http://bit.ly/RespIll0113. Updated January 2013.

ICSI
Institute for Clinical Systems Improvement

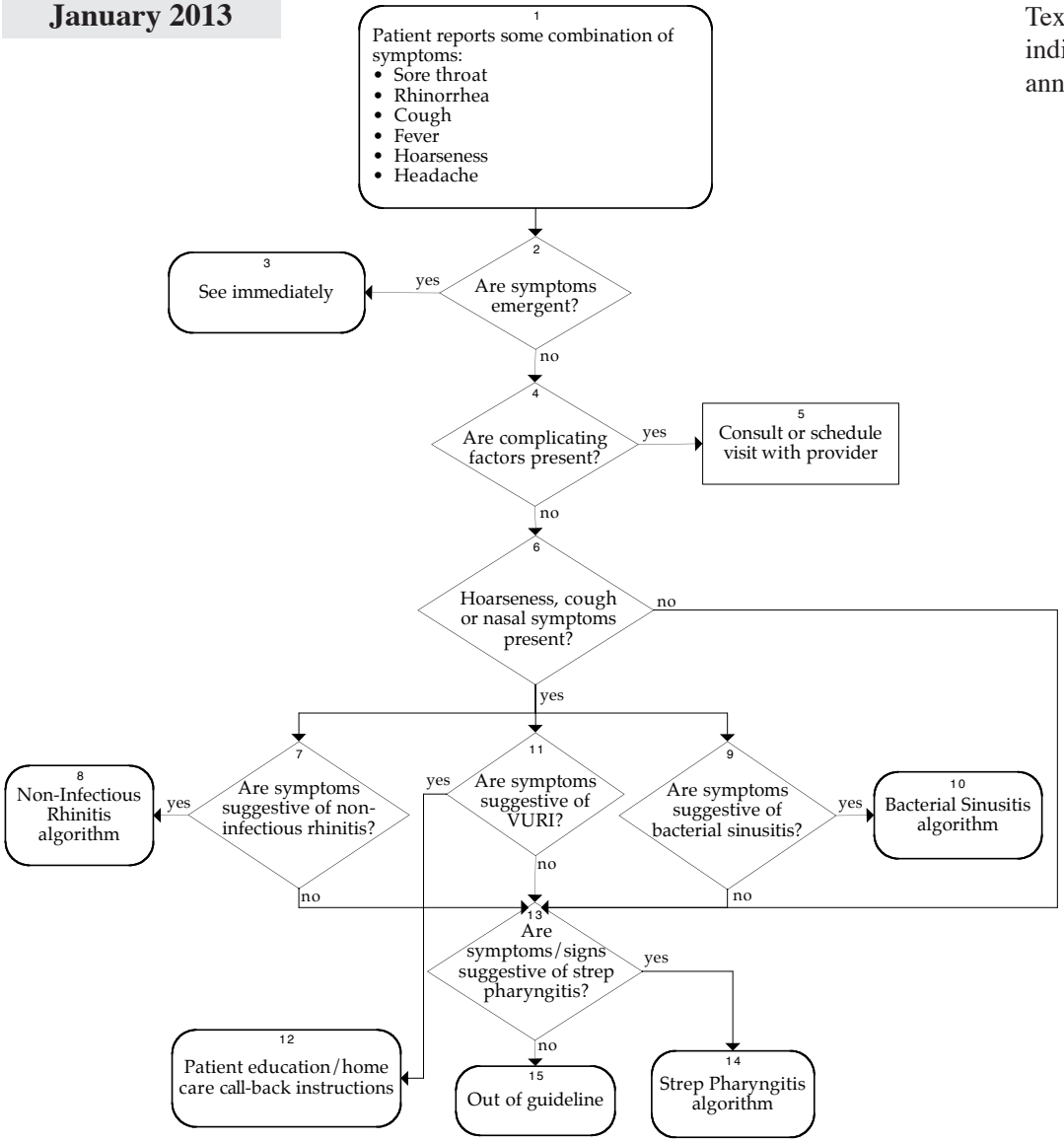
Health Care Guideline:

Diagnosis and Treatment of Respiratory Illness in Children and Adults

Fourth Edition
January 2013

Main Algorithm

Text in blue in this algorithm indicates a linked corresponding annotation.



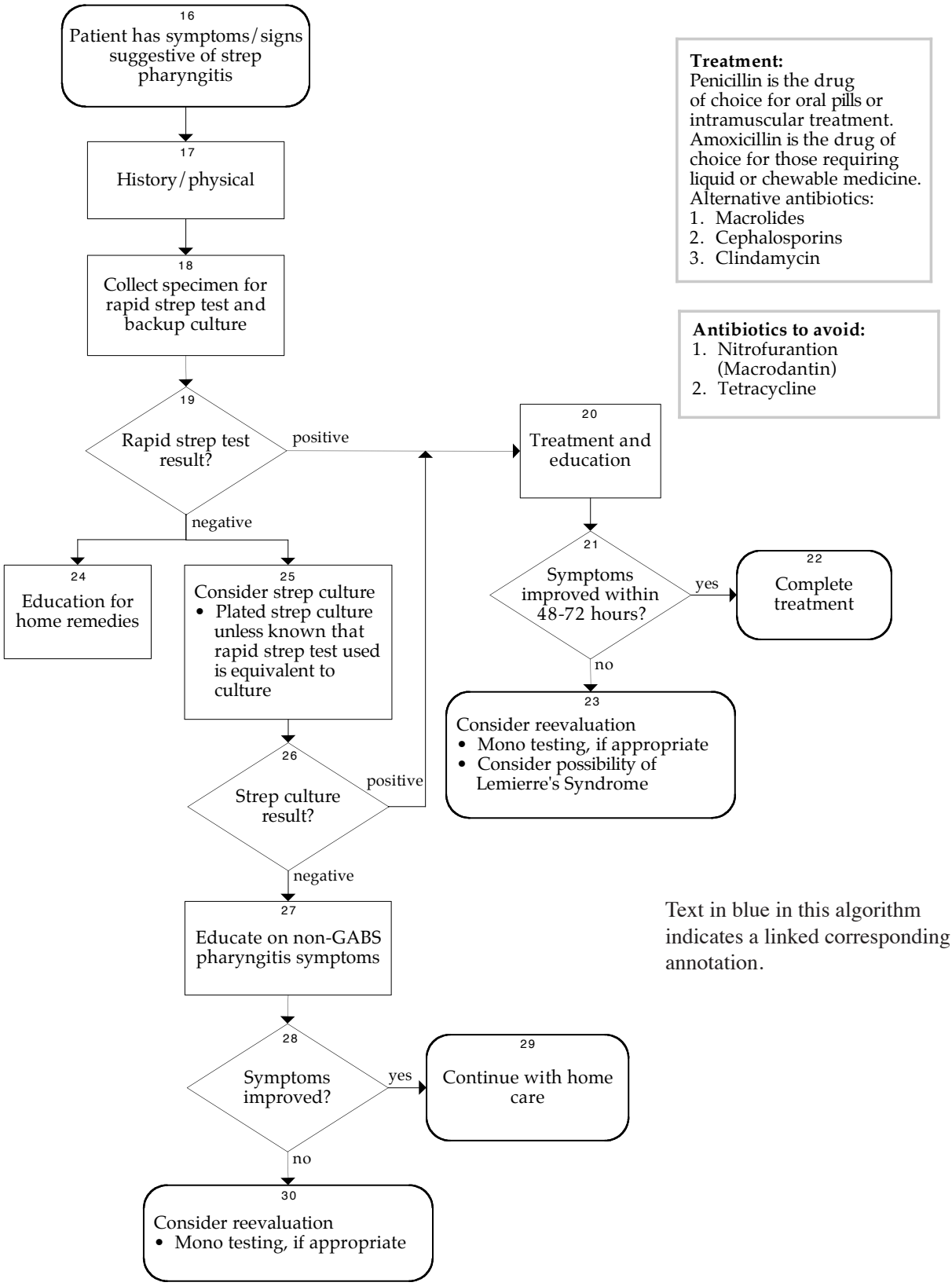
7
Symptoms of non-infectious rhinitis:
- Pruritis of the eyes, nose, palate, ears
- Watery rhinorrhea
- Sneezing
- Nasal congestion
- Postnasal drip

9
Symptoms of bacterial sinusitis:
Upper respiratory symptoms present 10-14 days.
Two or more of the following factors present at a point of 10-14 days after onset:
- Facial pain or sinus pain, particularly if aggravated by postural changes or by valsalva maneuver
- Purulent nasal drainage
- Fever

11
Symptoms of VURI:
- Rhinorrhea
- Cough
- Fever
- Hoarseness
- Injection of the conjunctiva (red eyes)

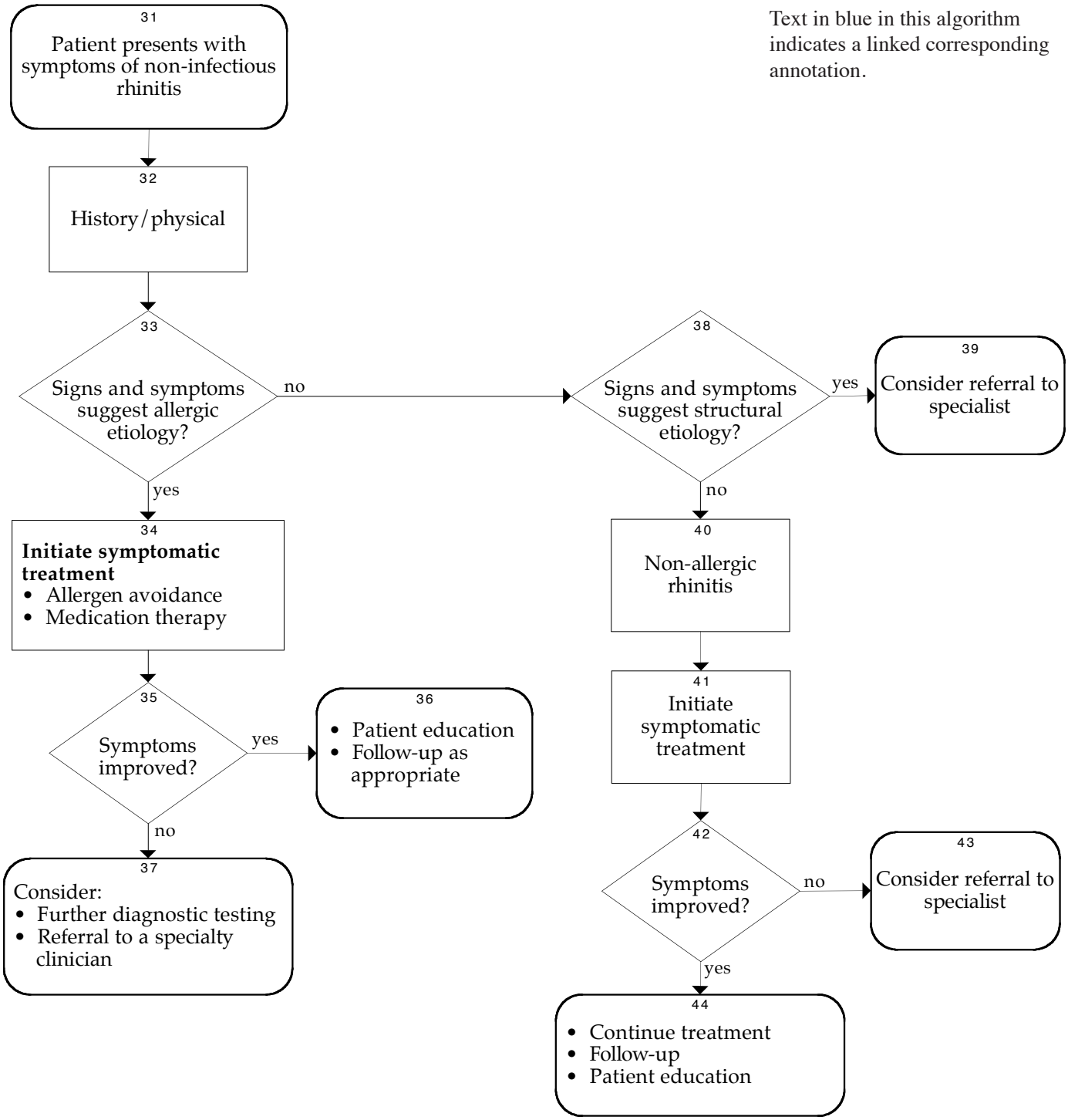
13
Symptoms/signs of strep pharyngitis:
- Close exposure to strep throat
- Sudden onset of sore throat
- Exudative tonsilitis
- Tender anterior cervical adenopathy
- Fever
- Headache (only when present with above symptoms)
- Abdominal pain (only when present with above symptoms)
- Absence of rhinorrhea, cough, hoarseness

Strep Pharyngitis Algorithm



Text in blue in this algorithm indicates a linked corresponding annotation.

Non-Infectious Rhinitis Algorithm



Text in blue in this algorithm indicates a linked corresponding annotation.

Bacterial Sinusitis Algorithm

Text in blue in this algorithm indicates a linked corresponding annotation.

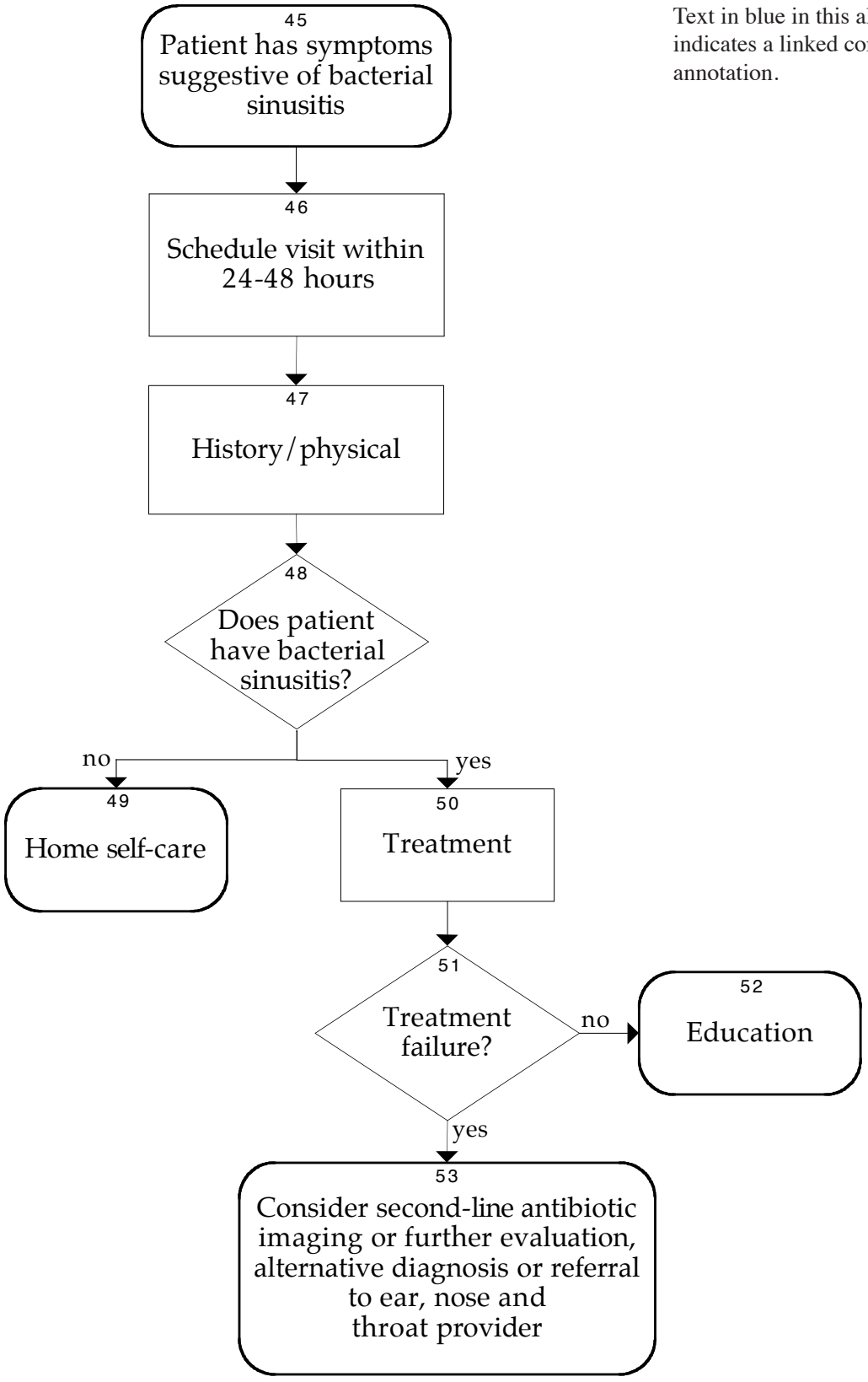


Table of Contents

Work Group Leader
Leonard Snellman, MD
Pediatrics, HealthPartners Medical Group

Work Group Members
Fairview Health Services
Sonja Short, MD
Internal Medicine and Pediatrics

HealthPartners Medical Group and Regions Hospital
Peter Marshall, PharmD
Pharmacy

Mayo Clinic
Greg Anderson, MD
Family Practice

South Lake Pediatrics
Andrea Gravley, RN, MAN, CPNP
Pediatrics

Stillwater Medical Group and Lakeview Hospital
Ramona Nesse, RN, C-NP
Family Practice

Patient/Family Representatives
William Adams
Ann Godfrey

ICSI
Kari Johnson, RN
Clinical Systems Improvement Facilitator
Cassie Myers
Clinical Systems Improvement Facilitator

Evidence Grading

Literature Search

A consistent and defined process is used for literature search and review for the development and revision of ICSI guidelines. The literature search was divided into two stages to identify systematic reviews, (stage I) and randomized controlled trials, meta-analysis and other literature (stage II). Literature search terms used for this revision are respiratory tract infections, antimicrobial treatment, streptococcus, sinusitis, rhinitis and acute respiratory pharyngitis and include literature from June 2010 through June 2012.

GRADE Methodology

Following a review of several evidence rating and recommendation writing systems, ICSI has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

GRADE has advantages over other systems including the current system used by ICSI. Advantages include:

- developed by a widely representative group of international guideline developers;
- explicit and comprehensive criteria for downgrading and upgrading quality of evidence ratings;
- clear separation between quality of evidence and strength of recommendations that includes a transparent process of moving from evidence evaluation to recommendations;
- clear, pragmatic interpretations of strong versus weak recommendations for clinicians, patients and policy-makers;
- explicit acknowledgement of values and preferences; and
- explicit evaluation of the importance of outcomes of alternative management strategies.

This document is in transition to the GRADE methodology

Transition steps incorporating GRADE methodology for this document include the following:

- Priority placed upon available Systematic Reviews in literature searches.
- All existing High Quality Evidence (RCTs) studies have been considered as high quality evidence unless specified differently by a work group member.
- All existing Class B, C and D studies have been considered as low quality evidence unless specified differently by a work group member.
- All existing Class M and R studies are identified by study design versus assigning a quality of evidence. Refer to Crosswalk between ICSI Evidence Grading System and GRADE.
- All new literature considered by the work group for this revision has been assessed using GRADE methodology.

Crosswalk between ICSI Evidence Grading System and GRADE

ICSI GRADE System	Previous ICSI System	
High, if no limitation	**Class A:**	Randomized, controlled trial
Low	**Class B:**	[observational] Cohort study
	Class C:	[observational] Non-randomized trial with concurrent or historical controls
Low		Case-control study
Low		Population-based descriptive study
***Low**		Study of sensitivity and specificity of a diagnostic test
* Following individual study review, may be elevated to Moderate or High depending upon study design		
	Class D:	[observational]
Low		Cross-sectional study Case series Case report
Meta-analysis	**Class M:**	Meta-analysis
Systematic Review		Systematic review
Decision Analysis		Decision analysis
Cost-Effectiveness Analysis		Cost-effectiveness analysis
Low	**Class R:**	Consensus statement
Low		Consensus report
Low		Narrative review
Guideline	**Class R:**	Guideline
Low	**Class X:**	Medical opinion

Evidence Definitions:

High Quality Evidence = Further research is very unlikely to change our confidence in the estimate of effect.

Moderate Quality Evidence = Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low Quality Evidence = Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate or any estimate of effect is very uncertain.

Foreword

Introduction

The goals of the guideline are threefold educational: to assist patients to be competent and comfortable with home care of respiratory illness, to assist medical personnel to differentiate respiratory illness from more severe illness, and to improve the appropriateness of care and antibiotic use for respiratory illness while decreasing the cost of that care.

Scope and Target Population

The Diagnosis and Treatment of Respiratory Illness in Children and Adults guideline encompasses acute conditions in infants greater than three months, children, adolescents and adults who are in good health.

Aims

1. Increase the percentage of patients diagnosed with viral upper-respiratory infection who receive appropriate treatment. *(Annotation #12)*
2. Reduce excessive antibiotic treatment through decreased empiric treatment of patients with strep pharyngitis. *(Annotations #16, 20, 25, 27)*
3. Increase the use of recommended first-line medications for patients diagnosed with strep pharyngitis. *(Annotations #20, 25, 27)*
4. Increase patient/caregiver knowledge about strep pharyngitis and pharyngitis care. *(Annotations #20, 24, 27)*
5. Decrease the use of injectable corticosteroid therapy for patients diagnosed with allergic rhinitis. *(Annotation #34)*

Clinical Highlights

- Patients and/or parents of children presenting or calling with symptoms suggestive of the common cold should be evaluated for other symptoms and the presence of more serious illness. *(Annotations #2, 4; Aim #1)*
- The primary treatment of viral upper-respiratory infection is education based; education is to take place in the clinic, on the telephone, at the work site and in newsletters. Patients and/or parents should receive home care and call-back instructions. *(Annotation #12; Aim #1)*
- Reduce unnecessary use of antibiotics. Antibiotic treatment should be reserved for a bacterial illness. *(Annotations #16, 20, 25, 27; Aim #2)*
- Diagnosis of group A beta streptococcal pharyngitis should be made by laboratory testing rather than clinically. *(Annotations #18, 25; Aims #2, 4)*
- Patients should be educated on strep pharyngitis, including the importance of following the prescribed medication regimen, use of home remedies to relieve symptoms, actions to take if symptoms worsen, and the importance of eliminating close contact with family members or visitors to the home while group A beta streptococcal may be contagious. *(Annotations #20, 24, 27; Aim #4)*
- Prescribe intranasal steroids for moderate or severe allergic rhinitis. *(Annotation #34; Aims #5, 6)*

- Treat patients diagnosed as having allergic seasonal rhinitis with prophylactic medications and educate about avoidance activities. *(Annotations #34, 36; Aim #5)*
- Consider limited coronal computed tomography scan of sinuses and/or referral to ear, nose and throat clinician for patients when three weeks of antibiotic therapy have not produced a response in sinusitis treatment. *(Annotation #51)*

Implementation Recommendation Highlights

The following system changes were identified by the guideline work group as key strategies for health care systems to incorporate in support of the implementation of this guideline.

- Develop, collect and disseminate materials to educate patients with allergic rhinitis about avoidance activities.
- Develop phone- or computer-based care for established patients that includes telephone nurse assessment, symptomatic care with follow-up instructions and use of a protocol to prescribe first-line antibiotics for sinusitis.

Related ICSI Scientific Documents

Guidelines

- Diagnosis and Management of Asthma
- Preventive Services in Adults
- Preventive Services in Children and Adolescents

Definition

Clinician – All health care professionals whose practice is based on interaction with and/or treatment of a patient.

Algorithm Annotations

Main Algorithm Annotations

1. Patient Reports Some Combination of Symptoms

Patients may present for an appointment, call into a clinician to schedule an appointment or call a nurse line presenting with respiratory illness symptoms. The symptoms of respiratory illness may include sore throat, rhinorrhea, cough, fever, headache and/or hoarseness.

2. Are Symptoms Emergent?

Recommendations:

- Patients with upper-airway obstruction, lower-airway obstruction, altered responsiveness or severe headache should be seen immediately.

Recognizing the signs of a serious illness before it becomes life threatening is usually the medical clinician's key concern. Patients should be assessed for upper-airway obstruction, lower-airway obstruction, severe headache and then the symptoms in Table 1, "Symptoms of Serious Illness." An important purpose of Table 1 is to assist clinicians and triage personnel in distinguishing between respiratory illness and more serious illness. The urgency index increases with the number and severity of symptoms. Symptoms in Table 1 indicate which patients presenting with respiratory illness symptoms need to be seen immediately by a clinician.

Upper-Airway Obstruction

Patients with epiglottitis, croup or peritonsillar/retropharyngeal abscess may have signs of upper-airway obstruction (stridor, air hunger, respiratory distress, toxic appearance, cyanosis, drooling with epiglottis) and require immediate medical evaluation with combined ear, nose and throat/anesthesia management in an emergency room or operating room setting.

Severe symptoms – including inability to swallow liquids, trismus, drooling without respiratory distress – should receive prompt evaluation by a physician within a reasonable amount of time, depending on the symptoms.

Lower-Airway Obstruction

Lower-airway obstruction signals an underlying condition different from respiratory illness. If moderate to severe distress is present, this suggests pneumonia, chronic obstructive pulmonary disease, asthma, foreign body, cardiac condition or other underlying conditions requiring specific evaluation and treatment in an intensive setting. Such symptoms indicate the need for urgent evaluation and/or the need for intensive treatment, supplemental oxygen and prolonged observation.

Severe Headache

Severe headache (usually described as the worst headache of their life) could indicate subarachnoid hemorrhage, complications of sinusitis such as cavernous sinus thrombosis or sphenoid sinusitis, meningitis, encephalitis or other conditions. Such symptoms require prompt, intensive evaluation and care.

Table 1. Symptoms of Serious Illness

Less than three months	Three months - three years	Four years - adult
Respiratory distress • grunting • retractions • cyanosis • stridor with croup symptoms not relieved by conservative measures	**Respiratory distress** • retractions • cyanosis • marked dyspnea • rapid respiratory rate • shallow respirations • difficulty swallowing • choking • foreign body inhalation • stridor with croup symptoms not relieved by conservative measures	**Respiratory distress** • retractions • cyanosis • moderate to severe dyspnea • rapid respiratory rate • shallow respirations • difficulty swallowing • choking • foreign body inhalation • drooling • dysphonia • feeling that throat is closing
Responsiveness and activity • flaccid • lethargic • cannot awaken or keep awake • weak cry or weak suck • inconsolable • refuses feedings	**Responsiveness and activity** • unresponsive • decreased level of consciousness • cannot awaken or keep awake • markedly decreased activity • very lethargic • sleeps excessively • inconsolable • weak suck or weak cry (if infant) • refuses feedings	**Responsiveness and activity** • altered mental state • decreased level of consciousness • markedly decreased activity • refuses to eat • very lethargic • sleeps excessively • cannot awaken or keep awake • unresponsive
Dehydration and vomiting • reduced wet diapers for more than 8 hrs	**Dehydration and vomiting** • no urination within 6-8 hrs if younger than one year • no urination within 12 hrs if older than one year	**Dehydration and vomiting** • no urination in more than 12 hrs
	Meningeal signs • stiff neck • persistent vomiting	**Meningeal signs** • stiff neck • persistent vomiting • severe headache
Other • petechial or purpuric rash	**Other** • petechial or purpuric rash	**Other** • petechial or purpuric rash

(Simon, 1997 [Low Quality Evidence]; Haugen, 1993 [Low Quality Evidence]; Ingraham, 1992 [Low Quality Evidence]; Nelson, 1992 [Low Quality Evidence])

3. See Immediately

Use algorithm to triage patient symptoms; begin at algorithm box #6, "Hoarseness, Cough or Nasal Symptoms Present?"

4. Are Complicating Factors Present?

This guideline applies to patients in normal health and without severe complicating health factors.

Patients with complicating factors should consult with a clinician. The guideline should be applied with great care, if at all, to any adult or pediatric patients with complicating factors. A list of potential complicating factors, though not comprehensive, may include:

- Chronic illness/disease (congestive heart failure, chronic obstructive pulmonary disease, sickle-cell disease, etc.)
- Elderly
- History of rheumatic fever
- Human immunodeficiency virus positive
- Immunocompromised/immunosuppressed
- Patient on chemotherapy
- Asthma
- Diabetes
- Patient started antibiotics prior to diagnosis
- Treatment failure is defined as recurrence of symptoms within seven days of completing antibiotic therapy. Possible reasons include medication non-compliance, repeat exposure, antibiotic resistance, copathogen *(Hayes, 2001 [Guideline])*.
- Pregnancy*
- Recurrent streptococcal pharyngitis – recurrence of culture positive group A beta streptococcal pharyngitis more than seven days but within four weeks of completing antibiotic therapy
- Smokers
- Sore throat for more than five days duration
- Symptoms of whooping cough or recent exposure

* This guideline should be applied with caution to pregnant women and under-immunized children.

History of Rheumatic Fever

An individual with a previous history of rheumatic fever who develops group A beta streptococcal pharyngitis is at high risk for a recurrent attack of rheumatic fever. The infection does not need to be symptomatic to trigger a recurrence. Rheumatic fever recurrence can also occur when a symptomatic infection is optimally treated. Therefore, prevention of recurrent rheumatic fever requires continuous antimicrobial prophylaxis, and group A beta streptococcal infections in family members should be diagnosed and treated promptly *(Dajani, 1995 [Low Quality Evidence])*.

Human Immunodeficiency Virus Positive, Patient on Chemotherapy, Immunosuppressed, Diabetes Mellitus, Pregnant

These complicating factors were arrived at by the consensus of the guideline work group and may involve different diagnostic possibilities and/or treatment.

Patient Started Antibiotics Prior to Diagnosis

Occasionally, patients may have started "leftover" antibiotics at home on the assumption that the diagnosis is group A beta streptococcal pharyngitis prior to presenting for diagnosis. This can make the diagnosis of group A beta streptococcal more difficult. Snellman et al. have reported that cultures of patients on anti-group A beta streptococcal active antibiotics may remain positive for a short period of time.

If the patient has started antibiotics (two or more doses) before a laboratory test is done, the laboratory test results may be invalidated; therefore, a clinician should be consulted *(Snellman, 1993 [High Quality Evidence])*.

Sore Throat for More Than Five Days Duration

Patients with pharyngitis persisting over five days are less likely to have group A beta streptococcal pharyngitis and should be seen to be evaluated. Infectious mononucleosis can be difficult to differentiate from group A beta streptococcal pharyngitis on clinical grounds, and some patients with infectious mononucleosis may have a positive throat culture for group A beta streptococcal. Serologic evidence of infectious mononucleosis should be sought in patients when splenomegaly is present or if pharyngitis symptoms persist over five to seven days. Other possibilities include other viral etiologies, bacterial sinusitis and other causes of postnasal drip.

Persistent Infection/Treatment Failure

Patients who have been treated with antibiotics for streptococcal pharyngitis within the last month may represent a treatment failure, recurrent disease or carrier state, and further evaluation may be necessary.

Treatment failure is defined as recurrence of symptoms within seven days of completing antibiotic therapy. Possible reasons include:

- medication non-compliance, and
- pharyngeal flora producing beta-lactamase.

Recurrent Strep Pharyngitis

Recurrent strep pharyngitis is defined as recurrence of culture-positive group A beta streptococcal pharyngitis greater than seven days but within four weeks of completing antibiotic therapy. In patients with culture-positive group A beta streptococcal pharyngitis, the patient is likely to be experiencing recurrent episodes of acute group A beta streptococcal pharyngeal infection when:

- clinical findings suggest group A beta streptococcal as the etiology,
- epidemiologic findings suggest group A beta streptococcal as etiology (e.g., age 5-15 and winter/spring season),
- there is a repeated marked clinical response to antibiotic therapy,
- throat cultures are negative between episodes of pharyngitis, and
- there is a serologic response to group A beta streptococcal extra cellular antigens (ASO, anti-DNAase B) if measured.

7. Are Symptoms Suggestive of Non-Infectious Rhinitis?

Rhinitis is defined as inflammation of the membranes lining the nose and is characterized by nasal congestion, rhinorrhea, sneezing and itching of the nose and/or postnasal drainage *(Dykewicz, 1998 [Low Quality Evidence])*.

Symptoms of non-infectious rhinitis include:

- pruritis of the eyes, nose, palate and ears;
- watery rhinorrhea;
- sneezing;
- nasal congestion; and
- postnasal drip.

9. Are Symptoms Suggestive of Bacterial Sinusitis?

Symptoms include:

- upper-respiratory symptoms present 10-14 days, and
- one or more of the following factors present at a point of 10-14 days after onset:
  - facial pain or sinus pain particularly if aggravated by postural changes or by valsalva maneuver
  - fever
  - purulent nasal drainage

11. Are Symptoms Suggestive of Viral Upper-Respiratory Infection?

A viral upper-respiratory infection (common cold) is a self-limited illness typically lasting up to 14 days manifested by rhinorrhea, cough and fever.

Influenza is a viral upper-respiratory infection and has the potential to be more serious and differentiated by degree of illness, impressive myalgia, and season, and should be treated early on-set (http://www.cdc.gov/flu/index.htm). The symptoms may include general malaise, hoarseness, injection of the conjunctiva, decreased appetite, headache and increased fussiness. Onset of symptoms is rapid. Fever, more commonly seen in children, usually lasts one to three days. Nasal discharge is initially clear and usually becomes yellow or green toward the end of the viral upper-respiratory infection; this does not signify a bacterial infection, and the patient does not need to be seen. The symptoms of a viral upper-respiratory infection usually peak in 3 to 5 days and should resolve within 14 days. A mild cough may persist at night for two to three weeks.

There was consensus within the work group regarding the symptoms of the viral upper-respiratory infection that are not indicative of more serious illness. Medical textbooks and a widely used self-care source also listed essentially the same constellation of symptoms.

For children:

It is not unusual for a child to have five to eight colds a year.

Children with viral upper-respiratory infections have some combination of the following symptoms: nasal congestion and discharge, fever, sore throat, cough, hoarseness, mild fussiness or irritability, decrease in appetite, sleep disturbance and mild eye redness or drainage.

(Szilagyi, 1990 [Low Quality Evidence]; Walson, 1984 [Low Quality Evidence]; Wood, 1980 [Decision Analysis])

Table 2. Illnesses to Be Differentiated from Viral Upper-Respiratory Infection

The table utilizes a diagnostic-based approach and a more complete summary of illnesses to be differentiated from the viral upper-respiratory infection and associated symptoms.

Diagnosis	Symptoms	Caution
Otitis media	• Otalgia (ear pain) • Otorrhea (ear drainage) • Hearing loss • Dizziness	
Pneumonia/bronchitis	• Deep cough • Deep mucus • Fever • Pleuritic chest pain • Wheezing • Rhonchi • Mild dyspnea • Chest tightness	Be particularly concerned if person has asthma, is a smoker or has lung disease
Epiglottitis	• Alteration in voice • Severe sore throat • Severe dysphagia • Stridor • Drooling	Needs immediate evaluation at appropriate site
Whooping cough	• Cough spasms • Vomiting with cough • No fever	Needs evaluation by a provider
Croup	• Hoarseness • Barky seal cough or persistent hacky cough • Inspiratory stridor	

It is essential to recognize symptoms that indicate an illness other than – or in addition to – pharyngitis, rhinitis, sinusitis and viral upper-respiratory infection that should be evaluated and treated.

12. Patient Education/Home Care Call-Back Instructions

Recommendations:

- Patients, parents and caregivers should be educated on prevention, comfort measures and treatment recommendations for the common cold.
- Hand washing or use of hand sanitizers is recommended to prevent the spread of the common cold (viral upper-respiratory infection) *(Sandora, 2005 [High Quality Evidence])*.

The goal is to provide solid, useful advice to patients without putting them at undue risk or expense. The guideline recommendations should provide improved comfort or otherwise proven benefit and not just represent "something to do."

Studies of effectiveness of patient/parent education: a number of investigators have found that health care consumer education resulted in appropriate self-care for the common cold specifically, or illness in general,

with less unnecessary medical treatment and with lowered cost of care *(Roberts, 1983 [High Quality Evidence]; Terry, 1993 [High Quality Evidence])*.

Other investigators failed to find that health care consumer education reduced health care visits and cost of care. However, no negative effects of such education were found, and some other benefits were reported *(Kemper, 1982 [High Quality Evidence]; Moore, 1980 [High Quality Evidence])*.

For many parents, day care for their infant is a necessary fact of life, but there are some issues to consider. Day care has been shown to increase the frequency, severity and duration of upper-respiratory infections and the risk of secondary upper- and lower-respiratory infections *(Wald, 1988 [Low Quality Evidence]; Fleming, 1987 [Low Quality Evidence])*.

Otitis, sinusitis, pneumonia and wheeze-associated respiratory illnesses such as bronchiolitis have been shown to be more frequent among children who attend day care *(Denny, 1986 [Low Quality Evidence]; Goodman, 1984 [Low Quality Evidence]; Loda, 1972 [Low Quality Evidence])*.

Prevention

Although the viral upper-respiratory infection is a respiratory illness, researchers have found that viral upper-respiratory infections are spread more by hands of the person with a cold and by very close contact than by droplets in the air. Hand washing or use of hand sanitizers are the most effective ways to prevent the spread of the common cold (viral upper-respiratory infection) *(Sandora, 2005 [High Quality Evidence])*. Viral upper-respiratory infection is most contagious at the onset of symptoms and while febrile *(Carabin, 1999 [High Quality Evidence])*.

Viral shedding continues for up to two weeks after the onset of initial upper-respiratory symptoms *(Szilagyi, 1990 [Low Quality Evidence])*.

Suggestions for limiting exposure are appropriate guidance for parents of children attending day care. Care provided in private home care has a lower rate of infectious disease. Children who are cared for in their own home by baby-sitters have the lowest rate of infection. Children under one year of age are at the highest risk for infections such as respiratory syncytial virus, and prudent counseling about day care attendance for this group would seem appropriate *(Schmitt, 1992 [Low Quality Evidence])*. Palivizumab, humanized monoclonal antibody against respiratory syncytial virus F glycoprotein, is available. Please see referenced article for details *(American Academy of Pediatrics, 2003a [Low Quality Evidence])*.

The first winter of the infant's life is the time when most caution should be exercised. Another measure that may be helpful for those in day care settings is segregation of infants and toddlers.

Encouraging continued breastfeeding may offer further protection from recurrent otitis and prolonged duration of upper-respiratory illnesses *(Duncan, 1993 [Low Quality Evidence]; Frank, 1982 [Low Quality Evidence])*.

For infants and toddlers

- Discourage visitors who have an acute illness, a fever or contagious disease.
- Prevent child with viral upper-respiratory infection from sharing toys and pacifier with other children, and clean these items with soap and hot water as feasible to reduce opportunities for viral transmission.
- Use and teach good hand washing.
- Ask visitors to wash their hands before holding baby.

- Day care with three or more families represented is associated with higher incidence of viral upper-respiratory infections, ear infections and lower-respiratory infections; therefore:
  - check to see if staff and children at your child's day care are being taught good hand washing and other infection control measures (excellent educational materials are available that day care clinicians can obtain), and
  - consider day care options that reduce exposure to other children:
    - relative or friend
    - in-home nanny shared by two families
- Encourage and support mothers to continue breastfeeding for an appropriate period because human milk contains ingredients that help protect babies from infections.

Comfort Measures

Parents have comfort and convenience, personal plans and work to contend with, as well as a fear of the unknown potential of their child's illness. These factors drive parents to seek help (and sometimes antibiotics) as early as possible to minimize the impact of the illness. Health care clinicians need to help parents gain knowledge about childhood respiratory illnesses and develop decision-making skills and realistic expectations *(Cowan, 1987 [Low Quality Evidence]; Zapka, 1979 [Cost-Effectiveness Analysis])*.

- Nasal suction for infants

  To relieve nasal congestion for infants less than three months, suction gently with a blunt-tipped bulb syringe before feedings and sleep. Using a bulb syringe to aspirate nasal secretions may promote drainage and comfort. When using a blunt-tipped bulb syringe, compressing the bulb before placing the syringe over the nose prevents pushing mucus farther into nasal passage. Proper cleaning and air drying of bulb syringe reduces the opportunity for growth of organisms inside the syringe. Wash bulb syringe with hot, soapy water, rinse and allow to air dry.

- Steam or mist inhalation

  Mist inhalation does serve as an effective comfort measure for some people. Because of burns that have occurred when people use steam vaporizers, and the potential for microorganism growth in vaporizers, the recommended method for steam inhalation is standing in a hot shower or sitting in the bathroom when the hot shower is running. "Cool mist" vaporizers avoid the burn risk, though not the potential for growth of microorganisms *(Macknin, 1990 [High Quality Evidence]; Tyrrell, 1989 [High Quality Evidence]; Ophir, 1987 [High Quality Evidence])*.

- Nasal irrigation

  Saline nose drops help loosen secretions, making it easier to clear nares *(Gadomski, 1992 [Low Quality Evidence]; Szilagyi, 1990 [Low Quality Evidence])*. Commercial or homemade saline nose drops/sprays may be used. Home remedy: 1/4 teaspoon salt dissolved in eight ounces warm water.

- Maintain adequate humidity in the home

  Microorganisms grow easily in humidifiers/vaporizers unless they are cleaned properly and often. Health care clinicians often advise against using steam humidifiers/vaporizers because of the risk of the child getting burned with the hot water in the device. Also, added humidity can cause the growth of mildew in the home. These well-known risks should be weighed against the potential benefits of using humidifiers and the parents' ability and willingness to use and clean the device properly.

- Consume extra fluids.

  Warm fluids are especially soothing for irritated throats (e.g., chicken soup).

- Honey *(Paul, 2007 [Low Quality Evidence]*; avoid using honey preparations for children under one year because of the risk of botulism.

- Consume nutritious diet as tolerated.

- Elevate head of bed.

- Salt water gargle for sore throat with homemade salt water (1/4 teaspoon dissolved in 8 ounces warm water) or a store version.

- Use hard candy or throat lozenge for sore throat or cough (not recommended for children four and under).

- Get adequate rest.

  How a person feels is an indication of the amount of rest needed. When a person with a viral upper-respiratory infection is afebrile and feels like being up and about, normal activity should not prolong the illness.

Treatment Recommendations

Antibiotics

Antibiotics are effective only for treating bacterial infections. Because colds are viral infections, antibiotic use will not cure or shorten their length *(Arroll, 2010 [Systematic Review]; Soyka, 1975 [Low Quality Evidence])*.

Antibiotics cause side effects such as gastrointestinal discomfort, diarrhea, allergic reactions, diaper rash, and yeast infections. Unnecessary use of antibiotics can lead to the development of antibiotic-resistant strains of bacteria.

Over-the-counter medications

Over-the-counter cold and cough medications and acetaminophen do not shorten the duration of viral upper-respiratory infection.

Children

In April 2007 the Food and Drug Administration issued a warning on using cough and cold medicines in young children. Parents and other caregivers should only administer cough and cold medications to children under two when following the exact advice of their doctor. Clinicians should be certain that caregivers understand both the importance of administering these medications only as directed and the risk of overdose if they administer additional medications that might contain the same ingredient *(Federal Drug Administration, 2007 [Low Quality Evidence])*.

The Food and Drug Administration does not have approved dosing recommendations for clinicians prescribing cough and cold medications for children two and under *(Centers for Disease Control and Prevention, 2005 [Low Quality Evidence])*.

The Cochrane Collaboration conducted an extensive search of studies involving over-the-counter preparations for acute cough. It concluded that there is no good evidence for or against the effectiveness of over-the-counter cough medications *(Schroeder, 2007 [Systematic Review])*.

Decongestants also have not clearly shown benefit in shortening or ameliorating symptoms *(Hutton, 1991 [High Quality Evidence])*.

A phenol-type throat spray appears to be effective in relieving coughs and sore throats associated with colds, but no pertinent research could be located. Many coughs associated with colds respond to the non-pharmacological measures listed above and do not require an over-the-counter preparation *(Pruitt, 1985 [Low Quality Evidence])*.

Acetaminophen or ibuprofen may be suggested for home use because of the risk of Reye's syndrome associated with aspirin use in children.

The fever that frequently accompanies a viral upper-respiratory infection in children is not harmful and is usually gone in two to three days. Parents/caregivers should be educated on fevers, signs, symptoms and treatment. It is the consensus of the work group that fevers persisting beyond two to three days should be evaluated by a clinician. Work group members also agree that infants under three months with fevers should be thoroughly evaluated. Fever can only be evaluated in the specific context of the whole illness and the accompanying circumstances. By itself, the magnitude of fever bears little or no relationship to the severity of the illness *(Schmitt, 1984 [Low Quality Evidence])*.

Adults

For adults with a cold, over-the-counter products such as nasal sprays, decongestants, saline nose drops and analgesics may provide temporary relief of sore throat, runny nose, coughing, minor aches and fever. Because of potential side effects, however, be sure to follow the recommended dosage and precautions. Patients who have high blood pressure, diabetes, thyroid disease or who are pregnant should check with their physician regarding recommendations for decongestant use.

Use medication for discomfort as recommended by a physician or nurse for fever.

General discomfort, headache and fever reduction

Graham et al. (1990) conducted a double-blind, placebo-controlled study to test the effects aspirin, acetaminophen and ibuprofen in 56 volunteers who were infected with the cold virus. Use of aspirin and acetaminophen was associated with suppression of serum-neutralizing antibody response and increased nasal symptoms and signs. There were no significant differences in viral shedding among the four groups. Sperber et al. (1992) compared the effects of naproxen with a placebo in a randomized, double-blind, controlled trial. Persons in the naproxen group had significant reductions in headache, malaise, myalgia and cough, but viral titers and antibody responses were similar in the two groups *(Sperber, 1992 [High Quality Evidence]; Graham, 1990 [High Quality Evidence])*.

Aspirin, ibuprofen and naproxen should be avoided by persons who are not eating well (risk of gastrointestinal upset), have a history of peptic ulcer or related disorder, have aspirin-sensitive asthma, and have renal dysfunction. For these reasons, plus the risk of Reye's syndrome associated with aspirin use in young, healthy children, acetaminophen should be suggested as the drug of choice. However, it should be used only as needed because of the effects described by Graham et al. (1990).

The most helpful source located to guide decisions about over-the-counter cold preparations is a major review article published in 1993. It includes clinical trials published between 1950 and 1991. Only 27 articles of the 106 retrieved met the study criteria and were judged to have adequate scientific validity to be included in the final review. In the adolescent/adult studies, the following drugs were found to reduce nasal symptoms: chlorpheniramine maleate, pseudoephedrine HCl and oxymetazoline HCl *(Smith, 1993 [Systematic Review])*.

An intranasal anticholinergic (ipratropium bromide) is not effective when there is documented significant nasal obstruction. The cost/benefit relationship for ipratropium bromide nasal spray is rarely supportive for use of this medication. In addition, it requires physician intervention that consists of phone calls and/or office visits, which significantly increases the cost of care for a benign condition.

Echinacea

Findings in the medical literature do not support the use of echinacea in preventing viral upper-respiratory infection. Some preliminary data indicate that echinacea may shorten the course of viral upper-respiratory infection; however, studies that produced this data are small. Methods by which echinacea is prepared are not standardized, and actual dose delivered by specific products varies widely. Hence, the work group cannot recommend the use of echinacea in preventing or shortening the duration of viral upper-respiratory infection at this time. The work group will continue to evaluate the data on this and other herbal preparations *(Turner, 2005 [Low Quality Evidence]; Grimm, 1999 [High Quality Evidence])*.

Vitamin C

There is no consistent evidence in the medical literature that high doses of vitamin C help shorten the course of viral upper-respiratory infections. Hence, it was the consensus of the work group that high doses of vitamin C should not be recommended.

Zinc

In adults there is some evidence that oral zinc gluconate may decrease the duration of a cold if started within 24 hours of onset; however, adverse reactions including nausea and bad taste may limit its usefulness. Zinc is not indicated and may be dangerous during pregnancy.

Intranasal zinc gluconate therapy can cause anosmia and is not recommended http://www.fda.gov/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandClinicians/DrugSafetyInformationforHeathcareProfessionals/PublicHealthAdvisories/ucm166059.htm *(Davidson, 2010 [Low Quality Evidence])*.

Mossad et al. conducted a randomized, double-blind, placebo-controlled study to test this. They found that zinc gluconate did reduce the duration of symptoms of the common cold *(Mossad, 1996 [High Quality Evidence])*.

Two clinical trials involving experimental rhinovirus colds and natural colds tested the efficacy of oral zinc acetate for the treatment of the common cold. Three preparations were used in the study: zinc acetate lozenges, zinc gluconate lozenges and placebo lozenges. The study concluded that oral zinc gluconate did reduce the duration of symptoms with experimental rhinovirus. Please note that during the first three days the severity of symptoms was not affected, and it had no effect for the natural cold. Oral zinc acetate had no effect on duration or severity on either experimental or natural colds *(Turner, 2000 [High Quality Evidence])*.

According to the Cochrane Collaborative, overall results of studies of the effect of oral zinc gluconate on upper-respiratory infection duration and severity have been inconclusive *(Marshall, 2000 [Systematic Review])*.

A randomized control trial of 249 students in grades 1 through 12 were studied for the effects of zinc gluconate lozenges for treating the common cold. The study found that zinc gluconate lozenges, in 10 mg, orally dissolved, were ineffective in relieving symptoms *(Macknin, 1998 [High Quality Evidence])*.

Call Back Instructions

Children three months to 18 years of age.

Call back if:

- fever lasts three days or more;
- symptoms worsen after three to five days or if new symptoms appear (e.g., increasing symptoms of illness, lethargy, decreased responsiveness, poor eye contact, difficulty breathing); or
- symptoms have not improved after 7 to 10 days; it is not unusual, however, for a mild cough and congestion to continue 14 days or more.

Adults

Call back if symptoms worsen after 3 to 5 days, new symptoms develop or symptoms do not improve after 14 days.

13. Are Symptoms/Signs Suggestive of Strep Pharyngitis?

Patients report a sore throat without rhinorrhea, cough or hoarseness.

Patients with recent strep exposure may be more likely to have group A beta streptococcal pharyngitis.

Signs and symptoms associated with group A beta streptococcal include:

- sudden onset of sore throat,
- exudative tonsillitis,
- tender anterior cervical adenopathy,
- history of fever,
- headache in the setting of other symptoms noted above,
- abdominal pain in the setting of other symptoms noted above, and
- absence of rhinorrhea, cough, hoarseness.

Other symptoms sometimes associated with group A beta streptococcal pharyngitis include:

- close exposure to strep throat (especially familial exposure)
- vomiting,
- malaise,
- anorexia, and
- rash (especially scarletina) or urticaria.

Strep Pharyngitis Algorithm Annotations

16. Patient Has Symptoms/Signs Suggestive of Strep Pharyngitis

Patients with recent strep exposure may be more likely to have group A beta streptococcal pharyngitis.

See Annotation #13, "Are Symptoms/Signs Suggestive of Strep Pharyngitis?" for the signs and symptoms associated with group A beta streptococcal pharyngitis.

After viral upper-respiratory infection and otitis, acute tonsillopharyngitis is the third most common illness diagnosed by United States pediatricians. The major issue in most cases of acute pharyngitis is differentiating between group A beta streptococcal infection (causing 15-30% of cases of acute pharyngitis in children and 5-20% in adults) and other self-limited etiologies *(Choby, 2009 [Guideline])*. Group A beta streptococcal pharyngitis requires appropriate antimicrobial therapy to prevent rheumatic fever and suppurative complications, and to minimize the secondary spread of the illness. It may also shorten the course of the illness, although not dramatically. Many of the other causes of acute pharyngitis can be treated symptomatically *(Bisno, 1997a [Low Quality Evidence]; Randolph, 1985 [High Quality Evidence])*.

Group A beta streptococcal pharyngitis is uncommon in children younger than three years of age and rare in children younger than 18 months old. Rheumatic fever is uncommon in children younger than three years of age *(Peter, 1992 [Low Quality Evidence])*.

Viral Causes of Acute Pharyngitis

Acute pharyngitis can be caused by both bacterial and viral pathogens. Most cases of acute pharyngitis are viral in etiology. Viral pathogens can cause pharyngitis clinically indistinguishable from group A beta streptococcal pharyngitis and can also cause distinct clinical syndromes, including adenovirus (pharyngoconjunctival fever), parainfluenza (hoarseness, croup), rhinovirus (coryza), herpes simplex type 1 and 2 (gingivitis and stomatitis), respiratory syncytial virus (hoarseness, wheezing), Epstein-Barr virus (infectious mononucleosis), influenza, coxsackievirus A (herpangina), enteroviruses (diarrhea), human immunodeficiency virus, coronavirus (viral upper-respiratory infection symptoms) and cytomegalovirus *(Paradise, 1992 [Low Quality Evidence]; Lang, 1990 [Low Quality Evidence])*.

Although it has been recognized that group A beta streptococcal and mononucleosis can be present together, most of the time this is felt to be because of the strep carrier state in those with mononucleosis. The acute symptoms of mononucleosis are nearly identical to those of group A beta streptococcal pharyngitis; thus, many patients with mononucleosis present initially for a throat culture. If the culture is positive, they are treated, and then return when symptoms persist. With the prevalence of the carrier state being between 10% and 25%, it would be expected that a similar percentage of patients with mononucleosis would have positive throat cultures. Since there is no practical way to differentiate these patients as carriers, a full course of antibiotics is recommended. However, if the patient on antibiotics is not recovering as expected, he/she should be reevaluated.

Bacterial Causes of Acute Pharyngitis

Bacterial pathogens (along with associated syndromes) other than group A beta streptococcal that can cause pharyngitis include group C and group G strep, mixed anaerobes (Vincent's angina), *Fusobacterium necrophorum*, *Neisseria gonorrhea*, *Corynebacterium diptheriae* (diphtheria), *Yersinia pestis* (plague), *Treponema palladium* (secondary syphilis), *Francisella tularensis* (tularemia), *Mycoplasma pneumoniae* (atypical pneumonia), and several chlamydial species *(Paradise, 1992 [Low Quality Evidence]; Lang, 1990 [Low Quality Evidence])*.

Non-infectious causes of sore throat, such as thyroiditis, are relatively uncommon considerations in the differential diagnosis of acute febrile pharyngitis.

Group A beta streptococcal pharyngitis has a number of characteristic features, including odynophagia, high fever, scarlatiniform rash, pharyngeal exudates, petechiae on the soft palate, tender anterior cervical lymphadenopathy, and malodorous breath. Few patients display all the classic signs and symptoms of group A beta streptococcal *(American Academy of Pediatrics, 2003b [Low Quality Evidence])*.

Complications Associated with Untreated Group A Beta Streptococcal

Rheumatic fever is a non-suppurative complication of group A beta streptococcal pharyngitis *(Gordis, 1973 [Low Quality Evidence])*. The risk of developing rheumatic fever is about 3% under epidemic conditions and approximately 0.3% under endemic conditions. First attacks of rheumatic fever are rarely seen in children younger than three years of age or adults over 40 years of age because of the relative infrequency of group A beta streptococcal infections in these age groups. One reason for identifying and treating patients with group A beta streptococcal pharyngitis is to decrease the incidence of rheumatic fever *(Dajani, 1995 [Low Quality Evidence])*. The only controlled study demonstrating the possibility of preventing rheumatic fever was done in 1950 in military camps *(Denny, 1950 [Low Quality Evidence])*. Further longitudinal studies have shown evidence of prevention of rheumatic fever by treatment of group A beta streptococcal

with penicillan. Several studies have shown that treatment of patients with group A beta streptococcal pharyngitis shortens the course of the illness *(Krober, 1985 [High Quality Evidence])*, although it should be recognized that group A beta streptococcal pharyngitis is usually a self-limited disease, and fever and constitutional symptoms disappear spontaneously within three to four days of onset, even without antibiotic therapy *(Bisno, 2002 [Guideline])*.

17. History/Physical

History and physical findings may increase or decrease the likelihood of group A beta hemolytic strep as the cause of pharyngitis. Factors increasing the likelihood include abrupt onset, associated fever, headache, abdominal pain in the setting of a sore throat (especially in children), presence of tonsillar exudate, primarily anterior cervical adenopathy and the absence of cough, hoarseness and nasal congestion. These findings are not specific enough for group A strep to allow empiric treatment without testing. On the other hand, lack of these physical findings and history may eliminate the need to do strep testing and focus treatment instead on symptomatic measures.

18. Collect Specimen for Rapid Strep Test and Backup Culture

Several scoring systems have been developed to assist in predicting which patients will have a positive throat culture, but none has a high enough predictive value to allow treatment without a positive rapid strep test or strep throat culture. Historically these scoring systems were used to identify patients likely enough to have group A beta streptococcal that a confirmatory throat culture was unnecessary. Now they are used to identify patients who are so unlikely to have group A beta streptococcal that rapid strep test or strep culture is unnecessary *(Seppälä, 1993 [Low Quality Evidence]; Breese, 1977 [Low Quality Evidence])*.

Rapid strep test and strep culture both require proper collection technique by trained professionals and must be performed according to the Federal Clinical Laboratory Improvement Act (CLIA) regulations. Poor collection procedures reduce accuracy of either test. Rapid strep test must also be performed according to the manufacturer's guidelines. An appropriately performed throat swab touches both tonsillar pillars and the posterior pharyngeal wall. The tongue should not be included (although its avoidance is sometimes technically impossible). Backup strep culture is needed if rapid strep test is negative, unless it has been ascertained that in a given practice the rapid strep test is comparable to a throat culture *(Bisno, 2002 [Guideline]*. Testing for rapid strep test and backup culture may require the use of separate swabs for each test.

Polymerase chain reaction (PCR) may also be used for primary testing or as a backup instead of plated culture.

Rapid strep test has the following advantages:

- It has nearly 100% specificity.
- Rapid turnaround time reduces unnecessary short-term treatment while awaiting test results and the associated complexity of interim treatment strategies.
- It potentially reduces need for callbacks.
- It allows the initiation of antibiotic in the timeliest fashion, reducing acute morbidity and contagion.
- Overall, rapid strep test may be more cost effective through reduced rework and reduced cycle time *(Lieu, 1990 [Cost-Effectiveness Analysis])*.
- Rapid strep test has high patient satisfaction, even with associated wait time for results.

Rapid strep test has the following disadvantages or limitations:

- Lab costs are increased.

- Current technology requires that negative rapid strep tests be backed up with strep culture because of relatively low sensitivities, unless it has been ascertained that in a given practice the rapid strep test is comparable to a throat culture *(Bisno, 2002 [Guideline])*.
- Recent study indicates the utility of a real-time polymerase chain reaction assay as a replacement for both rapid antigen testing and culture *(Uhl, 2003 [Low Quality Evidence])*. The polymerase chain reaction (PCR) method requires a minimum of 30 to 60 minutes to perform the test, and in order to be used efficiently, it would require batch testing. When PCR testing is used, a backup plated culture is not necessary.
- Clinics may need to arrange patient flow in the office and need to determine who will perform rapid strep test.
- False positives may occur with retesting for up to 14 days following antibiotic course completion (presumably due to incomplete clearing of strep antigen fragments that are still detected after clinical recovery).
- It does not differentiate between illness and carrier states.

20. Treatment and Education

Recommendations:

- Penicillin (PCN) is the drug of choice for treatment of culture positive cases of group A beta streptococcal pharyngitis. In children and patients unable to swallow pills, amoxicillin is an acceptable alternative due to the poor palatability of the penicillin suspension.
- In penicillin-allergic patients, options include cephalosprins (for some types of allergies), macrolides and clindamycin. Consider reevaluating patient for carrier status. Although macrolides may be an acceptable alternative, clinicians should check their local resistance patterns.

Alternative medication recommendations

- Macrolides
- Cephalexin
- Clindamycin
- Amoxicillin/clavulanate
- Rocephin

(Peter, 1992 [Low Quality Evidence]; Bass, 1991 [Low Quality Evidence]; Gerber, 1990 [High Quality Evidence])

A discussion of referral criteria for tonsillectomy in patients with recurrent tonsillitis is outside the scope of this guideline. As a result, the work group suggests physicians refer to one or more sources that offer a detailed discussion of referral criteria *(Lan, 2000 [Meta-analysis]; Paradise, 1984 [High Quality Evidence])*.

Patients currently on antistreptococcal antibiotics are unlikely to have streptococcal pharyngitis. Antibiotics not reliably antistreptococcal include sulfa medications, nitrofurantoin and tetracycline.

Children may return to school 24 hours after antibiotic treatment has been started *(Snellman, 1993 [High Quality Evidence])*.

21. Symptoms Improved within 48-72 Hours?

After initiating a course of an appropriate antibiotic, improvement in symptoms related to group A streptococcal pharyngitis should be seen by 48 to 72 hours.

It is suggested that the patient be instructed to contact the clinician's office within 72 hours if symptoms do not improve.

22. Complete Treatment

It is important to emphasize to the patient that completion of the course of antibiotic is important to reduce risk of recurrence.

23. Consider Reevaluation

Strep Group A testing may, if positive, reflect a carrier state in which case the antibiotic used may not be effective. The prevalence of the carrier state has been estimated to vary between 10% and 25%. For this reason, if symptoms have not improved by 72 hours, there should be consideration of reevaluation of the patient. This may be needed particularly to exclude peritonsillar cellulitis or abscess, infectious mononucleosis, and especially in patients aged 15-30, the possibility of infection with the bacteria *Fusobacterium necrophorum* that can lead to a severe complication called Lemierre's Syndrome. The causative organisms of peritonsillar cellulites and abscess are unlikely to be strep, and therefore an empiric change in antibiotic or referral to ear, nose and throat clinician may be indicated. If clinically indicated, testing for mononucleosis may be appropriate, keeping in mind that screening tests for mononucleosis may not be positive until several days into the illness.

Patients who are chronically colonized with group A beta streptococcal are called carriers. These patients are at very low risk, if any, for developing suppurative (e.g., peritonsillar abscess) or non-suppurative (e.g., rheumatic fever) complications and are unlikely to spread group A beta streptococcal to close contacts. Therefore, most carriers require no medical intervention.

In the patient with recurrent culture positive group A beta streptococcal pharyngitis, the patient is likely to be a streptococcal carrier if:

- clinical findings suggest a viral etiology,
- epidemiologic findings (e.g., age, season) suggest a viral etiology,
- there is little clinical response to antibiotic therapy,
- throat cultures done between episodes of acute pharyngitis (when the patient is asymptomatic) are also positive, or
- there is no serologic response to group A beta streptococcal antigens if measured (ASO, anti-DNAase B).

Situations in which identification and eradication of streptococcal carrier state may be desirable include *(Kaplan, 1980 [Low Quality Evidence])*:

- family history of rheumatic fever,
- ping-pong spread within a family,
- family with significant anxiety about group A beta streptococcal,
- outbreaks of group A beta streptococcal pharyngitis in closed or semiclosed community, and
- when tonsillectomy is being considered solely because of chronic carrier state.

Two alternative treatment protocols have been established in the literature as effective in eliminating the carrier state. Clindamycin is the treatment of choice if the decision is made to treat the carrier state. If clindamycin is not a suitable therapeutic choice, consideration can also be given to penicillin/rifampin combination *(Tanz, 1991 [High Quality Evidence]; Chaudhary, 1985 [High Quality Evidence]; Tanz, 1985 [High Quality Evidence]; Kaplan, 1980 [High Quality Evidence])*.

Lemierre's Syndrome is a potentially severe complication of pharyngitis caused by *Fusobacterium necrophorum*. Lemierre's Syndrome is characterized by an initial episode of pharyngitis, followed by clinical signs of bacteremia, after approximately four days. They develop suppurative thrombophlebitis of the internal jugular vein, bacteremia, and metastatic infections, most commonly pulmonary abscesses. Although first described in 1936, it has recently been recognized more often. Recent case study reports providing mortality data found a mortality rate of 4.6%. In addition, the most recent published case series included morbidity data, finding that permanent sequelae occurred in 10.2% of patients. Thus, clinicians caring for young adults and older adolescents should educate themselves about Lemierre's Syndrome and consider that diagnosis in patients with worsening clinical symptoms several days into an episode of pharyngitis. Since there is no clinically useful test to identify this pathogen, empiric treatment could be considered particularly if symptoms are worsening after three to five days or if neck swelling occurs. Penicillins/cephalosporins are effective but macrolides/azolides are not. In the presence of bacteremic symptoms, empiric treatment should include penicillin with metronidazole or with clindamycin *(Centor, 2009 [Low Quality Evidence])*.

If clinically indicated, testing for mononucleosis may be appropriate, keeping in mind that screening tests for mononucleosis may not be positive until several days into the illness.

Treatment of persistent infection should be directed toward eradication of both group A beta streptococcal and beta lactamase-producing protective organisms.

Note: All episodes consist of clinical findings and positive lab tests within seven days after completion of a course of antibiotic therapy.

24. Education for Home Remedies

Recommendation:

- The patient should be instructed to call back if the symptoms worsen or if they persist beyond five to seven days.

When a patient currently on antibiotics (other than sulfa, tetracycline, nitrofurantoin or other non-strep antibiotics) is taking the medication as prescribed and develops a sore throat, chances are that the sore throat is caused by something other than group A beta streptococcal. Treatment failure for group A beta streptococcal is rare, education is needed on home remedies for sore throats.

Home remedies include the following:

- Take acetaminophen or ibuprofen. Do not use aspirin with children and teenagers because it may increase the risk of Reye's syndrome.
- Gargle with warm salt water (1/4 teaspoon of salt per 8 ounce glass of water).
- Adults or older children may suck on throat lozenges, hard candy or ice.
- Eat soft foods.
- Drink cool beverages or warm liquids.
- Suck on flavored frozen desserts (such as popsicles).

Health education resources are listed in the Implementatin Tools and Resources Table.

25. Consider Strep Culture

If a rapid strep test is not available or the results are negative, a strep culture should be performed unless it has been ascertained that in a given practice the rapid strep test is comparable to a throat culture. Generally treatment should be delayed until the culture results are available. Results are usually available within 24 hours or slightly less but may require incubation for longer periods of time. Some clinicians choose to initiate treatment prior to culture result availability, but a full course of treatment should not be prescribed until culture results confirm the presence of group A beta streptococcal *(Gerber, 1989 [Low Quality Evidence])*.

A less satisfactory strategy is empiric treatment. Using complex clinical scoring systems or in patients with the complete constellation of classic strep symptoms, empiric treatment may be justified but has significant limitations. If full-course treatment is initiated without intent to rely on the test results, laboratory testing is redundant and wasteful. Routinely culturing and prescribing antibiotic treatment for asymptomatic family members is not recommended. Routinely reculturing patients after treatment with antibiotics is not recommended.

Treatment of group A beta streptococcal pharyngitis is accurate when based on rapid strep test or strep culture results. Even with elaborate clinical scoring systems, diagnostic accuracy (probability of group A beta streptococcal) is only 50%, increasing to 75% if white blood count results are included in decision-making. For this reason, empiric treatment is discouraged; several professional societies recommend treatment based solely on culture results. Advantages and disadvantages for several modalities are listed below *(Breese, 1977 [Low Quality Evidence])*.

Strep culture has the following advantages:

- Even though strep culture is not a perfect test, it remains the "gold standard" by which other diagnostic methods are measured.
- It is less expensive to perform than rapid strep test.

Strep culture has the following disadvantages or limitations:

- Incubation time delays initiation of definitive treatment, reducing patient satisfaction.
- It does not differentiate between illness and carrier states.
- Culture sensitivity is dependent on technique and technical expertise.

Short-term treatment awaiting culture has the following advantages:

- It allows reduction of acute morbidity and associated lost productivity of patient or caregiver because of the early initiation of treatment.
- It does not promote saving of unused antibiotic if the culture is negative.

Short-term treatment awaiting culture positives has the following disadvantages:

- It may promote inappropriate drug sampling.
- It may cause additional patient co-pays due to need for secondary prescriptions.
- Additional callbacks are still required to report culture results.
- Many unnecessary antibiotics may be used with the potential risk of iatrogenic harm.

Empirical treatment of classic strep presentation has the following advantages:

- There is reduced time until initiation of definitive therapy.
- Redundant diagnostic tests are not performed.

- It gives high patient satisfaction to patients who are confident of their diagnosis prior to the test results.

Empirical treatment of classic strep presentation has the following disadvantages:

- It promotes overtreatment since clinical diagnostic accuracy is only 50-75% with the best scoring systems.
- Due to overtreatment, other risks are enhanced, such as medication intolerance or serious allergy, including anaphylaxis.
- It reinforces mistaken beliefs about strep pharyngitis.

26. Strep Culture Result?

Whether or not the test is positive, patients and their families want to know results as soon as possible so that they can appropriately plan for their needs.

- If negative, they need educational information and a planned course of action if they do not recover in a reasonable time frame or if they become more ill.
- If positive, patients want to be started on medication as rapidly as possible, primarily as a comfort or convenience issue and to reduce contagion. Rheumatic fever prophylaxis is likely satisfactory if started up to nine days after the onset of illness *(Gerber, 2009 [Guideline])*, however, patients and parents may perceive any delay in initiation of treatment as poor service.

27. Educate on Non-Group A Beta Streptococcal Pharyngitis Symptoms

If the rapid strep test and/or the strep culture are negative, the patient needs to be educated on non-strep sore throats. This includes the duration of the symptoms, ineffectiveness of antibiotic treatment, and home remedies that will ease the symptoms. The patient should be instructed to call back if the symptoms worsen or if they persist beyond five to seven days.

The benefit of treating non-group A beta streptococcal bacterial pharyngitis with erythromycin is small and of borderline statistical significance. Because of the small effect and the risk of promoting drug resistance, the use of erythromycin for the treatment of non-group A beta streptococcal pharyngitis is not recommended *(Peterson, 1997 [High Quality Evidence])*.

Home remedies include the following:

- Eat soft foods.
- Drink cool beverages or warm liquids.
- Suck on flavored frozen desserts (such as popsicles).

Provide educational material about non-strep causes of sore throats and home remedies for the patient to take home. See Annotation #24, "Education for Home Remedies," for additional information. Health education resources are included in the Resources Table.

28. Symptoms Improved?

Non-group A beta streptococcal pharyngitis would generally be expected to be improving over a period of a few days. Patients should be instructed to contact their clinician if symptoms are persisting.

29. Continue with Home Care

Home care measures to alleviate symptoms should be continued as needed. See Annotation #24, "Education for Home Remedies," for additional information.

30. Consider Reevaluation/Mono Testing, If Appropriate

See Annotation #23, "Consider Reevaluation," for details.

Non-Infectious Rhinitis Algorithm Annotations

31. Patient Presents with Symptoms of Non-Infectious Rhinitis

Non-infectious rhinitis is defined as inflammation of the membranes lining the nose and is characterized by nasal congestion, rhinorrhea, sneezing and itching of the nose and/or postnasal drainage.

(Dykewicz, 1998 [Low Quality Evidence])

32. History/Physical

Non-infectious rhinitis can present with any of the symptoms listed in the history of present illness. Topical decongestant abuse can cause a form of rhinitis alone, or can be associated with worsening of other forms of rhinitis. Many antihypertensive agents, specifically alpha-adrenergics, beta-blockers and ACE inhibitors, have been reported to induce rhinitis.

Clues in the history include previous facial trauma or surgery; atopic conditions such as asthma, rhinitis or atopic dermatitis; vasomotor triggers such as foods, strong odors, weather changes, bright light or inhaled irritants; or hormonal conditions such as pregnancy or thyroid disease *(Wheeler, 2005 [Guideline])*. A family history of atopy or a history of other allergy-associated conditions make allergic non-infectious rhinitis more likely.

A structural etiology such as obstruction or a cerebrospinal fluid leak is more likely when previous trauma or surgery is present. Suspicion of a cerebrospinal fluid leak as the cause of nasal discharge can be confirmed by testing for glucose in the discharge. If cerebrospinal fluid leak is seriously being considered, this would fall in the realm of specialty diagnosis, and a consultation should be obtained as soon as possible.

In young children, foreign body in the nares and gastroesophogeal reflux should also be considered as potential causes of rhinitis.

Exposure to triggers in the environment is a crucial point in the history. Home, school, work, day care and other frequent exposures should be reviewed. Finally, in the history of present illness, documentation of treatments used for rhinitis is important, as trial and error is often the only way to determine each patient's needs.

The following points in the history and physical are relevant to rhinitis.

History of present illness:

- congestion or obstruction
- rhinorrhea (anterior nasal discharge)
- pruritus of nose or eyes
- sneezing
- posterior nasal discharge with or without cough

- sinus pressure/pain
- snoring
- episodic or seasonal or perennial symptoms; consider specific triggers*
- pregnancy
- current medications such as topical decongestants, hormones, antihypertensives, antibiotics
- current and previous treatments for rhinitis

Past medical history:

- history of trauma or facial/sinus surgery
- relevant medical conditions: asthma, dermatitis, chronic sinusitis, chronic or recurrent otitis media
- history of polyps and ASA/NSAID sensitivity

Family history:

- asthma
- rhinitis
- atopic dermatitis

Social and environmental history:

- occupational exposures*
- home exposures*
- active and passive smoking exposures
- school exposures
- illicit drug exposures

* Refer to Appendix A, "Rhinitis Triggers"

Physical examination

The physical exam can have any combination of signs noted. Swollen nasal turbinates (congestion), rhinorrhea and pruritus tend to be the most common. Allergic conjunctivitis may also be present with red, watery, pruritic eyes.

Atrophic rhinitis is characterized by foul-smelling nasal crusting and sinus pain and is usually related to atrophy, excessive nasal and sinus surgery, radiation or one of several rare diseases such as Wegner's granulomatosis.

Nose:

- swollen nasal turbinates (may be boggy, bluish or pale, hyperemic or purplish red); note size and color
- clear, cloudy or colored rhinorrhea
- nasal septal deviation or structural abnormality
- nasal polyps

- nasal crease or "salute"
- sneezing
- mouth breathing
- unilateral obstruction
- foreign body

Eyes:

- conjunctivitis
- allergic "shiners" (dark circles under the eyes from venous stasis)
- dennie's lines (lower eyelid creases)
- periorbital edema

Ears:

- acute otitis media or otitis media with effusion (suggesting associated eustachian tube dysfunction)

Lungs:

- wheezing or prolonged expiratory phase (suggesting associated asthma)

Skin:

- atopic dermatitis

(Graft, 1995 [Low Quality Evidence]; Knight, 1995 [Low Quality Evidence]; Druce, 1992 [Low Quality Evidence]; Raphael, 1991 [Low Quality Evidence])

33. Signs and Symptoms Suggest Allergic Etiology?

With seasonal or episodic allergic rhinitis, common symptoms are sneezing, itching of the nose, palate or eyes, and clear rhinorrhea. However, nasal congestion is often the most significant complaint in patients with perennial rhinitis.

(Graft, 1995 [Low Quality Evidence]; Naclerio, 1991 [Low Quality Evidence])

Signs and symptoms suggestive of an allergic etiology include:

- pruritus of the eyes, nose, palate, ears;
- watery rhinorrhea;
- sneezing;
- seasonal symptoms;
- family history of allergies;
- sensitivity to specific allergens, especially dust mites, animals, pollen and mold;
- asthma or eczema.

Signs and symptoms suggestive of non-allergic rhinitis include:

- sensitivity to smoke, perfume, weather changes and environmental irritants,

- history of previous negative allergy testing,
- overuse of topical decongestants,
- adult onset of symptoms,
- nasal crusting or drying, and
- facial pain.

Signs and symptoms suggestive of either or both include:

- perennial symptoms,
- episodic symptoms,
- nasal congestion, and
- history of frequent sinus infections/chronic sinusitis.

34. Initiate Symptomatic Treatment/Allergen Avoidance/Medication Therapy

Symptomatic Treatment

If the clinical diagnosis is obvious, symptomatic treatment should be initiated. Symptomatic treatment includes both education on avoidance and medication therapy.

Avoidance activities: Identifying avoidable allergens by skin test or radioallergosorbent test will enhance a patient's motivation to practice avoidance. Some avoidance activities require significant financial investment or substantial lifestyle changes by the patient. Before recommending such measures, it may be useful to recommend skin testing or limited radioallergosorbent test testing to confirm the diagnosis and to identify the specific allergen.

House dust mites: House dust mites are major allergens found in the house in carpets, mattresses, bedding, pillows, upholstered furniture, stuffed animals and clothing (especially children's clothing). They thrive on human epithelial scales.

Essential changes to reduce mite exposure include the following:

- Encase the mattress and box springs in an allergen-impermeable cover.
- Encase the pillow in an allergen-impermeable cover or wash it weekly.
- Wash the sheets and blankets on the patient's bed weekly in hot water. A temperature of greater than or equal to 130º F is necessary for killing house dust mites.

The following measure minimizes exposure to dust mites and is desirable:

- Reduce indoor humidity to less than 50%. (An air conditioner will reduce indoor humidity in the summer.)

Further measures are discussed in the Implementation Tools and Resources Table located in the Quality Improvement Support section of this guideline.

Pets:

- Remove animals from the house.

- If the pet cannot be removed, a compromise to at least remove it from the bedroom can often be secured. Weekly washing of the pet may reduce allergens, but the usefulness of this practice remains controversial.
- After cat removal from the home, an average of 20 weeks is required before the allergen concentration reaches levels found in the animal-free home *(Wood, 1989 [Low Quality Evidence])*.
- Confining a cat to an uncarpeted room (other than bedroom) with HEPA filtration may reduce by 90% airborne allergen dissemination to the remainder of the house *(de Blay, 1991 [Low Quality Evidence])*.

Indoor molds:

- Basements tend to have higher humidity levels and therefore have higher mold growth.
- Reduce indoor humidity to less than 50%.
- Remove sites for mold growth.
- Clean with fungicides.

Outdoor pollens and molds:

- Remain indoors on specific days when pollen counts are high.
- Keep doors and windows closed in the home and in automobiles.
- Air conditioning is recommended.

In general:

- Minimize contact with irritants such as cigarette smoke, perfumes, cosmetics, hair spray and various other odors.
- Discourage indoor smoking.

(Wallace, 2008 [Guideline]; Wood, 1989 [Low Quality Evidence])

Medication Therapy

As with the chronic use of any medications, special consideration of risk benefit may need to be given to elderly, fragile patients, pregnant women, athletes and children.

The following table provides information to assist in the selection of appropriate medical therapy for patients with allergic rhinitis.

Medication	**Symptom**			
	Sneezing	**Runny nose**	**Itching**	**Congestion**
Antihistamines	+++	++	+++	±
Decongestants	-	-	-	+++
Cromolyn sodium	+	+	+	±
Topical corticosteroids	+++	+++	+++	++
Anticholinergics	-	+++	-	-
Leukotriene receptor blockers	+	+	+	±

Key: - no effect ++ moderate effect
± negligible effect +++ pronounced effect
+ slight effect

Corticosteroids

With the exception of systemic steroids, intranasal corticosteroids are the most effective single agents for controlling the spectrum of allergic rhinitis symptoms and should be considered first-line therapy in patients with moderate to severe symptoms. However, a Cochrane review in 2009 found limited evidence for efficacy in children though no evidence of adverse effects *(Al Sayyad, 2009 [Systematic Review])*.

They reduce nasal blockage, itching, sneezing and rhinorrhea in allergic and non-allergic rhinitis. Regular daily use of the medications is required to achieve optimal results. It may be best to start treatment one week before the beginning of the allergy season for prophylactic use. Patients need to be carefully instructed on the correct method of administration. The clinical response does not appear to vary significantly between intranasal corticosteroids that are currently available *(Corren, 1999 [Low Quality Evidence])*.

The most common side effects of intranasal corticosteroids are nasal irritation (dryness, burning and crusting) and mild epistaxis. Nasal septal perforation has been reported. The likelihood of these side effects can be decreased by use of the proper technique for administration. Intranasal corticosteroids when given in recommended doses are not generally associated with clinically significant systemic side effects. Nasal mucosal atrophy and clinically significant suppression of the adrenal axis have not been demonstrated either in adults or children. There were no bone metabolism side effects seen after three years of nasal topical steroid use in children *(Emin, 2011 [Low Quality Evidence])*. Growth suppression was detected in children with perennial allergic rhinitis treated with intranasal beclomethasone diproprionate (no longer available) for one year. Similar studies with intranasal fluticasone propionate and mometasone furoate showed no effect on growth *(Allen, 2002 [High Quality Evidence]; Skoner, 2000 [High Quality Evidence]); Schenkel, 2000 [High Quality Evidence])*. However, it appears that over the long term, the eventual adult height is unchanged. There is less data about preschool-aged children, so more caution should be used in this age group. Uncontrolled asthma and allergies can also impair growth, so no child should go under treated due to concerns about possible growth effects. Children on steroids of any form should be monitored regularly with height and weight plotted on growth curves. This issue remains under study and care should be used in prolonged use of these medications. (Consider giving children oral antihistamines or topical non-steroid medications as the first line of treatment.) Systemic corticosteroid use should be reserved for severe cases not controlled by antihistamines or topical agents. A short course of oral corticosteroid may be helpful.

Oral steroids should be reserved for refractory or severe cases only and given as a short burst (for example, prednisone 40 mg/day for 3-5 days for adults or 1-2 mg/kg/day for 3-5 days in children). Injectable steroids are not generally recommended; they are more expensive, invasive and tend to have a longer course of action than typical course of corticosteroids. As with the chronic use of any medications, special consideration of risk benefit may need to be given to elderly, fragile patients, pregnant women, athletes and children.

Patient education materials to support the various treatment options listed in the annotations can be found in the Quality Improvement Support section of this guideline.

(Wallace, 2008 [Guideline]; Schenkel, 2000 [High Quality Evidence]; Skoner, 2000 [High Quality Evidence]; Cave, 1999 [Low Quality Evidence]; Dykewicz, 1998 [Low Quality Evidence]; Kennis, 1998 [Low Quality Evidence]; Weiner, 1998 [Systematic Review]; Graft, 1996 [High Quality Evidence]; Brannan, 1995 [High Quality Evidence]; Fluticasone Propionate Collaborative Pediatric Working Group, 1994 [High Quality Evidence]; Vuurman, 1993 [Low Quality Evidence]; Wolthers, 1993 [High Quality Evidence]; Juniper, 1990 [High Quality Evidence]; Juniper, 1989 [High Quality Evidence]; Pipkorn, 1987 [High Quality Evidence]; Welsh, 1987 [High Quality Evidence]; Soderberg-Warner, 1984 [Low Quality Evidence]; Holopainen, 1982 [Low Quality Evidence]); Ganderton, 1970 [Low Quality Evidence])

Antihistamines

Antihistamines are effective at controlling all symptoms associated with allergic rhinitis, with the exception of nasal congestion. They are somewhat less effective than intranasal corticosteroids, but they can be used either on a daily basis or on an as-needed basis. Common side effects of the first-generation antihistamines include somnolence, diminished alertness and anticholinergic effects such as dry mouth, blurred vision and urinary retention. The anticholinergic side effects are of more concern in people over 65 years old. Evidence supports that first-generation antihistamines cause central nervous system impairment even in the absence of overt symptoms. Some reports indicate that first-generation antihistamines clearly impair driving performances. The second-generation antihistamines are less sedating and cause less central nervous system impairment because they do not cross the blood brain barrier well.

See Table 3.

(Meltzer, 2002 [Low Quality Evidence]; Nayak, 2002 [High Quality Evidence]; Meltzer, 2000 [High Quality Evidence]; Weiler, 2000 [High Quality Evidence]; Wilson, 2000 [High Quality Evidence]; Pullerits, 1999 [High Quality Evidence]; Vermeeren, 1998 [High Quality Evidence]; Bronsky, 1996 [High Quality Evidence]; Klein, 1996 [High Quality Evidence]; McCue, 1996 [Low Quality Evidence]; Bronsky, 1995 [High Quality Evidence]; Schoenwetter, 1995 [High Quality Evidence]; Simons, 1994a [High Quality Evidence]; Simons, 1994b [Low Quality Evidence]; Ramaekers, 1992 [High Quality Evidence]; Walsh, 1992 [High Quality Evidence]; Naclerio, 1991 [Low Quality Evidence]; Storms, 1989 [High Quality Evidence]; Mullarkey, 1988 [Low Quality Evidence])

Decongestants

Oral decongestants can reduce nasal congestion but can result in side effects such as irritability, insomnia, and palpitations. Clinician may consider using topical decongestants for short-term or intermittent/episodic therapy. Routine daily use is not recommended because of the risk for the development of rhinitis medicamentosa.

Both oral and topical decongestants should be used with caution in older adults, children under the age of six, and in patients of any age who have a history of any of the following: arrhythmia, angina, cerebrovascular disease, high blood pressure, bladder neck obstruction, glaucoma or hyperthyroidism.

(Wallace, 2008 [Guideline])

A review of multiple randomized placebo studies suggests that pseudoephedrine causes a slight but significant increase in systolic blood pressure (0.99 mmHg) and increase in heart rate 2.82 beats/min. Statistically, the diastolic blood pressure is not affected. Immediate-release formulations have more effects than sustained-release formulations. Although no serious adverse effects were observed, there were 30 cases (3%) of episodes of hypertension to levels greater than 140/90 mm/Hg among the 1,108 exposed patients. It is possible that patients with the exaggerated hypertensive responses have a degree of underlying autonomic instability. The conclusion is that patients with stable controlled hypertension do not seem to be at greater risk with use of pseudoephedrine *(Salerno, 2005 [Meta-analysis])*.

Cromolyn

Cromolyn is less effective than intranasal corticosteroids. It is most effective when used regularly prior to the onset of allergic symptoms. Adverse effects are minimal and include nasal irritation, sneezing and unpleasant taste. The four times daily dosing can cause compliance problems. Cromolyn is an alternative for patients who are not candidates for corticosteroids. Intranasal cromolyn sodium is effective in some patients for prevention and treatment of allergic rhinitis and is associated with minimal side effects. It is less effective in most patients than corticosteroids.

(Wallace, 2008 [Guideline]; Meltzer, 1995 [Low Quality Evidence]; Naclerio, 1991 [Low Quality Evidence]; Orgel, 1991 [High Quality Evidence]; Welsh, 1987 [High Quality Evidence])

Anticholinergics

Intranasal anticholinergics (ipratropium bromide) are effective in relieving anterior rhinorrhea in patients with allergic and non-allergic rhinitis. They have no effect on congestion, sneezing or itching. Most frequent side effects include epistaxis, blood-tinged mucus and nasal dryness. Other possible side effects include dry mouth and throat, dizziness, ocular irritation, blurred vision, precipitation or worsening of narrow angle glaucoma, urinary retention, prostatic disorders, tachycardia, constipation and bowel obstruction.

(Meltzer, 1995 [Low Quality Evidence]; Meltzer, 1992 [High Quality Evidence]; Naclerio, 1991 [Low Quality Evidence]; Mullarkey, 1988 [Low Quality Evidence])

Leukotriene Blockers

Montelukast is a leukotriene receptor antagonist that is as effective as loratadine and less effective than nasal steroids. It is generally well-tolerated and may be considered as a third-line option to add after the failure of a nasal corticosteroid and an oral antihistamine. Headache is the most commonly reported effect. Events such as insomnia, agitation, depression and suicidal ideation are listed as precautions in the package labeling and should be monitored. Consider discontinuing if the symptoms develop. Montelukast is FDA-approved for seasonal allergic rhinitis in patients two years of age and older, and for perennial allergic rhinitis in patients six months of age and older.

(Nayak, 2007 [Systematic Review])

Ophthalmic Medications

Ophthalmic medications are available as topical solutions/suspensions and contain antihistamines, decongestants, dual action antihistamine/mast cell stabilizers, combination antihistamines/decongestants, corticosteroids, or mast cell stabilizers (cromolyn sodium and lodoxamide). Side effects of ophthalmic medications (except corticosteroids) are generally mild and include a brief stinging, burning sensation. Care must be taken in the use of decongestant containing drops as they may cause rebound erythema (medicamentosa) when discontinued. Topical antihistamines can be used as needed for acute symptomatic relief and prophylaxis of allergic rhinitis with minimal systemic side effects.

Contact lens users should consult their eye care clinician regarding the use of these products.

(Leino, 1994 [High Quality Evidence]; Caldwell, 1992 [High Quality Evidence]; Bende, 1987 [High Quality Evidence])

Table 3.

Drug	Examples not all inclusive	Comments
1st generation antihistamines	Chlorpheniramine Diphenhydramine	Effective but commonly sedating Available as single-ingredient products and combinations (with pseudoephedrine and phenylephrine)
2nd generation antihistamines	Loratadine Fexofenadine Cetirizine Desloratadine	Low- and non-sedating options Fexotenaide, cetirizine and loratadine are available as over-the-counter options Available as single-ingredient products and as combinations (with pseudoephedrine)
Leukotriene blockers	Montelukast	May be as effective as loratadine but less effective than other antihistamines and nasal steroids
Nasal steroids	Fluticasone Mometasone Budesonide Triamcinolone	
Nasal antihistamine	Astelin Olopatadine hydrochloride	Bitter taste and moderately sedating
Mast cell stabilizers	Cromolyn nasal	Over the counter, less effective than nasal steroids, must be used regularly
Anticholinergics	Ipratropium nasal	Can relieve rhinorrhea but has no effect on congestion or itching

Diagnostic Testing

The clinician may choose to conduct diagnostic testing at this point if the results would change management. The following are recommended.

- **Skin tests and radioallergosorbent tests:** Skin tests and radioallergosorbent tests identify the presence of IgE (immunoglobulin E) antibody to a specific allergen. Clinical relevance is established when exposure to an allergen to which the patient has evidence of allergen-specific IgE (e.g., skin tests) causes symptoms consistent with an allergic reaction. There are two major reasons to consider allergy testing: to differentiate allergic from non-allergic rhinitis, and to identify specific allergens causing allergic rhinitis. A limited panel of two to four radioallergosorbent tests should be considered. If a greater number of specific allergens is to be identified, skin tests are the preferred diagnostic tests. Skins tests are faster, more sensitive and more cost effective. Skin tests require experience in application and interpretation, and carry the risk of anaphylactic reactions. Therefore, only specially trained clinicians should perform them. The precise sensitivity of specific IgE immunoassays such as radioallergosorbent tests compared with prick/puncture skin tests is approximately 70-75% *(Wallace, 2008 [Guideline])*. Therefore, skin tests are presently the preferred test for the diagnosing of IgE-mediated sensitivity.

  (Bernstein, 1995 [Guideline]; Bernstein, 1988 [Low Quality Evidence]; Shapiro, 1988 [Low Quality Evidence]; DeClerck, 1986 [Low Quality Evidence]; American Academy of Allergy and Immunology, 1983 [Low Quality Evidence])

- **Nasal smear for eosinophils:** Nasal smear may be a low-cost screening tool to detect eosinophils. While eosinophils may be present in both allergic and non-allergic rhinitis, eosinophlia predicts a good response to topical nasal corticosteroid medication. This test must be done during the actual symptomatic period to yield interpretable results.

In more than 80% of patients with allergic rhinitis, nasal cytology shows an increased number of eosinophils. In one study, secretion eosinophilia was found to correlate highly significantly with active immediate-type nasal allergy.

(Meltzer, 1992 [High Quality Evidence]; Anderson, 1979 [Low Quality Evidence]; Malmberg, 1979 [Low Quality Evidence])

- **Other tests:** Blood eosinophilia has little diagnostic value in the evaluation of nasal allergies and is generally not helpful in the differential diagnosis. Total IgE concentrations provide only modest information about the risk of allergic disease. According to the American Academy of Allergy and Immunology and the National Center for Health Care Technology, sublingual provocation testing is unproven and experimental. These tests are therefore not recommended *(American Academy of Allergy, 1981 [Low Quality Evidence])*.

  A peripheral blood eosinophil count, total serum IgE level, Rinkel method of skin titration and sublingual provocation testing are not recommended.

  (Bernstein, 1995 [Guideline]; Barbee, 1987 [Low Quality Evidence]; Brown, 1979 [Low Quality Evidence]; Mygind, 1978 [Low Quality Evidence])

35. Symptoms Improved?

If symptoms have not improved after two to four weeks, the clinician should consider issues affecting compliance, ongoing environmental triggers, alternative diagnosis and alternative medication therapy.

36. Patient Education/Follow-Up As Appropriate

If the patient has adequate relief of rhinitis and associated allergic symptoms either by instituting avoidance measures or through a medication trial, appropriate follow-up should include:

- Further education and review of information about avoidance activities
- Education and review of appropriate use of medications and possible side effects
- Begin the use of medications prior to exposure when exposure to known allergens is anticipated and unavoidable. For example, in a patient with cat or dog sensitivity, taking oral antihistamines prior to visiting a home with a cat or dog can prevent symptoms. Starting intranasal corticosteroids one to two weeks prior to the start of the ragweed pollen season will maximize benefits of the medication in people with seasonal allergic rhinitis symptoms in the late summer.

Adequate follow-up may require a separate clinician visit or a follow-up phone call or may be accomplished during another clinic visit. Use of appropriate educational handouts and materials may be helpful. Children on steroids of any form should have height and weight checked regularly and plotted on the appropriate growth chart.

Patient education materials can be found in the Implementation Tools and Resources Table section of this guideline.

37. Consider Further Diagnostic Testing/Referral to a Specialty Clinician

When the patient has not experienced relief of symptoms within two to four weeks of adequate therapy, the clinician should:

- review obstacles to compliance with current medication and discuss avoidance measures;
- consider a trial of another medication or add another agent for targeted symptoms;
- consider allergen skin testing by a qualified physician: if there are positive skin tests to allergens that correlate with the patient's timing of symptoms, immunotherapy may be considered;
- consider complete nasal examination (rhinoscopy) by a qualified individual to rule out a mass or lesion, particularly if obstruction and congestion are the major symptoms; or
- consider diagnosis of non-allergic rhinitis.

If the patient does not respond to medical treatment, a complete examination of the ears, nose and throat is indicated to rule out structural and extrinsic sources of obstruction and drainage. Allergy evaluation should be performed. This examination should include visualization of the entire nasal septum, inferior and middle nasal turbinates and possibly the middle meatus, and visualization of the nasopharynx. A topical decongestant spray may be used to shrink nasal tissues and allow better visualization of nasal structures. Endoscopic nasal and nasopharyngeal examination may be required.

Immunotherapy

Immunotherapy is a series of subcutaneous injections of extracts of allergenic materials in an attempt to decrease the severity of allergic symptoms that may occur upon future exposure to the allergen. It consists of weekly incremental doses usually over four to six months, followed by maintenance injections of the tolerated maximum dose every two to four weeks. If successful, this treatment regimen is normally carried on for three to five years. Immunotherapy should be generally reserved for patients with significant allergic rhinitis for whom avoidance measures and pharmacotherapy are insufficient to control symptoms. Other candidates for immunotherapy include patients who have experienced side effects from medication or who cannot comply with a regular (or prescribed) pharmacotherapy regimen or who develop complications such as recurrent sinusitis.

All immunotherapy injections should be administered in a medical facility where personnel, equipment and medications are available to treat an anaphylactic reaction to an injection. Because there is a risk of anaphylaxis with every injection during the buildup or maintenance phases of treatment, regardless of the duration of treatment, the patient should be advised to wait in the physician's office or clinic for 30 minutes after the injection.

Patient education materials can be found in the Quality Improvement Support section of this guideline.

Immunotherapy injections are most effective for allergic rhinitis caused by pollens and dust mites. They may be less effective for mold and animal dander allergies.

(Calderon, 2007 [Systematic Review]; Cox, 2007 [Guideline]; Varney, 1991 [High Quality Evidence]; Norman, 1990 [Low Quality Evidence]; Van Metre, 1980 [High Quality Evidence]; Norman, 1978 [High Quality Evidence]; Lichtenstein, 1971 [High Quality Evidence]; Lowell, 1965 [High Quality Evidence])

38. Signs and Symptoms Suggest Structural Etiology?

Malignant tumors of the nose and sinuses can be difficult to detect. Recent onset of pain; decreased sensation of the face, palate or teeth; decreased sense of smell; bleeding; and facial swelling and/or nasal obstruction may all be signs of a nasal or sinus cancer.

Structural abnormalities most often present with symptoms of obstruction. Deviated nasal septum, deformity of nasal bones, nasal turbinates or nasal cartilage may be detected on physical examination and may cause significant obstruction. Nasal polyps and adenoidal hypertrophy can cause obstruction.

Unilateral nasal obstruction is often indicative of a structural or extrinsic source of nasal obstruction. The most common cause of chronic unilateral nasal obstruction in an adult is a deviated septum; however, nasal tumors such as inverting papilloma and carcinomas must be ruled out. In the pediatric population, unilateral nasal obstruction and/or rhinorrhea require that an intranasal foreign body be ruled out.

Juvenile angiofibroma is a benign vascular tumor found in adolescent males. It may present with nasal obstruction or epistaxis and can cause torrential nosebleeds.

Another structural defect resulting from trauma that should be considered is a cribiform plate defect that can result in cerebral spinal fluid rhinorrhea.

Suspicion of one of these abnormalities requires a complete nasal examination including visualization of the posterior nasopharynx, generally performed by an ENT clinician.

40. Non-Allergic Rhinitis

Symptoms of non-allergic rhinitis are similar to those of allergic rhinitis and may include nasal congestion, postnasal drainage, rhinorrhea and even sneezing. Examples of non-allergic rhinitis include hormonal, such as rhinitis of pregnancy; vasomotor rhinitis with sensitivity to smells and temperature changes; non-allergic rhinitic eosinophilic syndrome; rhinitis medicamentosa from regular use of topical nasal decongestants; and atrophic rhinitis.

41. Initiate Symptomatic Treatment

Treatment of obstructive symptoms due to non-allergic rhinitis includes the following:

- Azelastine hydrochloride nasal spray
- Intranasal corticosteroid spray

  Topical nasal steroid sprays can be used to treat chronic nasal congestion secondary to non-allergic rhinitis. Side effects seem to be related to application of the spray and are usually limited to intranasal dryness, crusting, and bleeding. Documented systemic side effects are rare. Topical nasal steroid sprays have a relatively long onset of action (up to four weeks) and are therefore better suited to patients with chronic, rather than sporadic, symptoms.
- Intranasal cromoglycate (cromolyn sulfate)

  Intranasal cromolyn has been shown to improve sneezing and congestion scores. It can safely be used in children two years of age and older. Side-effects are minimal.
- Oral decongestant

  The use of oral decongestants may cause central nervous system stimulation, hypertension and cardiac arrhythmias. However, some patients find them helpful at relieving symptomatic nasal obstruction secondary to non-allergic rhinitis. Oral decongestants, which have a relatively rapid onset of action, are particularly useful for sporadic symptoms. Patients using oral decongestants should be monitored for side effects, particularly hypertension.

- Nasal strips

  Nasal strips are effective for some patients with only nocturnal symptoms (dependent nasal obstruction). They are more effective for patients with narrow noses or with anterior septal deviations. Daytime use is not usually practical.

- Topical antihistamines

  Topical anthistamines have been shown to be effective in controlling rhinorrhea associated with non-allergic rhinitis. Side effects include drowsiness and bitter taste.

  (Banov, 2001 [High Quality Evidence])

Treatment of symptomatic non-purulent chronic posterior nasal drainage (postnasal drip) includes the following.

Conservative treatment:

- Increase water intake.
- Decrease caffeine and alcohol intake (both have a diuretic effect).
- Nasal saline irrigation. Nasal saline irrigations can be purchased over the counter. A saline nasal irrigation solution can be made at home by mixing 1/4 teaspoon table salt into one cup of water.
- Determine whether the patient is using any medications that may cause oral or nasal dryness.
- Petroleum jelly or antibiotic ointment may be used for nasal crusting.
- Add humidity in bedroom if significantly less than 50%.

Medical treatment:

- Intranasal corticosteroids

Treatment of symptomatic bilateral chronic anterior rhinorrhea due to non-allergic rhinitis includes the following:

- Avoidance of offending irritants such as smoke and perfume
- Intranasal corticosteroids
- Intransal ipratropium bromide

  Topical ipratropium bromide has been shown to be helpful for rhinorrhea only in patients with vasomotor rhinitis. It has a quick onset of action and thus can be used as needed, as opposed to intranasal steroids. It is generally well tolerated, with local irritation its only common side effect. It is approved for children ages six and older *(Wheeler, 2005 [Guideline]; Skoner, 2002 [Low Quality Evidence])*.

- Nasal saline

42. Symptoms Improved?

If symptoms have not improved within two to six weeks, the clinician should consider issues of compliance, alternative medical treatment, or referral to a specialty clinician.

43. Consider Referral to Specialist

Nasal examinations are generally done by an ear, nose and throat specialist but may be done by a physician trained in endoscopic fiberoptic rhinoscopy. A limited computed tomography scan of the sinuses may be helpful at this time.

If chronic sinusitis remains in the differential diagnosis, a trial of antibiotic therapy should be completed prior to radiological examination.

Coronal computed tomographies are used rather than plain sinus films mainly because plain sinus films do not adequately delineate intranasal and sinus anatomy. Plain films rarely adequately visualize the ethmoid sinuses, which are the sinuses most commonly involved in chronic sinusitis. Also, at this stage of the protocol, medical treatment has already failed, so if surgery is indicated for chronic sinusitis, etc., a coronal computed tomography is needed prior to surgery.

Bacterial Sinusitis Algorithm Annotations

45. Patient Has Symptoms Suggestive of Bacterial Sinusitis

The diagnosis of acute sinusitis is based primarily on the patient's presenting symptoms and history, and is supported by the physical exam. The duration of illness is key, as patients with less than seven days of symptoms are very unlikely to have a bacterial cause.

Acute bacterial sinusitis has a high likelihood of being present with one of the following clinical presentations:

- symptoms persist or signs of acute rhinosinusitis, that lasts ten days or more without evidence of improvement, OR
- symptoms are severe or patient has fever 102ºF or more with purulent nasal discharge or facial pain that lasts for at least three to four consecutive days at onset of illness, OR
- symptoms are worsening or new onset of fever, headache, or increase in nasal discharge after a viral upper respiratory infection (VURI) that lasted five to six days and the patient was initially improving.

The gold standard for the diagnosis of acute bacterial sinusitis is sinus aspiration demonstrating high concentrations (> 10,000 colony forming units/ml). However, sinus aspiration is not practical as a routine in clinical practice. In addition, studies have shown that radiographic studies of the sinuses of patients with viral upper respiratory infections and sterile sinus aspiration cultures as well as studies of healthy children with no respiratory symptoms are often abnormal. Thus, although normal radiographic studies may exclude sinusitis, abnormal studies, including CT scans and MRI's, are not sufficient for a diagnosis. Thus, with our current state of knowledge, the clinical presentation history serves as an accurate guide to the diagnosis of sinusitis, when applied rigorously.

(Chow, 2012 [Guideline]; Meltzer; 2006 [Guideline]; Meltzer, 2004 [Guideline])

47. History/Physical

Review History

- Fever greater than 102º and a documented past history of sinusitis in addition to previously noted symptoms in Annotation #45, "Patient Has Symptoms Suggestive of Bacterial Sinusitis," are supportive of a sinusitis diagnosis. Fever is typically present at the beginning of a sinus infection and persists approximately twice as long as with a viral upper respiratory infection *(Chow, 2012 [Guideline]; American Academy of Pediatrics, 2001 [Guideline])*.

- Tooth pain not of dental origin is a more specific indication of sinusitis.
- Patients with severe symptoms should be evaluated in clinic and considered for treatment before seven days.
- Known anatomical blockage (e.g., chronic nasal polyps, severely deviated septum, recurrent sinusitis) may need immediate treatment.
- Patients on antibiotics for two or more days, whose sinus symptoms are worsening, should be scheduled for a clinician visit.
- Patients may also describe worsening symptoms after initial improvement.

Phone management

Phone management, with treatment via protocol by a triage nurse, is increasingly being used for initial treatment of sinusitis. Only one study has been published evaluating this practice *(Chauhdry, 2006 [Low Quality Evidence])*. It found phone treatment increased the likelihood of use of first-line antibiotic therapy and did not increase antibiotic use. Further studies should be performed. In the meantime, phone care should be limited to a select group of patients with follow-up in the office if the patient does not respond to first-line antibiotics.

Generally good health

Patients who have multisystem disease are generally more complicated/complex to treat by phone because their illnesses and medications need to be taken into consideration as the treatment plan is developed.

Mildly ill

Any patient who is determined by the phone triage person to be more than mildly ill should be scheduled for a visit. The clinician may determine if more intensive therapy is required (i.e., whether the initial therapy may include a ß-lactamase-resistant antibiotic if the patient is more severely ill).

Established patient

Generally patients who do not have an office record should not be considered for phone management because background data is insufficient for appropriate treatment of the patient.

Age

The only published study limited patients to age 16-75 *(Chauhdry, 2006 [Low Quality Evidence])*. Pediatric patients are less likely to have bacterial sinusitis and more likely to have viral infections or otitis media. Elderly patients are at risk for pneumonia and other severe illnesses. Both populations should be seen in clinic rather than treated via phone.

Patient is comfortable with phone management

The patient's acceptance of treatment by phone is necessary for successful treatment.

History of previous sinusitis treated successfully

An office record documenting that a physician has made a previous diagnosis of sinusitis potentially would allow the patient to be familiar with the previous symptoms of sinusitis and the physician to be more confident that sinusitis is again present.

Earlier visit for treatment of viral upper-respiratory infection

Patients recently seen by a care clinician who call back to the office to report symptoms of sinusitis are appropriate candidates for phone management, as the physician is already familiar with the patient.

Physical Examination and Imaging

Regional exam of the head and neck

The following physical findings may be present:

- purulent nasal drainage
- focal facial pain with bending forward (facial pressure or pain has a sensitivity of 52% and a specificity of 48%)
- sinus tenderness
- swollen turbinates
- decreased transillumination (optional)
- nasal polyps (nasal obstruction has a sensitivity of 41% and a specificity of 80%)

Assess for complicating factors – more intensive treatment may be indicated

- **Local**
  - external facial swelling/erythema over involved sinus
  - involvement of frontal sinus or symptoms of sinus impaction
- **Orbital**
  - visual changes
  - extraocular motion abnormal
  - proptosis
  - periorbital inflammation/soft tissue edema
  - periorbital erythema/cellulitis
    - subperiosteal abscess
    - orbital cellulitis
    - orbital abscess
- **Intracranial, central nervous system complications**
  - cavernous sinus thrombosis
  - meningitis
  - subdural empyema
  - brain abscess

Patients with any one of the following complicating factors require emergent care:

- orbital pain
- visual disturbances
- periorbital swelling or erythema

- facial swelling or erythema
- signs of meningitis or "worst headache of my life"

(Turner, 2010 [Low Quality Evidence])

Transillumination

Transillumination is of limited usefulness and is dependent on the skill level of the clinician performing the exam *(Williams, 1992 [Low Quality Evidence])*. Evidence suggests that it is an unreliable diagnostic tool in children less than 10 years of age *(American Academy of Pediatrics, 2001 [Guideline])*.

As a single finding, transillumination cannot be relied upon to rule sinusitis in or out.

Transillumination requires a completely darkened room, adequate time for dark adaptation, and practice *(Williams, 1993 [Low Quality Evidence])*.

Plain sinus x-rays and other imaging

Plain sinus x-rays and other imaging tests are usually not necessary in making the diagnosis of acute sinusitis.

Plain films offer little additional information in this setting *(Turner, 2010 [Low Quality Evidence]); Roberts, 1995 [Low Quality Evidence]; Williams, 1993 [Low Quality Evidence])*.

With sinus puncture and aspiration as the gold standard, plain films offer moderate sensitivity and specificity. Studies comparing sinus puncture to CT/MRI are not available *(Anzai, 2009 [Guideline])*.

Poor sensitivity and specificity limit the usefulness of a sinus x-ray series. The presence of opacification or air-fluid levels, although fairly predictive of bacterial infection, is seen in only 60% of patients with sinusitis. If one includes mucosal thickening as an indication of sinusitis, the specificity drops to as low as 36% *(Willett, 1994 [Low Quality Evidence])*.

According to the American College of Radiology, routine imaging of the paranasal sinuses in children with acute bacterial sinusitis without complications is not recommended *(Karmazyn, 2009 [Guideline])*. Overall CT scanning is felt to be a more sensitive and specific modality if imaging is needed. However, only 62% of patients with symptoms of sinusitis have abnormalities on scanning and 42% of patients having head CT scanning for other reasons will have sinus mucosal abnormalities. CT scanning can have a role in defining anatomic abnormalities in patients with recurrent and chronic sinusitis.

The American Academy of Pediatrics Guidelines indicate that imaging studies are not necessary to confirm a diagnosis of clinical sinusitis in children under six years of age. Imaging with CT scanning after age six may be appropriate if the patient does not improve after 90 days or worsens during the course of therapy. In this case it can be used to confirm or exclude the diagnosis, to assess for potential causes of poor mechanical drainage and to look for complications such as orbital cellulitis or abscess formation. Scanning is appropriate in cases where surgery is being considered *(Karmazyn, 2009 [Guideline]; American Academy of Pediatrics, 2001 [Guideline])*.

Maxillary antrum aspiration for culture

The "gold standard" for the diagnosis of acute sinusitis is antral puncture and cultures. However, this is not clinically practical *(Herr, 1991 [Low Quality Evidence]; Gwaltney, 1981 [Low Quality Evidence]; Hamory, 1979 [Low Quality Evidence])*. Maxillary antrum aspiration for culture is indicated only when precise microbial identification is required.

49. Home Self-Care

Patients who are in generally good health and only mildly ill may be appropriate candidates for home care/phone management of presumed acute sinusitis. Both the patient and the clinician should be comfortable with home care/phone management. The following factors are also supportive of home care/phone management:

- established patient (has been seen by primary care physician within the past year)
- history of previous sinusitis treated successfully
- earlier visit with viral upper-respiratory infection that has progressed to probable acute sinusitis

Many patient sources discuss the benefits of comfort measures even though no studies have been conducted on the sinusitis population to document the actual effects of these measures on the treatment of sinusitis. Therefore, non-pharmacologic measures are aimed at symptom relief and providing comfort.

The patient should be instructed to implement the following comfort and prevention measures.

Home self-care measures

Maintain adequate hydration (drink 6-10 glasses of liquid a day to thin mucus).

Steamy shower or increase humidity in the home. Because of burns that have occurred when people use steam vaporizers, and the potential for microorganism growth in vaporizers, the recommended method for steam inhalation is steam from a hot bathtub or shower.

Apply warm facial packs (warm wash cloth, hot water bottle or gel pack) for 5-10 minutes three or more times per day.

Localized pain and tenderness are common and may require analgesics.

Saline irrigation (saline nose drops, spray to thin muscus) can provide moisture and improve mucocilary function.

- Homemade (1/4 teaspoon salt dissolved in one cup of water; if water is drinkable, it is safe to use as a saline irrigation. Use bulb syringe or dropper purchased from drug store.)
- Saline nasal drops/spray

Decongestants (topically or orally)

- pseudoephedrine HC1
- decongestant nasal sprays for no longer than three days, e.g., oxymetazoline, phenylephrine HCl

No controlled trials have assessed the efficacy of decongestants for the treatment of acute sinusitis. Both the American Academy of Pediatrics and the Infectious Disease Society of America do not recommend their use *(Chow, 2012 [Guideline]; American Academy of Pediatrics, 2001 [Guideline])*. Numerous authorities recommend their use for symptomatic relief *(Willett, 1994 [Low Quality Evidence]; Druce, 1992 [Low Quality Evidence])*.

Decongestants are known to increase ostial diameter and thus have the potential to promote sinus drainage *(Melen, 1986 [Low Quality Evidence]; Gwaltney, 1981 [Low Quality Evidence])*.

The overall weight of clinical experience supports the use of decongestants as adjunctive therapy for sinusitis; however, further studies are needed.

Antihistamines

Antihistamines are not recommended for the treatment of sinusitis because they cause further inspissation of secretions *(Willett, 1994 [Low Quality Evidence])*.

Get adequate rest.

Sleep with head of bed elevated.

Avoid cigarette smoke and extremely cool or dry air.

Prevention measures

Appropriate treatment of allergies and viral upper-respiratory infections can prevent the development of sinusitis.

Environmental factors that affect the sinuses include cigarette smoke, pollution, swimming in contaminated water and barotrauma.

50. Treatment

The goal of treatment is to promote adequate drainage of the sinuses. This in turn will provide relief of symptoms associated with sinusitis. This may require a combination of home care and medical treatments.

Nasal Steroid Spray

Intranasal corticosteroid spray may be rational but is an unproved adjunctive therapy for acute sinusitis. The spray may be appropriate for selected cases of recurrent sinusitis, especially in the presence of an allergy or inflammation etiology *(Meltzer, 2000 [High Quality Evidence])*.

A recent study looked at amoxicillin and topical budesonide for the treatment of acute maxillary sinusitits. 240 adults were randomized into four treatment groups over a four-year study period. The study concluded that an antibiotic, a topical steroid or a combination of both does not alter the severity of symptoms, the duration or the natural history of the condition *(Williamson, 2007 [High Quality Evidence])*.

Adjunctive Therapy

Use of normal saline or hypertonic saline to irrigate the sinuses is now recommended as adjunct therapy with antibiotics, although the evidence is weak. Due to recent cases of infection, patients should be instructed to use saline or distilled water rather than tap water. Saline spray also can be used, especially for children who are likely to find irrigation objectionable. Oral decongestants, topical decongestants and antihistamines are not recommended as adjunctive therapy.

Antibiotics

According to one study, the natural history of the majority of the patients with acute sinusitis is resolution without the use of antibiotics. The study was a randomized placebo-controlled trial of the treatment of acute sinusitis in the primary care setting. It was the first to be done in the primary care setting and concluded that antibiotic treatment did not improve the clinical course of acute sinusitis. The antibiotic used in the treated group was amoxicillin, 750 mg, three times a day, for seven days. The only other placebo-controlled trial done treating acute sinusitis was conducted in an ear, nose and throat practice. The antibiotics used were penicillin and lincomycin. In this study, antibiotics seemed to accelerate resolution of radiographic abnormalities, but the difference between the antibiotic and the placebo-treated groups was small. Another randomized study supports the use of amoxicillin and Pen VK in the treatment of sinusitis *(Williams Jr, 2000 [Systematic Review]; Van Buchem, 1997 [High Quality Evidence]; Lindbaek, 1996 [High Quality Evidence]; Axelsson, 1970 [High Quality Evidence])*.

Antibiotics should be reserved for those patients who failed decongestant therapy, those who present with symptoms and signs of a more severe illness, and those who have complications of acute sinusitis *(Arroll, 2010 [Systematic Review]; Snow, 2001 [Low Quality Evidence])*.

Typical organisms isolated from patients with acute sinusitis include *Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis, Staphylococcus aureus*, other streptococci, anaerobes, and (rarely) other gram negative organisms. *S. Pneumoniae* and *H. influenzae* account for 70% of the isolates in adults *(Willett, 1994 [Low Quality Evidence])*.

In our area, 30-40% of the *H. influenzae* and most of the *M. cattarhalis* produce ß-lactamase and are considered resistant to amoxicillin.

Since antral puncture on all patients suspected of bacterial sinusitis is clinically impractical, the diagnosis rests on clinical impression and antibiotic therapy is empiric. A 7- to 10-day course of antibiotics leads to symptomatic and bacteriologic improvement in 80-90% of patients *(Willett, 1994 [Low Quality Evidence])*. Pundent rhinorrhea has a sensitivity of 72% and a specificity of 52% *(Turner, 2010 [Low Quality Evidence])*.

Amoxicillin clavulanate is now considered the first-line drug of choice according to the latest guideline from the Infectious Disease Society of America (IDSA). High-dose amoxicillin-clavulanate should be considered in situations where the patient has higher risk of resistance: age < 2 years or > 65 years, daycare participation, hospitalization within the past five days, prior antibiotics within the past month, immunocompromised patients, comorbidities, a local rate of *S. pneumoniae* resistance > 10% or severe disease. Amoxicillin, trimethoprim-sulfamethoxazole and macrolides are no longer recommended as alternatives due to increasing resistance. In penicillin-allergic patients, doxycycline should be first line for older children or adults. Levofloxacin is an alternative that is recommended for children and adults by the IDSA. Second or third-generation cephalosporins are not recommended as mono-therapy by IDSA due to lack of coverage of penicillin-resistant *s. pneumoniae*; however, they can be used in conjunction with clindamycin, although palatability will be an issue for children with clindamycin liquid *(Chow, 2012 [Guideline])*.

(Hickner, 2001 [Low Quality Evidence]; Adelglass, 1999 [High Quality Evidence]; Agency for Health Care Policy and Research, 1999 [Low Quality Evidence]; Lasko, 1998 [High Quality Evidence]; Willet 1994 [Low Quality Evidence]; Edelstein, 1993 [High Quality Evidence]; Huck, 1993 [High Quality Evidence]; Gwaltney, 1992 [Low Quality Evidence]; Sydnor, 1989 [Low Quality Evidence]; Wald, 1986 [High Quality Evidence]; Wald, 1984 [High Quality Evidence])

Duration of antibiotics

The duration of antibiotic therapy is controversial, with recommendations from various sources being anywhere from 3 to 14 days. An excellent study comparing 3 days versus 10 days of trimethoprim/sulfamethoxazole reported no difference in clinical response. Further studies will need to be done using 3-day therapy before this can be recommended. A 10-day course of antibiotics has commonly been recommended since this duration of antibiotics has been used in the vast majority of clinical trials in sinusitis. Also it has been shown that 10 days of antibiotics will achieve a bacteriologic cure as defined by follow-up sinus puncture. However, the Infectious Disease Society of America now recommends shortening the course in adults to five to seven days, while continuing to use the longer course in children *(Gwaltney, 1992 [Low Quality Evidence])*.

Call-Back Instructions

The patient should be instructed to call back if symptoms worsen, or if symptoms have not resolved within one week.

51. Treatment Failure?

Complete response

Patient is symptomatically improved to near normal.

Partial response

Patients who worsen in 48-72 hours after starting treatment or who are not responsive within three to five days warrant reevaluation. During reevaluation, consider whether the diagnosis is correct and if there is an underlying abnormality *(Chow, 2012 [Guideline]; (American Academy of Pediatrics, 2001 [Guideline])*.

Consider switching to a second line antibiotic for another 48-72 hours.

Consider referral to a specialist (e.g., ENT or ID)

Reinforce the comfort and prevention measures outlined in Annotation #49, "Home Self-Care."

There are no randomized clinical trials documenting the efficacy or necessity of further antibiotic therapy with the same drug in patients who have a partial response. However, numerous experts support this practice, and clinical experience suggests its efficacy *(Wilett, 1994 [Low Quality Evidence])*.

Failure or no response

Patient has little or no symptomatic improvement after finishing a 10-day course of first-line antibiotic therapy.

An antibiotic that offers better coverage resistant bacteria, such as high-dose amoxicillin/clavulanate should be prescribed. After three to five days of failure of first-line antibiotic, an antibiotic should be prescribed that would cover potentially resistant bacteria occasionally seen in acute bacterial sinusitis. No randomized trials have been done supporting this practice. We know, however, that a substantial minority of patients will have infection from bacteria that are resistant in vitro to first-line therapy. Several studies have suggested that failure of therapy may be due to ß-lactamase producing organisms, anaerobes or staphylococci. It would seem reasonable, therefore, to give a trial of a broader spectrum antibiotic in the setting of clinical failure *(Konen, 2000 [Low Quality Evidence]; Agency for Health Care Policy and Research, 1999 [Low Quality Evidence]; Willett, 1994 [Low Quality Evidence])*.

A second or third generation cephalosporin may be considered with IM ceftriaxone for one to three days followed by an oral agent is one possibility.

A fluoroquinolone with pneumococcal coverage may also be considered except for patients who are skeletally immature.

Additional second-line agents

Second-generation cephalosporin (best used with clindamycin)

- Cefuroxime
- Cefpodoxime
- Cefprozil
- Cefdinir
- Cefaclor

Fluoroquinolones with pneumococcal coverage (except for patients who are skeletally immature)

- Levofloxacin
- Moxifloxacin*

* There is concern within the medical community about using these drugs because of their potential for QT prolongation that some other quinolones do not have.

FDA approval

- Amoxicillin/clavulanate, cefuroxime, cefpodoxime, cefprozil, cefdinir and levofloxacin are FDA approved for the treatment of acute sinusitis.
- Cefaclor is not approved by the FDA for acute sinusitis treatment.

Reinforce the comfort and prevention messages outlined in Annotation #49, "Home Self-Care."

Most cases of acute bacterial sinusitis affect the maxillary sinus. A sinus radiograph series, although quite nonspecific due to many false positives, is fairly sensitive in detecting maxillary sinusitis. A normal x-ray series in the above clinical context should raise serious questions about the diagnosis of sinusitis, and alternative diagnoses should be entertained. An abnormal sinus x-ray, especially if opacification or an air-fluid level is present, is suggestive of bacterial sinusitis. A sinus CT scan could also be obtained to verify disease. It is somewhat more expensive, but has greater accuracy and is often recommended as the imaging test of choice.

Failure or no response in three weeks

In patients who have not responded to three weeks of continuous antibiotic therapy, consider limited coronal computed tomography scan of sinuses and/or referral to ear, nose and throat clinician and/or infectious disease specialist.

Please see individual health plan for formulary information.

The Aims and Measures section is intended to provide protocol users with a menu of measures for multiple purposes that may include the following:

- population health improvement measures,
- quality improvement measures for delivery systems,
- measures from regulatory organizations such as Joint Commission,
- measures that are currently required for public reporting,
- measures that are part of Center for Medicare Services Physician Quality Reporting initiative, and
- other measures from local and national organizations aimed at measuring population health and improvement of care delivery.

This section provides resources, strategies and measurement for use in closing the gap between current clinical practice and the recommendations set forth in the guideline.

The subdivisions of this section are:

- Aims and Measures
- Implementation Recommendations
- Implementation Tools and Resources
- Implementation Tools and Resources Table

Aims and Measures

1. Increase the percentage of patients diagnosed with viral upper-respiratory infection who receive appropriate treatment. *(Annotation #12)*

   Measures for accomplishing this aim:

   a. Percentage of patients diagnosed with a viral upper-respiratory infection alone who do not receive an antibiotic.

   b. Percentage of patients and/or parents of children with a viral upper-respiratory infection who receive home treatment education.

2. Reduce excessive antibiotic treatment through decreased empiric treatment of patients diagnosed with strep pharyngitis. *(Annotations #16, 20, 25, 27)*

   Measures for accomplishing this aim:

   a. Percentage of patients diagnosed with strep pharyngitis who had a laboratory strep test.

   b. Percentage of patients diagnosed with strep pharyngitis, and prescribed antibiotics, who had a negative laboratory strep test.

3. Increase the use of recommended first-line medications for patients diagnosed with strep pharyngitis. *(Annotations #20, 25, 27)*

   Measure for accomplishing this aim:

   a. Percentage of patients diagnosed with strep pharyngitis prescribed first-line medications for strep pharyngitis.

4. Increase patient/caregiver knowledge about strep pharyngitis and pharyngitis care. *(Annotations #20, 24, 27)*

   Measures for accomplishing this aim:

   a. Percentage of patients diagnosed with strep pharyngitis prescribed antibiotics with documentation of education on 24-hour treatment prior to returning to work, school or day care.

   b. Percentage of patients diagnosed with strep pharyngitis prescribed antibiotics with documentation of being educated on taking the complete course.

   c. Percentage of patients diagnosed with strep pharyngitis instructed on actions to take if symptoms worsen.

5. Decrease the use of injectable corticosteroid therapy for patients diagnosed with allergic rhinitis. *(Annotation #34)*

   Measure for accomplishing this aim:

   a. Percentage of patients diagnosed with seasonal allergic rhinitis being treated with injectable corticosteroids.

Measurement Specifications

Measurement #1a

Percentage of patients diagnosed with a viral upper-respiratory infection who do not receive an antibiotic.

Population Definition

Children and adult patients with a visit to primary care (general internal medicine, pediatrics, family practice, urgent care) for viral upper-respiratory infection alone.

Data of Interest

$$\frac{\text{\# of patients who do not receive an antibiotic}}{\text{\# of patients with viral upper-respiratory infection diagnosis}}$$

Numerator/ Denominator Definitions

Numerator: Patients with viral upper-respiratory infection alone who do not receive an antibiotic.

Denominator: Patients with viral upper-respiratory infection diagnosis alone.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients who did not receive an antibiotic prescription.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure on overuse, and improvement is noted as an increase in the rate.

Measurement #1b

Percentage of patients and/or parents of children diagnosed with a viral upper-respiratory infection symptoms who receive home treatment education.

Population Definition

Children and adult patients with a visit to primary care (general internal medicine, pediatrics, family practice, urgent care) for viral upper-respiratory infection alone.

Data of Interest

$$\frac{\text{\# of patients who received home treatment education}}{\text{\# of patients with viral upper-respiratory infection diagnosis alone}}$$

Numerator/ Denominator Definitions

Numerator: Patients with viral upper-respiratory infection diagnosis alone who receive home treatment education.

Denominator: Patients with viral upper-respiratory infection diagnosis alone.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients who received home treatment education.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as an increase in the rate.

Measurement #2a

Percentage of patients diagnosed with strep pharyngitis who had a rapid group A strep test or strep culture.

Population Definition

Children and adult patients diagnosed with strep pharyngitis.

Data of Interest

$$\frac{\text{\# of patients with a rapid group A strep test or strep culture}}{\text{\# of patients with a diagnosis of strep pharyngitis}}$$

Numerator/Denominator Definitions

Numerator: Patients diagnosed with strep pharyngitis who received a rapid group A strep test or strep culture.

Denominator: Patients with a diagnosis of strep pharyngitis.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients with a rapid group A strep test or strep culture.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as an increase in the rate.

Measurement #2b

Percentage of patients diagnosed with strep pharyngitis, and prescribed antibiotics, who had a negative culture or no rapid group A strep test or strep culture.

Population Definition

Children and adult patients with strep pharyngitis diagnosis and prescribed antibiotics.

Data of Interest

$$\frac{\text{\# of patients with negative laboratory strep test or strep culture}}{\text{\# of patients with a diagnosis of strep pharyngitis and prescribed antibiotics}}$$

Numerator/Denominator Definitions

Numerator: Patients diagnosed with strep pharyngitis and prescribed antibiotics who have a negative laboratory strep test.

Denominator: Patients with a diagnosis of strep pharyngitis and prescribed antibiotics.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients with negative laboratory strep test.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure on overuse, and improvement is noted as a decrease in the rate.

Measurement #3a

Percentage of patients diagnosed with strep pharyngitis prescribed first-line medications for strep pharyngitis.

Population Definition

Children and adult patients with strep pharyngitis diagnosis codes.

Data of Interest

$$\frac{\text{\# of patients prescribed first-line medications}}{\text{\# of patients with a diagnosis of strep pharyngitis}}$$

Numerator/Denominator Definitions

Numerator: Patients diagnosed with strep pharyngitis who were prescribed first-line medications for strep pharyngitis.

Denominator: Patients with a diagnosis of strep pharyngitis.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients who were prescribed first-line medications.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure on underuse, and improvement is noted as an increase in the rate.

Measurement #4a

Percentage of patients diagnosed with strep pharyngitis prescribed antibiotics with documentation of education on 24-hour treatment prior to returning to work, school or day care.

Population Definition

Children and adult patients diagnosed with strep pharyngitis and prescribed antibiotics.

Data of Interest

$$\frac{\text{\# of patients with education on 24-hour treatment prior to returning to work, school or day care}}{\text{\# of patients with a diagnosis of strep pharyngitis and prescribed antibiotics}}$$

Numerator/Denominator Definitions

Numerator: Patients diagnosed with strep pharyngitis with education on 24-hour treatment prior to returning to work, school or day care.

Denominator: Patients with a diagnosis of strep pharyngitis and prescribed antibiotics.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients with education on 24-hour treatment to returning to work, school or day care.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as an increase in the rate.

Measurement #4b

Percentage of patients diagnosed with strep pharyngitis prescribed antibiotics with documentation of being educated on taking the complete course.

Population Definition

Children and adult patients diagnosed with strep pharyngitis and prescribed antibiotics.

Data of Interest

$$\frac{\text{\# of patients with education on taking the complete course of antibiotics}}{\text{\# of patients diagnosed with strep pharyngitis and prescribed antibiotics}}$$

Numerator/Denominator Definitions

Numerator: Patients diagnosed with strep pharyngitis and prescribed antibiotics with education on taking the complete course of antibiotics.

Denominator: Patients with a diagnosis of strep pharyngitis and prescribed antibiotics.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients with education on taking the complete course of antibiotics.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as an increase in the rate.

Measurement #4c

Percentage of patients diagnosed with strep pharyngitis instructed on actions to take if symptoms worsen.

Population Definition

Children and adult patients diagnosed with strep pharyngitis.

Data of Interest

$$\frac{\text{\# of patients with education on actions to take if symptoms worsen}}{\text{\# of patients with a diagnosis of strep pharyngitis}}$$

Numerator/Denominator Definitions

Numerator: Patients with strep pharyngitis with instructions on actions to take if symptoms worsen.

Denominator: Patients with a diagnosis of strep pharyngitis.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients who had education on actions to take if symptoms worsened.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as an increase in the rate.

Measurement #5a

Percentage of patients diagnosed with seasonal allergic rhinitis being treated with injectable corticosteroids.

Population Definition

Children and adult patients diagnosed with seasonal allergic rhinitis.

Data of Interest

$$\frac{\text{\# of patients treated with injectable corticosteroids}}{\text{\# of patients diagnosed with seasonal allergic rhinitis}}$$

Numerator/Denominator Definitions

Numerator: Patients diagnosed with seasonal allergic rhinitis being treated with injectable corticosteroids.

Denominator: Patients diagnosed with seasonal allergic rhinitis.

Method/Source of Data Collection

Collect data on entire patient population that fit criteria under "Population Definition" through electronic medical records. Then, determine the number of patients who were treated with injectable corticosteroids.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as a decrease in the rate.

Implementation Recommendations

Prior to implementation, it is important to consider current organizational infrastructure that address the following:

- System and process design
- Training and education
- Culture and the need to shift values, beliefs and behaviors of the organization.

The following system changes were identified by the guideline work group as key strategies for health care systems to incorporate in support of the implementation of this guideline:

- Develop, collect and disseminate materials to educate patients with allergic rhinitis about avoidance activities.
- Develop phone or computer based care for established patients that includes telephone nurse assessment, symptomatic care with follow-up instructions and use of a protocol to prescribe first-line antibiotics for sinusitis.

Implementation Tools and Resources

Criteria for Selecting Resources

The following tools and resources specific to the topic of the guideline were selected by the work group. Each item was reviewed thoroughly by at least one work group member. It is expected that users of these tools will establish the proper copyright prior to their use. The types of criteria the work group used are:

- The content supports the clinical and the implementation recommendations.
- Where possible, the content is supported by evidence-based research.
- The author, source and revision dates for the content are included where possible.
- The content is clear about potential biases and when appropriate conflicts of interests and/or disclaimers are noted where appropriate.

Implementation Tools and Resources Table

Author/Organization	Title/Description	Audience	Web Sites/Order Information
American Academy of Allergy, Asthma and Immunology	Offers education resources for patients and clinicians. This site includes special sections for children and seniors.	Patients and Families; Health Care Professionals	http://www.aaaai.org 1-800-822-2762
American Academy of Family Practice	Clinical practice guidelines, clinical care, research, and quality improvement resources.	Patients and Families; Health Care Professionals	http://www.aafp.org
American Academy of Otolaryngology	Head and neck specialist site with user friendly information.	Patients and Families	http://www.entnet.org
BMJ (British Medical Journal)	Trusted global publisher of evidence into practice resources of various diseases and conditions.	Patients, researchers, clinicians	http://www.epocratesonline.com
HealthPartners Health Information Library	Patient education resources and decision support interactive tools, health topics and learning centers based on current practice guidelines and standards of care.	Patients and Families; Health Care Professionals	https://www.healthwise.net/healthpartners/Content/Cust-Document.aspx?XML=STUB.XML&XSL=CD.FRONTPAGE.XSL
Mayo Clinic	Health information on various diseases and conditions.	Patients and Families; Health Care Professionals	http://www.mayoclinic.com
Medline Plus	National Institute of Health Web site produced by the National Library of Medicine. Includes drug and disease videos, literature and illustrations. Multiple languages available.	Patients and Families; Health Care Professionals	http://www.nlm.nih.gov/medlineplus

The subdivisions of this section are:

- References
- Appendix

References

Adelglass J, DeAbate CA, McElvaine P, et al. Comparison of the effectiveness of levofloxacin and amoxicillin-clavulanate for the treatment of acute sinusitis in adults. *Otolaryngol Head Neck Surg* 1999;120:320-27. (High Quality Evidence)

Al Sayyad JJ, Fedorowicz Z, Alhashimi D, Jamal A. Topical nasal steroids for intermittent and persistent allergic rhinitis in children. *Cochrane Database Syst Rev* 2007;(1):CD003163. (Systematic Review)

Allen DB, Meltzer EO, Lemanske Jr RF, et al. No growth suppression in children treated with the maximum recommended dose of fluticasone propionate aqueous nasal spray for one year. *Allergy Asthma Proc* 2002;23:407-13. (High Quality Evidence)

American Academy of Allergy and Immunology. Skin testing and radioallergosorbent testing (radioallergosorbent test) for diagnosis of specific allergens responsible for IgE-mediated diseases. *J Allergy Clin Immunol* 1983;72:515-17. (Low Quality Evidence)

American Academy of Allergy. Position statements-controversial techniques. *J Allergy Clin Immunol* 1981;67:333-38. (Low Quality Evidence)

American Academy of Pediatrics. Clinical practice guideline: mangement of sinusitis. *Pediatrics* 2001;108:798-808. (Guideline)

American Academy of Pediatrics. Revised indications for the use of palivizumab and respiratory syncytial virus immune globulin intravenous for the prevention of respiratory syncytial virus infections. *Pediatrics* 2003a;112:1442-46. (Low Quality Evidence)

American Academy of Pediatrics, Pickering LK, Baker CS, et al. *In* Red Book. 2003 Report of the Committee on Infectious Diseases. 26th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003b. 573-84. (Low Quality Evidence)

Anderson HA. Practical nasal cytology: key to the problem nose. *J.C.E.O.R.L.& Allergy* 1979;53-60. (Low Quality Evidence)

Anzai Y, Paladin A. Diagnostic imaging in 2009: update on evidence-based practice of pediatric imaging. What is the role of imaging in sinusitis? *Pediatr Radiol* 2009:39:S239-41. (Guideline)

Arroll B, Kenealy T. Antibiotics for the common cold and acute purulent rhinitis. *Cochrane Database Syst Rev* 2005;(3):CD000247. (Systematic Review)

Axelsson A, Chidekel N, Grebelius N, et al. Treatment of acute maxillary sinusitis: a comparison of four different methods. *Acta Otolaryng* 1970;70:71-76. (High Quality Evidence)

Banov CH, Lieberman P, for the vasomotor rhinitis study groups. Efficacy of azelastine nasal spray in the treatment of vasomotor (perennial non-allergic) rhinitis. *Ann Allergy Asthma Immunol* 2001;86:28-35. (High Quality Evidence)

Barbee RA, Halonen M, Kaltenborn W, et al. A longitudinal study of serum IgE in a community cohort: correlations with age, sex, smoking, and atopic status. *J Allergy Clin Immunol* 1987;79:919-27. (Low Quality Evidence)

Bass JW. Antibiotic management of group A streptococcal pharyngotonsillitus. *Pediatr Infect Dis J* 1991;10:S43-S49. (Low Quality Evidence)

Bende M, Pipkorn U. Topical levocabastine, a selective H1-antagonist in seasonal allergic rhinoconjunctivitis. *Allergy* 1987;42:512-15. (High Quality Evidence)

Bernstein IL. Proceedings of the task force on guidelines for standardizing old and new technologies used for the diagnosis and treatment of allergic diseases. *J Allergy Clin Immunol* 1988;82:487-526. (Low Quality Evidence)

Bernstein IL, Storms WW. Practice parameters for allergy diagnostic testing. *Ann Allergy Asthma Immunol* 1995;75:546-47. (Guideline)

Bisno AL. Acute pharyngitis: etiology and diagnosis. *Pediatrics* 1997a;97:949-54. (Low Quality Evidence)

Bisno AL, Gerber MA, Gwaltney Jr JM, et al. Practice guidelines for the diagnosis and management of group A streptococcal pharyngitis. *Clin Infect Dis* 2002;35:113-25. (Guideline)

Brannan MD, Herron JM, Reidenberg P, et al. Lack of hypothalamic-pituitary-adrenal axis suppression with once-daily or twice-daily beclomethasone dipropionate aqueous nasal spray administered to patients with allergic rhinitis. *Clin Ther* 1995;17:637-47. (High Quality Evidence)

Breese BB. A simple scorecard for the tentative diagnosis of streptococcal pharyngitis. *Am J Dis Child* 1977;131:514-17. (Low Quality Evidence)

Bronsky EA, Boggs P, Findlay S, et al. Comparative efficacy and safety of a once-daily loratadine-pseudoephedrine combination versus its components alone and placebo in the management of seasonal allergic rhinitis. *J Allergy Clin Immunol* 1995;96:139-47. (High Quality Evidence)

Bronsky EA , Dockhorn RJ, Meltzer EO, et al. Fluticasone propionate aqueous nasal spray compared with terfenadine tablets in the treatment of seasonal allergic rhinitis. *J Allergy Clin Immunol* 1996;97:915-21. (High Quality Evidence)

Brown WG, Halonen MJ, Kaltenborn, WT, et al. The relationship of respiratory allergy, skin test reactivity, and serum IgE in a community population sample. *J Allergy Clin Immunol* 1979;63:328-35. (Low Quality Evidence)

Calderon MA, Alves B, Jacobson M, et al. Allergen injection immunotherapy for seasonal allergic rhinitis (review). *The Cochrane Library* 2009, Issue 1. (Systematic Review)

Caldwell DR, Verin P, Hartwich-Young R, et al. Efficacy and safety of lodoxamide 0.1% vs cromolyn sodium 4% in patients with vernal keratoconjunctivitis. *Am J Ophthalmol* 1992;113:632-37. (High Quality Evidence)

Carabin H, Gyorkos TW, Soto JC, et al. Effectiveness of a training program in reducing infections in toddlers attending day care centers. *Epidemiology* 1999;10:219-27. (High Quality Evidence)

Cave A, Arlett P, Lee E. Inhaled and nasal corticosteroids: factors affecting the risks of systemic adverse effects. *Pharm Ther* 1999;83:153-79. (Low Quality Evidence)

Centers for Disease Control and Prevention. Infant deaths associated with cough and cold medications – two states, 2005. *MMWR* 2007;56:1-4. (Low Quality Evidence)

Centor RM. Expand the pharyngitis paradigm for adolescents and young adults. *Ann Intern Med* 2009;151:812-15. (Low Quality Evidence)

Chaudhary S, Bilinsky SA, Hennesy JL, et al. Penicillin V and rifampin for the treatment of group A streptococcal pharyngitis: a randomized trial of 10 days penicillin vs 10 days penicillin with rifampin during the final 4 days of therapy. *J Pediatr* 1985;106:481-86. (High Quality Evidence)

Chaudhry R, Stroebel RJ, McLeod TG, et al. Nurse-based telephone protocol versus usual care for management of URI and acute sinusitis: a controlled trial. *Manag Care Interface* 2006;19:26-31. (Low Quality Evidence)

Choby BA. Diagnosis and treatment of streptococcal pharyngitis. *Am Fam Phys* 2009;79:383-90. (Guideline)

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:e72-e112. (Guideline)

Corren J. Intranasal corticosteroids for allergic rhinitis: how do different agents compare? *J Allergy Clin Immunol* 1999;104:S144-S49. (Low Quality Evidence)

Cowan PF. Patient satisfaction with an office visit for the common cold. *J Fam Pract* 1987;24:412-13. (Low Quality Evidence)

Cox L, Li JT, Nelson H, Lockey R. Allergen immunotherapy: a practice parameter second update. *J Allergy Clin Immunol* 2007;120:S25-S85. (Guideline)

Dajani A, Taubert K, Ferrieri P, et al. Treatment of acute streptococcal pharyngitis and prevention of rheumatic fever: a statement for health professionals. *Pediatrics* 1995;96:758-64. (Low Quality Evidence)

Davidson TM, Smith WM. The Bradford Hill criteria and zinc-induced anosmia: a causality analysis. *Arch Otolaryngol Head Neck Surg* 2010;136:673-76. (Low Quality Evidence)

de Blay F, Chapman MD, Platts-Mills TA. Airborne cat allergen (Fel d I): environmental control with the cat *in situ*. *Am Rev Respir Dis* 1991;143:1334-39. (Low Quality Evidence)

DeClerck LS, Verhelst JA, Bleys W, et al. Comparative evaluation of the multiple radioallergosorbent test and discrete radioallergosorbent test for inhalant allergy. *Allergy* 1986;41:327-30. (Low Quality Evidence)

Denny FW, Collier AM, Henderson FW. Acute respiratory infections in day care. *Rev Infect Dis* 1986;8:527-32. (Low Quality Evidence)

Denny Capt FW, Wannamaker Capt LW, Brink Capt WR, et al. Prevention of rheumatic fever. *JAMA* 1950;143:151-53. (Low Quality Evidence)

Dohlman AW, Hemstreet MPB, Odrezin GT, et al. Subacute sinusitis: are antimicrobials necessary? *J Allergy Clin Immunol* 1993;91:1015-23. (High Quality Evidence)

Druce HM. Diagnosis of sinusitis in adults: history, physical examination, nasal cytology, echo, and rhinoscope. *J Allergy Clin Immunol* 1992;90:436-41. (Low Quality Evidence)

Duncan B, Ey J, Holberg CJ, et al. Exclusive breastfeeding for at least 4 months protects against otitis media. *Pediatrics* 1993;91:867-72. (Low Quality Evidence)

Dykewicz MS, Fineman S, Skoner DP. Joint task force summary statements on diagnosis and management of rhinitis. *Ann Allergy Asthma Immunol* 1998;81:474-77. (Low Quality Evidence)

Edelstein DR, Avner SE, Chow JM, et al. Once-a-day therapy for sinusitis: a comparison study of cefixime and amoxicillin. *Laryngoscope* 1993;103:33-41. (High Quality Evidence)

Emin O, Fatih M, Emre D, Nedim S. Lack of bone metabolism side effects after 3 years of nasal topical steroids in children with allergic rhinitis. *J Bone Miner Metab* 2011;29:582-87. (Low Quality Evidence)

FDA Patient Safety News. Warning on using cough and cold medicines in young children. Available at: http://www.fda.gov/medwatch/safety/2007/safety07.htm#coughcold. April 2007. (Low Quality Evidence)

Fleming DW, Cochi SL, Hightower AW, et al. Childhood upper-respiratory tract infections: to what degree is incidence affected by day-care attendance? *Pediatrics* 1987;79:55-60. (Low Quality Evidence)

Fluticasone Propionate Collaborative Pediatric Working Group. Treatment of seasonal allergic rhinitis with once-daily intranasal fluticasone propionate therapy in children. *J Pediatr* 1994;125:628-34. (High Quality Evidence)

Frank AL, Taber LH, Glezen WP, et al. Breastfeeding and respiratory virus infection. *Pediatrics* 1982;70:239-45. (Low Quality Evidence)

Gadomski A, Horton L. The need for rational therapeutics in the use of cough and cold medicine in infants. *Pediatrics* 1992;89:774-76. (Low Quality Evidence)

Ganderton MA, James VHT. Clinical and endocrine side-effects of methylprednisolone acetate as used in hay-fever. *BMJ* 1970;1:267-69. (Low Quality Evidence)

Gerber MA. Comparison of throat cultures and rapid strep tests for diagnosis of streptococcal pharyngitis. *Pediatr Infect Disease J* 1989;8:820-24. (Low Quality Evidence)

Gerber MA, Baltimore RS, Eaton CB, et al. Prevention of rheumatic fever and diagnosis and treatment of acute streptococcal pharyngitis: a scientific statement from the American heart association rheumatic fever, endocarditis, and Kawasaki disease committee of the council on cardiovascular disease in the young, the interdisciplinary council on functional genomics and translational biology, and the interdisciplinary council on quality of care and outcomes research: endorsed by the American academy of pediatrics. *Circulation* 2009;119:1541-51. (Guideline)

Gerber MA, Randolph MF, DeMeo KK, et al. Lack of impact of early antibiotic therapy for streptococcal pharyngitis on recurrence rates. *J Pediatr* 1990;117:853-58. (High Quality Evidence)

Gerber MA, Tanz RR, Kabat W, et al. Optical immunoassay test for group A B-hemolytic streptococcal pharyngitis. *JAMA* 1997;277:899-903. (Low Quality Evidence)

Goodman RA, Osterholm MT, Granoff DM, et al. Infectious diseases and child day care. *Pediatrics* 1984;74:134-39. (Low Quality Evidence)

Gordis L. Effectiveness of comprehensive-care programs in preventing rheumatic fever. *N Engl J Med* 1973;289:331-35. (Low Quality Evidence)

Graft D, Aaronson D, Chervinsky P, et al. A placebo- and active-controlled randomized trial of prophylactic treatment of seasonal allergic rhinitis with mometasone furoate aqueous nasal spray. *J Allergy Clin Immunol* 1996;98:724-31. (High Quality Evidence)

Graft DF. Allergic and non-allergic rhinitis: directing medical therapy at specific symptoms. *Postgrad Med* 1995;100:64-74. (Low Quality Evidence)

Graham NMH, Burrell CJ, Douglas MR, et al. Adverse effects of aspirin, acetaminophen, and ibuprofen on immune function, viral shedding, and clinical status in rhinovirus-infected volunteers. *JID* 1990;162:1277-82. (High Quality Evidence)

Grimm W, Müller H-H. A randomized controlled trial of the effect of fluid extract of *echinacea purpurea* on the incidence and severity of colds and respiratory infections. *Am J Med* 1999;106:138-43. (High Quality Evidence)

Gwaltney JM, Phillips CD, Miller RD, et al. Computed tomographic study of the common cold. *N Engl J Med* 1994;330:25-30. (Low Quality Evidence)

Gwaltney JM, Scheld WM, Sande MA, et al. The microbial etiology and antimicrobial therapy of adults with acute community-acquired sinusitis: a fifteen-year experience at the University of Virginia and review of other selected studies. *J Allergy Clin Immunol* 1992;90:457-62. (Low Quality Evidence)

Gwaltney JM, Sydnor A, Sande MA. Etiology and antimicrobial treatment of acute sinusitis. *Ann Otol Rhinol Laryngol* 1981;90(Suppl 84):68-71. (Low Quality Evidence)

Hamory BH, Sande MA, Sydnor A, et al. Etiology and antimicrobial therapy of acute maxillary sinusitis. *J Infect Dis* 1979;139:197-202. (Low Quality Evidence)

Haugen JR, Ramlo JH. Serious complications of acute sinusitis. *Postgrad Med* 1993;93:115-25. (Low Quality Evidence)

Hayes CS, Williamson Jr H. Management of group A beta-hemolytic streptococcal pharyngitis. *Am Fam Phys* 2001;63:1557-64. (Guideline)

Herr RD. Acute sinusitis: diagnosis and treatment update. *AFP* 1991;44:2055-62. (Low Quality Evidence)

Hickner JM, Bartlett JG, Besser RE, et al. Principles of appropriate antibiotic use for acute sinusitis in adults: background. *Ann Intern Med* 2001;134:498-505. (Low Quality Evidence)

Holopainen E, Malmberg H, Binder E. Long-term follow-up of intra-nasal beclomethasone treatment: a clinical and histologic study. *Acta Otolaryngol* 1982;386(suppl):270-73. (Low Quality Evidence)

Huck W, Reed BD, Nielsen RW, et al. Cefaclor vs amoxicillin in the treatment of acute, recurrent, and chronic sinusitis. *Arch Fam Med* 1993;2:497-503. (High Quality Evidence)

Hutton N, Wilson M, Mellits ED, et al. Effectiveness of an antihistamine-decongestant combination for young children with the common cold: a randomized, controlled clinical trial. *J Pediatr* 1991;118:125-30. (High Quality Evidence)

Ingraham RH, Davies SF. Respiratory medicine, chronic obstructive pulmonary disease. *Sci Am Med* 1992;14:1-23. (Low Quality Evidence)

Juniper EF, Guyatt GH, O'Byrne PM, et al. Aqueous beclomethasone diproprionate nasal spray: regular versus 'as required' use in the treatment of seasonal allergic rhinitis. *J Allergy Clin Immunol* 1990;86:380-86. (High Quality Evidence)

Juniper EF, Kline PA, Hargreave FE, et al. Comparison of beclomethasone dipropionate aqueous nasal spray, astemizole, and the combination in the prophylactic treatment of ragweed pollen-induced rhinoconjunctivitis. *J Allergy Clin Immunol* 1989;83:627-33. (High Quality Evidence)

Kaplan EL. The group A streptococcal upper-respiratory tract carrier state: an enigma. *J Pediatr* 1980;97:337-45. (Low Quality Evidence)

Karmazyn BK, Gunderman R, Coley BD, et al. ACR appropriateness criteria sinusitis – child. *Am Coll Radiol* 2009. (Guideline)

Kemper DW. Self-care education: impact on HMO costs. *Med Care* 1982;20:710-18. (High Quality Evidence)

Kennis T. Inhaled corticosteroids–the FDA takes another look. *Ann Allergy Asthma Immunol* 1998;81:406-10. (Low Quality Evidence)

Klein GL, Littlejohn T III, Lockhart EA, et al. Brompheniramine, terfenadine, and placebo in allergic rhinitis. *Ann Allergy Asthma Immunol* 1996;77:365-70. (High Quality Evidence)

Knight A. The differential diagnosis of rhinorrhea. *J Allergy Clin Immunol* 1995;95:1080-83. (Low Quality Evidence)

Konen E, Faibel M, Kleinbaum Y, et al. The value of the occipitomental (Waters') view in diagnosis of sinusitis: a comparative study with computed tomography. *Clin Radiol* 2000;55:856.-60. (Low Quality Evidence)

Krober MS, Bass JW, Michels GN. Streptococcal pharyngitis: placebo-controlled double-blind evaluation of clinical response to penicillin therapy. *JAMA* 1985;253:1271-74. (High Quality Evidence)

Lan AJ, Colford JM. The impact of dosing frequency on the efficacy of 10-day penicillin or amoxicillin therapy for streptococcal tonsillopharyngitis: a meta-analysis. *Pediatrics* 105:1-8, 2000 URL: http://www.pediatrics.org/cgi/content/full/105/2/e19. (Meta-analysis)

Lang SDR, Singh K. The sore throat: when to investigate and when to prescribe. *Drugs* 1990;40:854-62. (Low Quality Evidence)

Lasko B, Lau CY, Saint-Pierre C, et al. Efficacy and safety of oral levofloxacin compared with clarithromycin in the treatment of acute sinusitis in adults: a multi-center, double-blind, randomized study. *J Intl Med Res* 1998;26:281-91. (High Quality Evidence)

Leino M, Montan P, Njä F. A double-blind group comparative study of ophthalmic sodium cromoglycate, 2% four times daily and 4% twice daily, in the treatment of seasonal allergic conjunctivitis. *Allergy* 1994;49:147-51. (High Quality Evidence)

Lichtenstein LM, Norman PS, Winkenwerder WL. A single year of immunotherapy for ragweed hay fever. *Ann Intern Med* 1971;75:663-71. (High Quality Evidence)

Lieu TA, Fleisher GR, Schwartz JS. Cost-effectiveness of rapid latex agglutination testing and throat culture for streptococcal pharyngitis. *Pediatrics* 1990;85:246-56. (Cost-Effectiveness Analysis)

Lindbæk M, Hjortdahl P, Johnsen U. Randomised, double blind, placebo-controlled trial of penicillin V and amoxycillin in treatment of acute sinus infections in adults. *BMJ* 1996;313:325-29. (High Quality Evidence)

Loda FA, Glezen WP, Clyde WA Jr. Respiratory disease in group day care. *Pediatrics* 1972;49:428-37. (Low Quality Evidence)

Lowell FC, Franklin W. A double-blind study of the effectiveness and specificity of injection therapy in ragweed hay fever. *N Engl J Med* 1965;273:675-79. (High Quality Evidence)

Macknin ML, Mathew S, Medendorp SV. Effect of inhaling heated vapor on symptoms of the common cold. *JAMA* 1990;264:989-91. (High Quality Evidence)

Macknin ML, Piedmonte M, Calendine C, et al. Zinc gluconate lozenges for treating the common cold in children: a randomized controlled trial. *JAMA* 1998;279:1962-67. (High Quality Evidence)

Malmberg H, Holopainen E. Nasal smear as a screening test for immediate-type nasal allergy. *Allergy* 1979;34:331-37. (Low Quality Evidence)

Marshall I. Zinc for the common cold. *Cochrane Database Syst Rev* 2000;(2):CD001364. (Systematic Review)

McCue JD. Safety of antihistamines in the treatment of allergic rhinitis in elderly patients. *Arch Fam Med* 1996;5:464-68. (Low Quality Evidence)

Melén I, Friberg B, Andréasson L, et al. Effects of phenylpropanolamine on ostial and nasal patency in patients treated for chronic maxillary sinusitis. *Acta Otolaryngol* 1986;101:494-500. (Low Quality Evidence)

Meltzer EO. An overview of current pharmacotherapy in perennial rhinitis. *J Allergy Clin Immunol* 1995;95:1097-110. (Low Quality Evidence)

Meltzer EO. Clinical evidence for antileukotriene therapy in the management of allergic rhinitis. *Ann Allergy Asthma Immunol* 2002;88:23-29. (Low Quality Evidence)

Meltzer EO, Hamilos DL, Hadley JA, et al. Rhinosinusitis: developing guidance for clinical trials. *Otolaryngol Head Neck Surg* 2006;135:S31–80. (Guideline)

Meltzer EO, Hamilos DL, Hadley JA, et al. Rhinosinusitis: establishing definitions for clinical research and patient care. *J Allergy Clin Immunol* 2004;114:s155-212. (Guideline)

Meltzer EO, Malmstrom K, Lu S, et al. Concomitant montelukast and loratadine as treatment for seasonal allergic rhinitis: a randomized, placebo-controlled clinical trial. *J Allergy Clin Immunol* 2000;105:917-22. (High Quality Evidence)

Meltzer EO, Orgel A, Bronsky EA, et al. Ipratropium bromide aqueous nasal spray for patients with perennial allergic rhinitis: a study of its effect on their symptoms, quality of life, and nasal cytology. *J Allergy Clin Immunol* 1992;90:242-49. (High Quality Evidence)

Moore SH, LoGerfo J, Inui TS. Effect of a self-care book on physician visits: a randomized trial. *JAMA* 1980;243:2317-20. (High Quality Evidence)

Mossad SB, Macknin ML, Medendorp SV, et al. Zinc gluconate lozenges for treating the common cold: a randomized, double-blind, placebo-controlled study. *Ann Intern Med* 1996;125:81-88. (High Quality Evidence)

Mullarkey MF. Eosinophilic non-allergic rhinitis. *J Allergy Clin Immunol* 1988;82:941-49. (Low Quality Evidence)

Mygind N, Dirksen A, Johnsen NJ, et al. Perennial rhinitis: an analysis of skin testing, serum IgE, and blood and smear eosinophilia in 201 patients. *Clin Otolaryngol* 1978;3:189-96. (Low Quality Evidence)

Naclerio RM. Allergic rhinitis. *N Engl J Med* 1991;325:860-69. (Low Quality Evidence)

Nayak A, Langdon RB. Montelukast in the treatment of allergic rhinitis: an evidence-based review. *Drugs* 2007;67:887-901. (Systematic Review)

Nayak AS, Philip G, Lu S, et al. Efficacy and tolerability of montelukast alone or in combination with loratadine in seasonal allergic rhinitis: a multicenter, randomized, double-blind, placebo-controlled trial performed in the fall. *Ann Allergy Asthma Immunol* 2002;88:592-600. (High Quality Evidence)

Nelson WE, Behrman RE, Kleigman RM, et al, eds. Infections of the upper-respiratory tract. *In* Nelson's Textbook of Pediatrics, 14th ed. Philadelphia: W.B. Saunders, 1992;1187-93. (Low Quality Evidence)

Norman PS, Lichtenstein LM, Tignall J. The clinical and immunologic specificity of immunotherapy. *J Allergy Clin Immunol* 1978;61:370-77. (High Quality Evidence)

Norman PS, Van Metre TE Jr. The safety of allergenic immunotherapy. *J Allergy Clin Immunol* 1990;85:522-25. (Low Quality Evidence)

Ophir D, Elad Y. Effects of steam inhalation on nasal patency and nasal symptoms in patients with the common cold. *Am J Otolaryngol* 1987;8:149-53. (High Quality Evidence)

Orgel HA, Meltzer EO, Kemp JP, et al. Comparison of intranasal cromolyn sodium, 4% and oral terfenadine for allergic rhinitis: symptoms, nasal cytology, nasal ciliary clearance, and rhinomanometry. *Ann Allergy* 1991;66:237-44. (High Quality Evidence)

Paradise JL. Etiology and management of pharyngitis and pharyngotonsillitis in children: a current review. *Ann Otol Rhinol Laryngol* 1992;101:51-57. (Low Quality Evidence)

Paradise JL, Bluestone CD, Bachman RZ, et al. Efficacy of tonsillectomy for recurrent throat infection in severely affected children: results of parallel randomized and nonrandomized clinical trials. *N Engl J Med* 1984;310:674-83. (High Quality Evidence)

Paul IM, Beiler J, McMonagle A, et al. Effect of honey, dextromethorphan, and no treatment on nocturnal cough and sleep quality for coughing children and their parents. *Arch Pediatr Adolesc Med* 2007;161:1140-46. (Low Quality Evidence)

Peter G. Streptococcal pharyngitis: current therapy and criteria for evaluation of new agents. *Clin Infect Dis* 1992;14(Suppl 2):S218-23. (Low Quality Evidence)

Petersen K, Phillips RS, Soukup J, et al. The effect of erythromycin on resolution of symptoms among adults with pharyngitis not caused by group A streptococcus. *J Gen Intern Med* 1997;12:95-101. (High Quality Evidence)

Pipkorn U, Proud D, Lichtenstein LM, et al. Inhibition of mediator release in allergic rhinitis by pretreatment with topical glucocorticosteroids. *N Eng J Med* 1987;316:1506-10. (High Quality Evidence)

Pruitt AW. Rational use of cold and cough preparations. *Pediatr Ann* 1985;14:289-91. (Low Quality Evidence)

Pullerits T, Praks L, Skoogh BE, et al. Randomized placebo-controlled study comparing a leukotriene receptor antagonist and a nasal glucocorticoid in seasonal allergic rhinitis. *Am J Respir Crit Care Med* 1999;159:1814-18. (High Quality Evidence)

Ramaekers JG, Uiterwijk MMC, O'Hanlon JF. Effects of loratadine and cetirizine on actual driving and psychometric test performance, and EEG during driving. *Eur J Clin Pharmacol* 1992;42:363-69. (High Quality Evidence)

Randolph MF, Gerber MA, DeMeo KK, et al. Effect of antibiotic therapy on the clinical course of streptococcal pharyngitis. *J Pediatr* 1985;106:870-75. (High Quality Evidence)

Rantanen T, Arvilommi H. Double-blind trial of doxicycline in acute maxillary sinusitis. *Acta Otolaryng* 1973;76:58-62. (Low Quality Evidence)

Raphael GD, Baraniuk JN, Kaliner MA. How and why the nose runs. *J Allergy Clin Immunol* 1991;87:457-67. (Low Quality Evidence)

Roberts CR, Imrey PB, Turner JD, et al. Reducing physician visits for colds through consumer education. *JAMA* 1983;250:1986-89. (High Quality Evidence)

Roberts DN, Hampal S, East CA, et al. The diagnosis of inflammatory sinonasal disease. *J Laryngol Otol* 1995;109:27-30. (Low Quality Evidence)

Salerno SM, Jackson JL, Berbano EP. Effect of oral pseudoephedrine on blood pressure and heart rate: a meta-analysis. *Arch Intern Med* 2005;165:1686-94. (Meta-analysis)

Sandora TJ, Taveras EM, Shih M, et al. A randomized, controlled trial of a multifaceted intervention including alcohol-based hand sanitizer and hand-hygiene education to reduce illness transmission in the home. *Pediatrics* 2005;116:587-94. (High Quality Evidence)

Schenkel EJ, Skoner DP, Bronsky EA, et al. Absence of growth retardation in children with perennial allergic rhinitis after one year of treatment with mometasone furoate aqueous nasal spray. *Pediatrics* 2000;105:1-7. (High Quality Evidence)

Schlager TA, Hayden GA, Woods WA, et al. Optical immunoassay for rapid detection of group A B-hemolytic streptococci. *Arch Pediatr Adolesc Med* 1996;150:245-48. (Low Quality Evidence)

Schmitt BD. Fever in childhood. *Pediatrics* 1984;74(suppl):929-36. (Low Quality Evidence)

Schmitt BD. Instructions for pediatric patients. *In* Your Child's Health. Philadelphia: W.B. Saunders, 1992;55-56. (Low Quality Evidence)

Schoenwetter W, Lim J. Comparison of intranasal triamcinolone acetonide with oral loratadine for the treatment of patients with seasonal allergic rhinitis. *Clin Thera* 1995;17:479-93. (High Quality Evidence)

Schroeder K, Fahey T. Over-the-counter medications for acute cough in children and adults in ambulatory settings. *The Cochrane Library* 2007, Issue 4. (Systematic Review)

Seppälä H, Lahtonen R, Ziegler T, et al. Clinical scoring system in the evaluation of adult pharyngitis. *Arch Otolaryngol Head Neck Surg* 1993;119:288-91. (Low Quality Evidence)

Shapiro GG. Diagnostic methods for assessing the patient with possible allergic disease. *In* Allergic Diseases from Infancy to Adulthood. Bierman CW, Pearlman DS, eds. WB Saunders, 1988;224-38. (Low Quality Evidence)

Simon HB. Pulmonary infections. *Sci Am Med* 1997;7:1-4. (Low Quality Evidence)

Simons FER, Reggin JD, Roberts JR, et al. Benefit/risk ratio of the antihistamines (H_1-receptor antagonists) terfenadine and chlorpheniramine in children. *J Pediatr* 1994a;124:979-83. (High Quality Evidence)

Simons FER, Simons KJ. The pharmacology and use of H1-receptor–antagonist drugs. *N Eng J Med* 1994b;330:1663-70. (Low Quality Evidence)

Sinus and Allergy Health Partnership. Antimicrobial treatment guidelines for acute bacterial rhinosinusitis. *Otolaryngol Head Neck Surg* 2004;130:S1-S45. (Guideline)

Skoner D. Update of growth effects of inhaled and intranasal corticosteroids. *Curr Opin Allergy Clin Immunol* 2002;2:7-10. (Low Quality Evidence)

Skoner DP, Rachelefsky GS, Meltzer EO, et al. Detection of growth suppression in children during treatment with intranasal beclomethasone dipropionate. *Pediatrics* 2000;105:1-7. (High Quality Evidence)

Smith MBH, Feldman W. Over-the-counter cold medications: a critical review of clinical trials between 1950 and 1991. *JAMA* 1993;269:2258-63. (Systematic Review)

Snellman LW, Stang HJ, Stang JM, et al. Duration of positive throat cultures for group A streptococci after initiation of antibiotic therapy. *Pediatrics* 1993;911:1166-70. (High Quality Evidence)

Snow V, Mottur-Pilson C, Hickner JM, et al. Principles of appropriate antibiotic use for acute sinusitis in adults. *Ann Intern Med* 2001;134:495-97. (Low Quality Evidence)

Soderberg-Warner ML. Nasal septal perforation associated with topical corticosteroid therapy. *J Pediatr* 1984;105:840-41. (Low Quality Evidence)

Soyka LF, Robinson DS, Lachant N, et al. The misuse of antibiotics for treatment of upper-respiratory tract infections in children. *Pediatrics* 1975;55:552-56. (Low Quality Evidence)

Sperber SJ, Hendley JO, Hayden FG, et al. Effects of naproxen on experimental rhinovirus colds: a randomized, double-blind, controlled trial. *Ann Intern Med* 1992;117:37-41. (High Quality Evidence)

Storms WW, Bodman SF, Nathan RA, et al. SCH 434: a new antihistamine/decongestant for seasonal allergic rhinitis. *J Allergy Clin Immunol* 1989;83:1083-90. (High Quality Evidence)

Sydnor A Jr., Gwaltney JM, Cocchetto DM, et al. Comparative evaluation of cefuroxime axetil and cefaclor for treatment of acute bacterial maxillary sinusitis. *Arch Otolaryngol Head Neck Surg* 1989;115:1430-33. (Low Quality Evidence)

Szilagyi PG. What can we do about the common cold? *Contemp Pediatr* 1990;7:23-49. (Low Quality Evidence)

Tanz RR, Poncher JR, Corydon KE, et al. Clindamycin treatment of chronic pharyngeal carriage of group A streptococci. *J Pediatr* 1991;119:123-28. (High Quality Evidence)

Tanz RR, Shulman ST, Barthel MJ, et al. Penicillin plus rifampin eradicates pharyngeal carriage of group A streptococci. *J Pediatrics* 1985;106:876-80. (High Quality Evidence)

Terry PE, Pheley A. The effect of self-care brochures on use of medical services. *JOM* 1993;35:422-26. (High Quality Evidence)

Turner RB, Bauer R, Woelkart K, et al. An evaluation of *echinacea angustifolia* in experimental rhinovirus infections. *N Engl J Med* 2005;353:341-48. (Low Quality Evidence)

Turner RB, Cetnarowski WE. Effect of treatment with zinc gluconate or zinc acetate on experimental and natural colds. *Clin Infect Dis* 2000;31:1202-08. (High Quality Evidence)

Tyrrell D, Barrow I, Arthur J. Local hyperthermia benefits natural and experimental common colds. *BMJ* 1989;298:1280-83. (High Quality Evidence)

Uhl JR, Adamson EA, Vetter CD, et al. Comparison of hightcycler PCR, rapid antigen immunoassay, and culture for detection of group A streptococci from throat swabs. *J of Clin Microbiology* 2003;41:242-49. (Low Quality Evidence)

van Buchem FL, Knottnerus JA, Schrijnemaekers VJJ, et al. Primary-care-based randomised placebo-controlled trial of antibiotic treatment in acute maxillary sinusitis. *Lancet* 1997;349:683-87. (High Quality Evidence)

Van Metre TE, Adkinson NF Jr, Amodio FJ, et al. A comparative study of the effectiveness of the Rinkel method and the current standard method of immunotherapy for ragweed pollen hay fever. *J Allergy Clin Immunol* 1980;66:500-13. (High Quality Evidence)

Varney VA, Gaga M, Frew AJ, et al. Usefulness of immunotherapy in patients with severe summer hay fever uncontrolled by antiallergic drugs. *BMJ* 1991;302:265-69. (High Quality Evidence)

Vermeeren A, O'Hanlon JF. Fexofenadine's effects, alone and with alcohol, on actual driving and psychomotor performance. *J Allergy Clin Immunol* 1998;101:306-11. (High Quality Evidence)

Vuurman EFPM, van Veggel LMA, Uiterwijk MMC, et al. Seasonal allergic rhinitis and antihistamine effects on children's learning. *Ann Allergy* 1993;71:121-26. (Low Quality Evidence)

Wald ER, Chiponis D, Ledesma-Medina J. Comparative effectiveness of amoxicillin and amoxicillin-clavulanate potassium in acute paranasal sinus infections in children: a double-blind placebo-controlled trial. *Pediatrics* 1986;77:795-800. (High Quality Evidence)

Wald ER, Dashefsky B, Byers C, et al. Frequency and severity of infections in day care. *J Pediatr* 1988;112:540-46. (Low Quality Evidence)

Wald ER, Reilly JS, Casselbrant M, et al. Treatment of acute maxillary sinusitis in childhood: a comparative study of amoxicillin and cefaclor. *J Pediatr* 1984;104:297-302. (High Quality Evidence)

Wallace DV, Dykewicz MS, Bernstein DI, et al. The diagnosis and management of rhinitis: an updated practice parameter. *J Allergy Clin Immunol* 2008;122:S1-S84. (Guideline)

Walsh JK, Muehlbach MJ, Schweitzer PK. Simulated assembly line performance following ingestion of cetirizine or hydroxyzine. *Ann Allergy* 1992;69:195-200. (High Quality Evidence)

Walson PD. Coughs and colds. *Pediatrics* 1984;74(suppl):937-40. (Low Quality Evidence)

Weiler JM, Bloomfield JR, Woodworth GG, et al. Effects of fexofenadine, diphenhydramine, and alcohol on driving performance: a randomized, placebo-controlled trial in the Iowa Driving Simulator. *Ann Intern Med* 2000;132:354-63. (High Quality Evidence)

Weiner JM, Abramson MJ, Puv RM. Intranasal corticosteroids versus oral H1 receptor antagonists in allergic rhinitis: systematic review of randomised controlled trials. *BMJ* 1998;317:1624-29. (Systematic Review)

Welsh PW, Stricker WE, Chu-Pin C, et al. Efficacy of beclomethasone nasal solution, flunisolide, and cromolyn in relieving symptoms of ragweed allergy. *Mayo Clin Proc* 1987;62:125-34. (High Quality Evidence)

Wheeler PW, Wheeler SF. Vasomotor rhinitis. *Am Fam Phys* 2005;72:1057-62. (Guideline)

Willett L, Carson JL, Williams JW. Current diagnosis and management of sinusitis. *J Gen Intern Med* 1994;9:38-45. (Low Quality Evidence)

Williams Jr JW, Aguilar C, Makela M, et al. Antibiotics for acute maxillary sinusitis (Cochrane Review). *In* The Cochrane Library, Issue 4, 2000. Oxford: Update Software. (Systematic Review)

Williams JW, Simel DL. Does this patient have sinusitis? Diagnosing acute sinusitis by history and physical examination. *JAMA* 1993;270:1242-46. (Low Quality Evidence)

Williams JW, Simel DL, Roberts L, et al. Clinical evaluation for sinusitis: making the diagnosis by history and physical examination. *Ann Intern Med* 1992;117:705-10. (Low Quality Evidence)

Williamson IG, Rumsby K, Benge S, et al. Antibiotics and topical nasal steroid for treatment of acute maxillary sinusitis: a randomized controlled trial. *JAMA* 2007;298:2487-96. (High Quality Evidence)

Wilson AM, Orr LC, Sims EJ, Lipworth BJ. Effects of monotherapy with intra-nasal corticosteroid or combined oral histamine and leukotriene receptor antagonists in seasonal allergic rhinitis. *Clinical and Experimental Allergy* 2000;31:61-68. (High Quality Evidence)

Wilson JF, Turner BJ, Williams S, Taichman D. In the clinic: acute sinusitis. *Ann Intern Med* 2010;153:ITC31-15. (Low Quality Evidence)

Winther B, Gwaltney JM. Therapeutic approach to sinusitis: anti-infectious therapy as the baseline of management. *Otolaryngol Head Neck Surg* 1990;103:876-78. (Low Quality Evidence)

Wolthers OD, Pedersen S. Short-term growth in children with allergic rhinitis treated with oral antihistamine, depot and intranasal glucocorticosteroids. *Acta Paediatr* 1993;82:635-40. (High Quality Evidence)

Wood RA, Chapman MD, Adkinson Jr NF, Eggleston PA. The effect of cat removal on allergen content in household-dust samples. *J Allergy Clin Immunol* 1989;83:730-34. (Low Quality Evidence)

Wood RW, Tompkins RK, Wolcott BW. An efficient strategy for managing acute respiratory illness in adults. *Ann Intern Med* 1980;93:757-63. (Decision Analysis)

Zapka J, Averill BW. Self care for colds: a cost-effective alternative to upper-respiratory infection management. *AJPH* 1979;69:814-16. (Cost-Effectiveness Analysis)

Appendix A – Rhinitis Triggers

Allergic Triggers:

Pollen (tree, grass, weed)

Molds

House dust mite

Animal dander

Cockroaches

Foods (rarely cause rhinitis)

Non-allergic triggers:

Smoke

Fumes, such as from cleaning solutions, pool chlorine, car exhaust or other chemicals

Strong odors, such as perfumes, hair sprays and some cleaners

Decongestant nasal sprays if used regularly longer than three to five days in a row

Pregnancy/hormones (including birth control pills)

Medications (particularly antihypertensive agents)

Strong odors

Cold air and sudden temperature changes

Food, especially spicy foods

Alcohol

Bright light

Emotional upset

Snorting or inhaling illicit drugs or substances

Appendix B – Patient Algorithm and Self-Care Measures

If you feel your symptoms are urgent or pertaining to an emergency, please contact your clinician immediately.

Respiratory Illness Self-Care Measures

Common Cold Self-Care Measures

- Hand washing or use of hand sanitizers is recommended to prevent the spread of the common cold
- **Comfort measures**
  - Steam or mist inhalation
  - Nasal irrigation
  - Nasal suction for infants less than three months of age with a bulb syringe
  - Consume extra fluids
  - Honey (not recommended for children under one year, due to risk of botulism)
  - Elevate head of bed
  - Get adequate rest
  - Salt water gargle for sore throat
  - Use hard candy or throat lozenge (not recommended for children four and under)
- **Infant and toddler cold prevention recommendations**
  - Discourage visitors who have a cold, fever, or contagious disease
  - Prevent sharing of toys and pacifier with children who have a cold
  - Ask visitors to wash their hands before holding baby
  - Continued breastfeeding is encouraged, due to increased protection for babies from infection

Strep Throat Self-Care Measures

- **Comfort Measures**
  - Take acetaminophen or ibuprofen. (Aspirin is not recommended for children or teenagers due to the increased risk of Reye's syndrome)
  - Gargle with warm salt water
  - Use hard candy or throat lozenge (not recommended for children four and under)
  - Eat soft foods
  - Drink cool or warm liquids
  - Consume flavored frozen desserts (such as popsicles or frozen fruit bars)

Allergen Self-Care Measures

- **Comfort Measures**
  - Avoid identified allergens
  - Avoid cigarette smoke, and avoid irritants such as smoke and perfume
  - Over-the-counter antihistamines can be taken

- Nasal saline irrigation
- Increased fluids

Sinus Infection Self-Care Measures

- **Comfort Measures**
  - Increased fluids (recommended 6-10 glasses of liquid a day to thin mucus)
  - Steamy showers or increase humidity in homes
  - Apply warm facial packs for 5-10 minutes three or more times per day
  - Saline irrigation (saline nasal drops, spray to thin mucus)
  - Over-the-counter decongestants can be taken (antihistamines should be avoided)
  - Get adequate rest
  - Elevate head of bed
  - Avoid cigarette smoke and extremely cool or dry air

What is considered a fever and when to seek medical attention:

Adults

Body temperature cycles through the day, typically the low point occurs early morning (6 a.m.) and the typical peak occurs in late afternoon (4-6 p.m.). The maximum normal temperature in the morning is 98.9ºF and maximum normal temperature at 4 p.m. is 99.9ºF. Temperatures above these levels at these times of day are considered fevers.

Elderly

The elderly may have lower baseline temperatures when healthy and are not as likely to develop a fever in response to infections. Increased body temperature can increase the body's need for oxygen.

When medical attention should be sought:

For those with underlying conditions such as lung disease or heart disease fever can have added consequences. In general, fever needs to be evaluated and treated in the context of other symptoms. Most treatment is directed at patient comfort. **Extremely high fevers (termed hyperpyrexia) with temperature over 105.8ºF can occur in the setting of severe infections or bleeding into the brain. Temperatures above this range can result in damage to neuronal tissue. This high a fever, though rare, is a medical emergency and requires prompt treatment.**

ICSI has long had a policy of transparency in declaring potential conflicting and competing interests of all individuals who participate in the development, revision and approval of ICSI guidelines and protocols.

In 2010, the ICSI Conflict of Interest Review Committee was established by the Board of Directors to review all disclosures and make recommendations to the board when steps should be taken to mitigate potential conflicts of interest, including recommendations regarding removal of work group members. This committee has adopted the Institute of Medicine Conflict of Interest standards as outlined in the report, Clinical Practice Guidelines We Can Trust (2011).

Where there are work group members with identified potential conflicts, these are disclosed and discussed at the initial work group meeting. These members are expected to recuse themselves from related discussions or authorship of related recommendations, as directed by the Conflict of Interest committee or requested by the work group.

The complete ICSI policy regarding Conflicts of Interest is available at http://bit.ly/ICSICOI.

Funding Source

The Institute for Clinical Systems Improvement provided the funding for this guideline revision. ICSI is a not-for-profit, quality improvement organization based in Bloomington, Minnesota. ICSI's work is funded by the annual dues of the member medical groups and five sponsoring health plans in Minnesota and Wisconsin. Individuals on the work group are not paid by ICSI but are supported by their medical group for this work.

ICSI facilitates and coordinates the guideline development and revision process. ICSI, member medical groups and sponsoring health plans review and provide feedback but do not have editorial control over the work group. All recommendations are based on the work group's independent evaluation of the evidence.

Disclosure of Potential Conflicts of Interest

William Adams (Work Group Member)
ICSI Patient Advisory Council Member, ICSI
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: None
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Greg Anderson, MD (Work Group Member)
Physician, Family Medicine
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: None
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Ann Godfrey (Work Group Member)
ICSI Patient Advisory Council Member, ICSI
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: None
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Andrea Gravley, RN, MAN, CPNP (Work Group Member)
Nurse Practitioner, Pediatrics, South Lake Pediatrics
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: ICSI Preventive Services Guideline
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Peter Marshall, Pharm D (Work Group Member)
Pharmacist, HealthPartners HealthPlan, Pharmacy Services
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: ICSI Diagnosis and Treatment of Venous Thromboembolism
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Mona Nesse, RN, CNP (Work Group Member)
Nurse Practitioner, Family Medicine, Stillwater Medical Group and Lakeview Hospital
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: None
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Sonja Short, MD (Work Group Member)
Physician, Internal Medicine and Pediatrics, Fairview Health Services-Eagan Clinic
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: None
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Leonard Snellman, MD (Work Group Leader)
Physician, Pediatrics, HealthPartners Medical Group and Regions Hospital
National, Regional, Local Committee Affiliations: None
Guideline Related Activities: ICSI Preventive Services Guideline
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

All ICSI documents are available for review during the revision process by member medical groups and sponsors. In addition, all members commit to reviewing specific documents each year. This comprehensive review provides information to the work group for such issues as content update, improving clarity of recommendations, implementation suggestions and more. The specific reviewer comments and the work group responses are available to ICSI members at http://bit.ly.RespIll0113.

The ICSI Patient Advisory Council meets regularly to respond to any scientific document review requests put forth by ICSI facilitators and work groups. Patient advisors who serve on the council consistently share their experiences and perspectives in either a comprehensive or partial review of a document, and engaging in discussion and answering questions. In alignment with the Institute of Medicine's triple aims, ICSI and its member groups are committed to improving the patient experience when developing health care recommendations.

Acknowledgements

ICSI Patient Advisory Council

The work group would like to acknowledge the work done by the ICSI Patient Advisory Council in reviewing the Diagnosis and Treatment of Respiratory Illness in Children and Adults and thank them for their input into the patient algorithm and self-care measures.

Invited Reviewers

During this revision, the following groups reviewed this document. The work group would like to thank them for their comments and feedback.

CenraCare, St. Cloud, MN
HealthPartners Health Plan, Minneapolis, MN
Lakeview Clinic, Waconia, MN
Marshfield Clinic, Marshfield, WI
Mayo Clinic, Rochester, MN
Medica, Hopkins, MN
South Lake Pediatrics, Minnetonka, MN

Document Drafted Oct – Nov 2006
First Edition Feb 2007
Second Edition Feb 2008
Third Edition Jan 2011
Fourth Edition Begins Feb 2013

Released in January 2013 for Fourth Edition.
The next scheduled revision will occur within 24 months.

Original Work Group Members

Greg Anderson, MD
Family Practice
Mayo Clinic

William Avery, DO
ENT
Sioux Valley Hospitals & Health Systems

Bruce Cunningham, DO
Family Practice, Work Group Leader
Family HealthServices MN

David Graft, MD
Allergy
Park Nicollet Health Services

Teresa Hunteman, RRT, CPHQ
Measurement/Implementation Advisor
ICSI

Jeffrey Jenkins, MD
Family Practice
Sioux Valley Hospitals & Health Systems

Heather Krueger, MD
Family Practice
Quello Clinic, Ltd.

Barbara Malone, MD
ENT
Midwest ENT

Melissa Marshall, MBA
Facilitator
ICSI

Peter Marshall, PharmD
Pharmacy
HealthPartners

Julie White, RN
Nursing
HealthPartners Medical Group

Document History

In October 2006, a merger of four ICSI guidelines began in order to create the current guideline, Diagnosis and Treatment of Respiratory Illness in Children and Adults. The documents merged were Acute Pharyngitis, last released in 2005; Acute Sinusitis, and Viral Upper Respiratory Infections, both last released in 2004; and Chronic Rhinitis, last released in 2003.

Contact ICSI at:
8009 34th Avenue South, Suite 1200; Bloomington, MN 55425; (952) 814-7060; (952) 858-9675 (fax)
Online at http://www.ICSI.org

ICSI Document Development and Revision Process

Overview

Since 1993, the Institute for Clinical Systems Improvement (ICSI) has developed more than 60 evidence-based health care documents that support best practices for the prevention, diagnosis, treatment or management of a given symptom, disease or condition for patients.

Audience and Intended Use

The information contained in this ICSI Health Care Guideline is intended primarily for health professionals and other expert audiences.

This ICSI Health Care Guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients and families are urged to consult a health care professional regarding their own situation and any specific medical questions they may have. In addition, they should seek assistance from a health care professional in interpreting this ICSI Health Care Guideline and applying it in their individual case.

This ICSI Health Care Guideline is designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and is not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition.

Document Development and Revision Process

The development process is based on a number of long-proven approaches and is continually being revised based on changing community standards. The ICSI staff, in consultation with the work group and a medical librarian, conduct a literature search to identify systematic reviews, randomized clinical trials, meta-analysis, other guidelines, regulatory statements and other pertinent literature. This literature is evaluated based on the GRADE methodology by work group members. When needed, an outside methodologist is consulted.

The work group uses this information to develop or revise clinical flows and algorithms, write recommendations, and identify gaps in the literature. The work group gives consideration to the importance of many issues as they develop the guideline. These considerations include the systems of care in our community and how resources vary, the balance between benefits and harms of interventions, patient and community values, the autonomy of clinicians and patients and more. All decisions made by the work group are done using a consensus process.

ICSI's medical group members and sponsors review each guideline as part of the revision process. They provide comment on the scientific content, recommendations, implementation strategies and barriers to implementation. This feedback is used by and responded to by the work group as part of their revision work. Final review and approval of the guideline is done by ICSI's Committee on Evidence-Based Practice. This committee is made up of practicing clinicians and nurses, drawn from ICSI member medical groups.

Implementation Recommendations and Measures

These are provided to assist medical groups and others to implement the recommendations in the guidelines. Where possible, implementation strategies are included that have been formally evaluated and tested. Measures are included that may be used for quality improvement as well as for outcome reporting. When available, regulatory or publicly reported measures are included.

Document Revision Cycle

Scientific documents are revised every 12-24 months as indicated by changes in clinical practice and literature. ICSI staff monitors major peer-reviewed journals every month for the guidelines for which they are responsible. Work group members are also asked to provide any pertinent literature through check-ins with the work group midcycle and annually to determine if there have been changes in the evidence significant enough to warrant document revision earlier than scheduled. This process complements the exhaustive literature search that is done on the subject prior to development of the first version of a guideline.