AAP Continuing Education Calendar

1990
December 7-9
Pediatric Update
Williamsburg, Virginia

1991
January 10-13
Current Concepts in Pediatrics
Vail, Colorado

February 15-17
Fourth Annual Pediatrics in Progress
San Francisco, California

April 9-14
Pediatrics 1991
Kauai/Maui, Hawaii

May 3-5
New York, New York

May 24-26
Pediatric Advances
Kiawah Island, South Carolina

June 21-23
Clinical Pediatrics
Washington, DC

October 26-31
Annual Meeting
New Orleans, Louisiana

These programs feature subject matter which is coordinated with the PREP curriculum and are eligible for PREP credits.

For further information, contact: CME, Department of Education, American Academy of Pediatrics, PO Box 927, Elk Grove Village, IL 60009-0927. (800) 433-9016. In Illinois (800) 421-0589.

American Academy of Pediatrics
The American Board of Pediatrics®

PRCP
Program for Renewal of Certification in Pediatrics

Guides for Record Review

Acute Pharyngitis

Supplement to Pediatrics in Review
This guide is one of a series of guides prepared by the American Board of Pediatrics as an integral part of the record review required for renewal of certification in general comprehensive pediatrics. Their purpose is to provide the pediatrician with criteria for assessing patient records dealing with specific problems. Important elements to be included in the record appear in the margins; those printed in italics are important under certain circumstances. Please note that these guides do not purport to articulate standards of care. They are designed solely to address record keeping issues.

The guides focus on the elements of the history and physical examination relevant to specific problems and are not meant to discourage a more thorough history and physical examination as appropriate for the patient and the particular circumstances.

The guides will be updated periodically. Because of rapid changes in knowledge about drugs and their availability, drugs and dosages included in these guides should be verified in current sources.

A table of international units is included in each guide.

Major Contributors to this Guide were:

Don P. Amren, M.D.
Private Practitioner
Minneapolis, Minnesota

John L. Green, M.D.
Private Practitioner
Rochester, New York

Thomas L. W. Roe, M.D.
Private Practitioner
Eugene, Oregon

Medical Editor: Joseph M. Garfunkel, M.D.

Technical Editor: Elaine A. Brown

Distribution of this guide is made possible by the American Academy of Pediatrics through a license agreement with the American Board of Pediatrics.
INTRODUCTION

Sore throat is one of the most common complaints of childhood, and a frequent reason for consulting the physician. Age is an important factor in providing a clue to the etiology of acute pharyngitis (hereinafter referred to as pharyngitis) because the clinical presentation and the likely etiologic agent tend to differ at various ages.\(^1\) Pharyngitis in infants and children younger than 3 years of age is most likely caused by a virus, primarily adenovirus or enterovirus. In that age group, streptococcal infection would more likely present with rhinitis, rather than as pharyngotonsillitis. In the older child or adolescent, symptoms of streptococcal pharyngitis might include only a painful pharynx, with minimal other findings. Infectious mononucleosis also becomes an important consideration in this age group. In sexually active adolescents, gonococcal infections must also be considered. Moreover, the late complications of the most clinically significant pharyngitis, that caused by group A B-hemolytic streptococcus, also differ according to the age of the patient; acute rheumatic fever is uncommon before 5 years of age. Although the patient’s gender and race are not important considerations in this situation, this information is an important part of every patient’s chart.

Because antibiotic therapy is frequently used in the treatment of pharyngitis, and antipyretic or other medications may be used for symptomatic relief, it is essential that any drug allergies be prominently noted on the patient’s chart. The immunization history is also essential because of the possibility of diphtheria in inadequately immunized children.

This guide will be confined to pharyngitis in children 3 years of age or older.

HISTORY

The history is often very helpful in the diagnosis of pharyngitis, particularly in differentiating streptococcal from viral pharyngitis.\(^3\) Streptococcal pharyngitis typically has an acute onset, and may be associated with fever, dysphagia, and headache. The child may complain of earache, especially when swallowing; abdominal pain and vomiting are also common. Swollen, tender anterior cervical lymph nodes may be noted. Parents may note that the breath smells fetid, or that the child talks as though he or she has “marbles in the throat.” Conversely, significant symptoms of clear rhinorrhea, cough, hoarseness, conjunctivitis, or “scratchy” throat without dysphagia reduce the likelihood of a streptococcal etiology.

A nonspecific rash may occur in the course of pharyngitis, but a history of streptococcal-type disease, such as impetigo, excoriated nares, paronychia, or perianal cellulitis, may provide a clue to the diagnosis. It is helpful to inquire about exposure to specific illnesses, particularly if an outbreak of known cause is occurring. If more than one member of a family already has a streptococcal illness, the odds increase that the patient has streptococcal pharyngitis. Streptococcal infections are found commonly in the winter and spring, whereas enteroviral infections are more common during summer and fall.\(^3\) If the child has not been adequately immunized, the possibility of diphtheria must be kept in mind. Although many sore throats are the result of viral or bacterial infection, it is important to remember that some are related to other factors including mouth breathing because of nasal obstruction or allergy, smoking of tobacco or marijuana, and inadequately humidified air.\(^3\) Because of the special problems associated with persistence, relapse, or recurrence of streptococcal disease, it is important to determine how long the sore throat has been present, how frequently sore throat has recurred, whether cultures have been done in the past, what treatment has been given, and for what duration.
**PHYSICAL FINDINGS**

The child’s temperature should be recorded to provide a baseline for future comparisons and as a guide to response to therapy. Very high fever (more than 40°C) is uncommon, but sometimes occurs with certain viral infections, such as coxsackie or herpetic disease. The oropharynx should be carefully examined for erythema, ulceration, exudate, petechiae, and enanthems. Although a tonsillar exudate is characteristic of streptococcal pharyngitis, it is not diagnostic. Infectious mononucleosis, adenovirus, and diphtheria are other causes of exudative pharyngitis. Extension of the exudate to the uvula indicates that diphtheria is likely. The presence or absence of the tonsils and their size and appearance should be noted, and the pharynx should be assessed for evidence of swelling or asymmetry such as displacement of the uvula that may indicate the possibility of a peritonsillar or retropharyngeal abscess. The presence of rhinitis or conjunctivitis increases the likelihood of a nonstreptococcal cause of the pharyngitis.

The neck should be examined for enlarged tender cervical lymph nodes, especially at the angle of the mandible, which are characteristic of streptococcal disease. Nodes in other locations indicate the need for a search for generalized lymphadenopathy or hepatosplenomegaly. Tender posterior cervical nodes indicate nonstreptococcal illness. Particularly in the presence of hoarseness or cough, a chest examination is warranted to rule out lower respiratory and heart disease. Important clues may be derived from examination of the skin. The characteristic rashes of scarlet fever, coxsackievirus infections, infectious mononucleosis, or gonococcal meningitis are noteworthy. Erythema marginatum indicates the likelihood of acute rheumatic fever. Paronychia, vaginitis, impetigo, perianal cellulitis, or desquamation are clues to streptococcal disease.

**LABORATORY STUDIES**

For practical purposes, the only laboratory studies important in the diagnosis of acute pharyngitis are aimed at identification of group A β-hemolytic streptococci. The direct culture of a throat swab onto a fresh sheep blood agar plate with incubation overnight remains the “gold standard” for diagnosis. It is important that the swab be applied directly to the tonsillar surface or bed, preferably in a circular, wiping motion, and to the posterior pharynx. Noncotton swabs are preferred. Not all hemolytic streptococci are of group A. Identification of the strain as group A is important from the standpoint of identification of risk of rheumatic fever. The use of a bacitracin disc will demonstrate selective inhibition by group A streptococci and may be especially useful if pharyngitis is persistent or recurrent.

The development of rapid diagnostic tests for streptococcal pharyngitis has provided means for making the diagnosis within minutes, thus avoiding the one-day delay needed for culture identification. This may have advantages in the very ill child, or when there are important social factors such as impending travel or the need to get the child back into day care or school rapidly because of parental work schedules. In the face of a clinical illness compatible with streptococcal pharyngitis, the finding of a positive rapid diagnostic test may preclude the need for a culture, and justifies prompt treatment. Because the sensitivity of such tests varies from 70% to 95%, depending upon the personnel and the setting in which they are used, a negative test should always be followed by a culture. Moreover, the tests vary in accuracy, and pediatricians should be aware of those which have been subjected to adequate evaluation
and are of proven value, and those which have not. The least reliable commercially available kit depends upon an enzyme fluorescence procedure, whereas those using latex agglutination or enzyme immunoassay for antigen detection have acceptable specificity and sensitivity. It is important that personnel performing any test be well trained, that periodic evaluations of technique are made, and that quality control be assured by confirming all negative screening tests, and some positive ones, with cultures.

The leukocyte count and leukocyte morphology may be helpful in differentiating viral from bacterial illness, with values > 15,000/mm³ and a leftward shift being more typically found in bacterial disease. The differential cell count may also provide a clue to the diagnosis of infectious mononucleosis, which can be confirmed by specific serologic studies. A positive test for mononucleosis may not eliminate the need for a throat culture, because streptococcal disease may be concurrently present in patients with infectious mononucleosis. If clinical circumstances indicate the possibility of other bacterial illness, such as diphtheria or gonococcal infection, cultures on media appropriate for those organisms should be done. As other rapid antigen tests (e.g., Chlamydia, adenovirus) are developed, they may be useful in certain circumstances to provide a rapid clue to etiology.

**TREATMENT**¹⁵⁻¹⁸

Streptococcal disease routinely requires treatment, and the discussion of specific therapy will be confined to infections by that organism. Usually, treatment should not be instituted until the diagnosis of streptococcal infection has been confirmed by culture or by a rapid antigen test. A delay of one day to provide bacteriologic confirmation is not harmful, may provide some time for the development of type-specific antibodies, and may reduce the carrier state. However, with an acutely ill or toxic-appearing child in the face of a known outbreak of streptococcal disease and/or exposure to a proven streptococcal infection, early treatment might be considered when the clinical history and findings on physical examination are typical. A classic scarlatiniform rash also justifies early treatment, but a throat culture should always be done to confirm the diagnosis because a similar rash can be caused by a staphylococcal infection.

An antibiotic regimen that assures at least ten days of effective tissue concentrations of an antibiotic active against group A β-hemolytic streptococci is necessary for optimum care of streptococcal pharyngitis. Penicillin continues to be the drug of choice for children. Penicillin V may be given orally two to three times daily for ten days. Benzathine penicillin alone or a combination of benzathine and procaine penicillin may be administered intramuscularly if compliance is thought to be a problem, or if the patient is vomiting and unable to retain oral medications. In the presence of concomitant otitis media, amoxicillin may be used instead of penicillin because Hemophilus influenzae is a common cause of otitis. In patients allergic to penicillin, erythromycin, cephalexin, or cefadroxil are appropriate substitutes. Ten days of therapy are necessary for eradication of the organism. Sulfonamides, trimethoprim with sulfamethoxazole, and tetracyclines are not appropriate therapy for streptococcal pharyngitis.

Most patients with streptococcal infection respond promptly to the administration of the appropriate antibiotic; in the interim, symptomatic therapy may be provided to alleviate symptoms, reduce excessive fever, and maintain adequate hydration. Absence of clinical response within 24 to 36 hours after the initiation of appropriate antibiotic therapy suggests that the disease being treated is not streptococcal, or that compliance with treatment has been poor.
FOLLOW-UP EVALUATION\textsuperscript{15-18}

Although as many as 30\% of patients who receive ten days of appropriate penicillin therapy may continue to harbor streptococci in the pharynx, a second culture at the end of treatment is not routinely indicated unless the patient continues to be symptomatic. If clinical streptococcal pharyngitis develops soon after the completion of therapy, either relapse or recurrence is possible. The first concern is that the patient or family may not have been compliant with therapy, and, in this instance, benzathine penicillin may be indicated. If relapse is considered likely, a second course of treatment should be given. The chance of eradicating the streptococcus may be increased if an antibiotic other than penicillin V is utilized. Effective therapy includes ampicillin plus sodium clavulanate, dicloxacillin, erythromycin or other macrolide antibiotics, a cephalosporin, or a second course of penicillin V with the addition of rifampin during the last four days of treatment.\textsuperscript{28} It is not necessary or desirable to treat an asymptomatic patient who has a persistently positive throat culture if the child is well. The carrier state is not harmful to the patient, and no treatment is indicated.

Recurrent streptococcal infections can be difficult to manage. In patients who have as many as three to five proven streptococcal infections over a six-month period, penicillin may be administered prophylactically, as for prevention of rheumatic fever. For children with such frequent, recurrent throat infections over a period of one or two years, tonsillectomy may be indicated, and will decrease the number of throat infections over the year or two following surgery.\textsuperscript{29,30} Tonsillectomy may also be indicated if the tonsils are chronically infected or enlarged to the point of causing abnormal speech or obstruction to swallowing, or when peritonsillar abscess has occurred. Parents must understand, however, that tonsillectomy will not prevent most acute episodes of pharyngitis, and they should be fully informed of the risks of general anesthesia and of the surgical procedure.

PATIENT EDUCATION

The most important educational guideline to be stressed to the parents of a child with streptococcal pharyngitis is the need for ten full days of therapy so that rheumatic fever is prevented. Antibiotics should be given as prescribed, with the doses spaced appropriately over 24 hours. Parents need reassurance that the carrier state does not warrant treatment, and should be informed of the risks of antibiotic therapy for patients with negative cultures. Administration of antibiotics to other children in the family who are symptomatic, for the same child with recurrent disease, or for other apparent infections should not be done without appropriate evaluation and cultures. The risk of infection to other family members should be explained, with emphasis on such measures as avoiding the use of common eating utensils or towels. Parents and teachers need to know that the child is not infectious 24 hours after starting antibiotic therapy, and that he or she may, if symptomatically well enough to do so, return to day care or school at that time.
### CONVERSION TABLE TO STANDARD INTERNATIONAL (SI) UNITS

#### I. Hematology
- **Hemoglobin** (g/dL) $\times 0.155$ = mmol/L
- **Platelets/mm$^3$** = count/μL = $10^9$ cells/L
- **Leukocytes/mm$^3$** = count/μL = $10^9$ cells/L
- **Erythrocytes/mm$^3$** = count/μL = $10^9$ cells/L
- **Hematocrit %** $\times 0.01$ = vol RBC/vol whole blood
- **Reticulocytes %** $\times 0.01$ = (1)

#### II. Blood Pressure
- mm Hg (torr) $\times 1.333$ = mbar

#### III. Blood Gases
- 1 mm Hg = 133.322 Pa
- PCO$_2$, mm Hg $\times 0.1333$ = kPa
- PO$_2$, mm Hg $\times 0.1333$ = kPa
- PCO$_2$, mm Hg $\times 0.01$ = kPa
- PO$_2$, mm Hg $\times 0.01$ = kPa

#### IV. Blood Chemistries
- **Acetone** mg/dL $\times 0.1722$ = mmol/L
- **Acetaminophen** μg/mL $\times 6.62$ = μmol/L
- **Albumin** g/dL $\times 144.9$ or g/L $\times 14.49$ = μmol/L
- **Aldosterone** ng/dL $\times 0.0277$ = nmol/L
- **Ammonia** mgN/dL $\times 0.714$ = mmol/L
- **Bicarbonate** mEq/L = mmol/L
- **Bilirubin** mg/dL $\times 17.10$ = μmol/L
- **Blood urea nitrogen** mg/dL $\times 0.357$ = mmol urea/L
- **Calcium** mg/dL $\times 0.25$ = mmol/L
- **Carotene** IU $\times 0.6$ = μg
- **or μg/dL $\times 0.01863$** = μmol/L
- **Ceruloplasmin** mg/dL $\times 0.0662$ = μmol/L
- **Chloride** mEq/L = mmol/L
- **Cholesterol** mg/dL $\times 0.0259$ = mmol/L
- **Complement component (C3)** mg/dL $\times 0.01$ = g/L
- **Copper** μg/dL $\times 1.157$ = μmol/L
- **Cortisol** μg/dL $\times 27.59$ = nmol/L
- **Creatine** mg/dL $\times 76.26$ = μmol/L
- **Creatinine** mg/dL $\times 88.40$ = μmol/L
- **Digoxin** ng/mL $\times 1.28$ = nmol/L

**Enzymes**
- **Alanine aminotransferase** (ALT, SGPT) U/L
- **Aldolase**
- **Sibley-Lehninger units/mL** = U/L
- **Amylase**
- **Somogyi units/dL** = U/L
- **Aspartate aminotransferase** (AST, SGOT) U/L
- **Creatine kinase (CK)** U/L
- **Phosphatase**
- **Bodansky units/dL** = U/L
- **King-Armstrong units/dL** = U/L
<table>
<thead>
<tr>
<th>Test</th>
<th>Unit</th>
<th>Conversion Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatty acids mg/dL x 0.0354</td>
<td></td>
<td>- mmol/L</td>
</tr>
<tr>
<td>Ferritin ng/mL x 1</td>
<td></td>
<td>- g/L</td>
</tr>
<tr>
<td>α1-Fetoprotein ng/mL x 1</td>
<td></td>
<td>- g/L</td>
</tr>
<tr>
<td>Fibrinogen mg/dL x 0.01</td>
<td></td>
<td>- nmol/L</td>
</tr>
<tr>
<td>Folic acid µg/dL x 22.65</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Glucose mg/dL x 0.0555</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Glyceral mg/dL x 0.1086</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Haptoglobin mg/dL x 0.01176</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>17-Hydroxycorticosteroids mg/d x 2.759</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Insulin IU x 0.04167</td>
<td></td>
<td>- g/L</td>
</tr>
<tr>
<td>or µU/mL x 1.0</td>
<td></td>
<td>- g/L</td>
</tr>
<tr>
<td>Iodine µg/dL x 78.8</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Iron µg/dL x 0.1791</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Iron binding capacity µg/dL x 0.1791</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>17-Ketosteroids mg/d x 3.467</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Lead µg/dL x 0.0483</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Lipoprotein mg/dL x 0.01</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Magnesium mg/dL x 0.4114</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>or mEq/L x 0.5</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Phosphorus mg/dL x 0.3229</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Potassium mEq/L</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Prednisone mg x 2.79</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Protein g/dL x 10</td>
<td></td>
<td>- g/L</td>
</tr>
<tr>
<td>Salicylate mg/dL x 0.0724</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Sodium mEq/L</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Theophylline µg/mL x 5.55</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Thyroid-stimulating hormone µU/mL x 1</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Thyroxine µg/dL x 12.87</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Transferrin mg/dL x 0.01</td>
<td></td>
<td>- g/L</td>
</tr>
<tr>
<td>Triglycerides mg/dL x 0.01</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Triiodothyronine ng/dL x 0.0154</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Urea nitrogen mg/dL x 0.357</td>
<td></td>
<td>- mol/L (urea/L)</td>
</tr>
<tr>
<td>Uric acid mg/dL x 59.48</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Vitamin A µg/dL x 0.0349</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Vitamin B6 pg/dL x 0.738</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Vitamin C mg/dL x 56.78</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Vitamin E µg/dL x 2.322</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Xylose mg/dL x 0.0667</td>
<td></td>
<td>- mol/L</td>
</tr>
<tr>
<td>Zinc µg/dL x 0.153</td>
<td></td>
<td>- mol/L</td>
</tr>
</tbody>
</table>

**V. Urine or Stool**

<table>
<thead>
<tr>
<th>Test</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coproporphyrin µg x 1.53</td>
<td>- nmol</td>
</tr>
<tr>
<td>Epinephrine µg/d x 5.458</td>
<td>- nmol/d</td>
</tr>
<tr>
<td>Vanilmandelic acid mg/d x 5.046</td>
<td>- nmol/d</td>
</tr>
<tr>
<td>Homovanillic acid mg/d x 5.489</td>
<td>- nmol/d</td>
</tr>
</tbody>
</table>

**VI. Energy**

<table>
<thead>
<tr>
<th>Test</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kcal x 4.1868</td>
<td>- KJ (Kilojoule)</td>
</tr>
<tr>
<td>Rad x 0.01</td>
<td>- Gy (Gray) (joule/kg)</td>
</tr>
</tbody>
</table>

**VII. Radionuclide Activity**

<table>
<thead>
<tr>
<th>Test</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curie (Ci) x 37</td>
<td>- GGq (Gigabecquerel)</td>
</tr>
</tbody>
</table>
REFERENCES


