Pharyngitis

Pharyngitis Guideline Team

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These guidelines should not be construed as including all proper methods of care or excluding other acceptable methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific clinical procedure or treatment must be made by the physician in light of the circumstances presented by the patient.

Patient population. Pediatric and adult.

Objectives. (1) Utilize symptoms and signs to determine pretest probability of disease. (2) In patients where Group A β-hemolytic streptococcal (GABHS) strep is suspected and a rapid strep screen is performed, confirm negative result with culture. (3) Reduce indiscriminate use of expensive antibiotics. (4) Assure adequate courses of antibiotic treatment.

Key points

- **General approach.**
  - Viral agents cause most cases of pharyngitis: 90% in adults, 60%-75% in children. *[evidence: C*]*
  - The prime reason to identify and treat GABHS pharyngitis is to decrease the risk of acute rheumatic fever *[A*]*. The endemic incidence of ARF is around 0.23-1.88 / 100,000.
  - Early treatment of GABHS can decrease the time a patient is symptomatic by 1/2 - 2 days from a typical 3 - 7 days *[A*]* and may decrease the period of contagiousness*[C*]*.
- **Diagnosis.**
  - Symptoms/signs can indicate the probability of GABHS for both adults and children.
    - Adults: a limited set of symptoms and signs can identify a low, intermediate, or high probability of having GABHS pharyngitis. *[C*]*
    - Children: a limited set of symptoms, signs and epidemiologic criteria can identify a high probability of having GABHS pharyngitis *[C*]*
  - Laboratory confirmation:
    - For adults: confirmation is most useful when GABHS is suspected but not highly probable; test those with intermediate probability. *[C*]*
    - For children: confirmation is most useful when GABHS cannot be excluded but is not highly probable. The threshold for testing is lower for children because the risk of non-suppurative complications is higher than for adults.
  - Throat culture is the "gold standard" for diagnosis *[C*]*. Strep screens identify GABHS more rapidly, but have variable sensitivity *[C*]*. Reserve rapid tests for patients with high probability of having GABHS, culture alone in all others will be more cost effective. In patients where GABHS is suspected and tested with a streptococcal antigen screen, a negative result should be confirmed by culture. *[C*]*
- **Treatment.**
  - Penicillin or amoxicillin are the drugs of choice in adults; if suspension is prescribed, amoxicillin is the drug of choice for children. Erythromycin for patients allergic to penicillin.
  - Antibiotic treatment must be continued for 10 days for penicillin *[D*]*, amoxicillin 1000 mg b.i.d. may be given for 6 days in adults *[A*]*.

Controversial areas:

- Based on a description over the phone, a clinician may decide to treat for GABHS *[C*]*:
  - an adolescent or adult with symptoms suggesting a high probability of GABHS pharyngitis.
  - a patient of any age with a family member with documented GABHS pharyngitis.

*** Levels of evidence for the most significant recommendations:**
A=randomized controlled trials; B=controlled trials, no randomization; C=observational trials; D=opinion of expert panel.

Clinical Background

Clinical Problem

Incidence: Pharyngitis, either as a part of a viral upper respiratory tract infection, or as the manifestation of group A beta hemolytic *Streptococcus* infection (GABHS), is a common presenting complaint in primary care. GABHS is the cause of 5–40% of sore throats.

The disease is much more common in the 5 – 15 age range (25%–40%) than in the 15 – 35 age range (10–20%) or in those age >35 (5%–6%). It is seasonal, with an increase seen in January to April. It occurs in epidemics in those living in close quarters such as dormitories or in the military.

(Continued on page 5)

Figure 1. Adult Pharyngitis

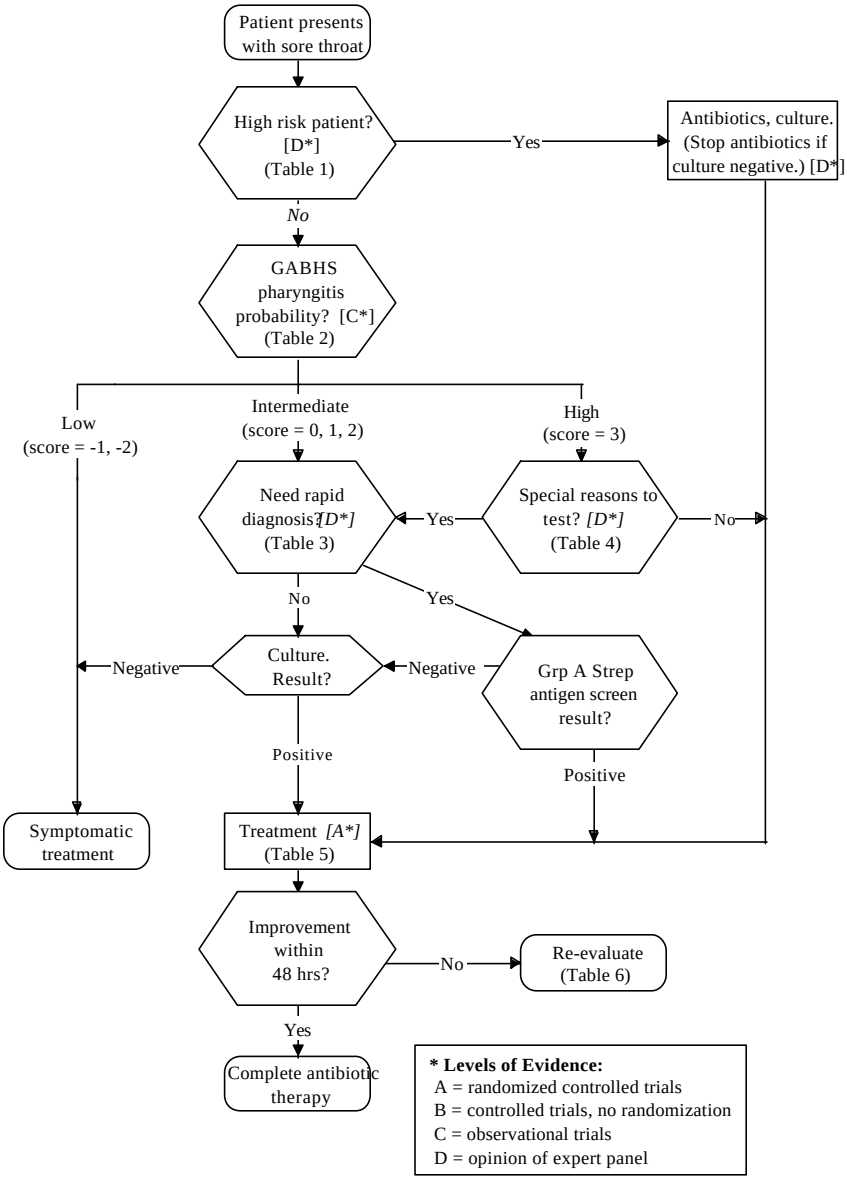

Table 1
High Risk Patients

- Past history of rheumatic fever, especially carditis/valvular disease
- Household contact with a history of rheumatic fever

Table 2
Symptoms and Signs of GABHS

Suggestive against GABHS: (score -1 each)

- Postnasal drainage
- Cough

Suggestive for GABHS: (score +1 each)

- <= 3 days of fever > 39º C (101.5º F)
- Tender anterior cervical nodes
- Enlarged tonsils with purulent exudates

Table 3
Advantages and Disadvantages of Strep Screens and Strep Cultures

Screen:

- Advantage:
  - Rapid positive result
  - On site diagnosis may aid in arranging work absence/day care.
  - Prompt treatment lowers risk of spread
- Disadvantage:
  - Less sensitive.
  - Higher average lab cost. Screen is $18 Majority are neg., requiring $18 culture.

Culture:

- Advantage:
  - Accurate positive and negative result.
  - Lower average lab cost, $18 for culture.
- Disadvantage:
  - Up to 3 day delay for result.
  - Logistics of reporting back results.
  - Delay in treatment for those testing pos.

Table 4
Special Reasons to Test

- Document index case to treat close contacts more rapidly
- Failure of standard therapy

Table 5
Preferred Treatment Regimens

Adolescents and adults:
Penicillin VK 500 mg bid-tid for 10 days
Amoxicillin 1000mg bid for 6 days
Benzathine penicillin G, IM
If penicillin allergic: Erythromycin
See Table 13 for alternatives & costs.

Table 6
Reasons for Failure of Response

- Peritonsillar or retropharyngeal abscess: REQUIRES a prompt ENT evaluation.
- Failure of antibiotic to eradicate Strep.
- Pharyngitis due to virus or other bacteria
- Compliance problem with medication

Figure 2. Pediatric Pharyngitis

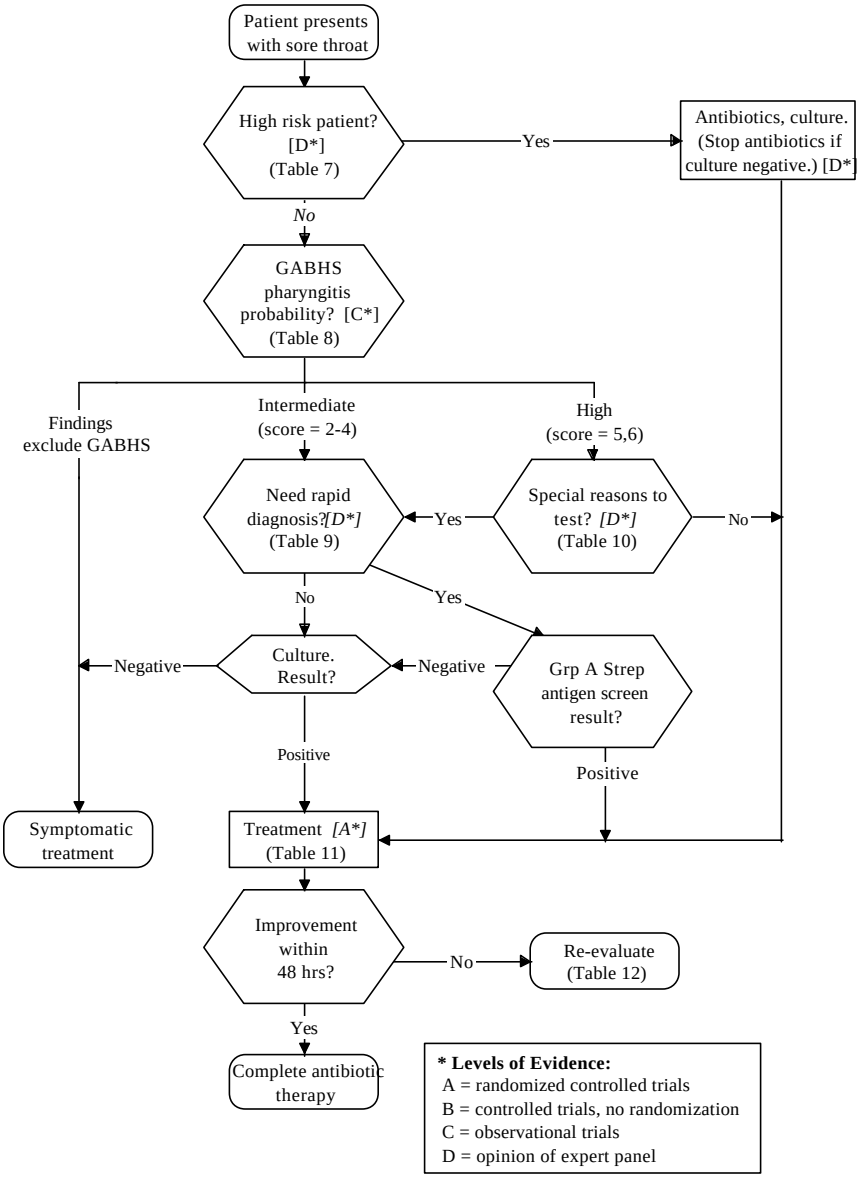

Table 7
High Risk Patients

- Past history of rheumatic fever, especially carditis/valvular disease
- Household contact with a history of rheumatic fever

Table 8
Symptoms and Signs of GABHS

Findings excluding GABHS

- Cough
- Rhinorrhea
- Conjunctivitis

If any one present, probably viral , not GABHS

Suggestive for GABHS

(For each of the following findings, score +1)

- Absence of cough, rhinorrhea, and conjunctivitis
- Fever at least 38.3 in past 24 hours
- Age is 5 – 15 years
- Tender anterior cervical nodes = 1 cm
- Erythema, swelling, or exudate of tonsils or pharynx
- Season is November – May

Probability of GABHS

Total score of 6 = 75%
Total score of 5 = 59%
Total score = 4 = < 50%

Table 9
Advantages and Disadvantages of Strep Screens and Strep Cultures

Screen:

- Advantage:
  - Rapid positive result
  - On site diagnosis may aid in arranging work absence/day care.
  - Prompt treatment lowers risk of spread
- Disadvantage:
  - Less sensitive.
  - Higher average lab cost. Screen is $18. Majority are neg., requiring $18 culture.

Culture:

- Advantage:
  - Accurate positive and negative result.
  - Lower average lab cost, $18 for culture.
- Disadvantage:
  - Up to 3 day delay for result.
  - Logistics of reporting back results.
  - Delay in treatment for those testing pos.

Table 10
Special Reasons to Test

- Document index case to treat close contacts more rapidly
- Failure of standard therapy

Table 11
Preferred Treatment Regimens

Pediatrics:
Amoxicillin 20-40 mg/kg/24 hr tid
(125 mg/5ml; 250 mg/5ml)
See Table 13 for alternatives and costs.

Table 12
Reasons for Failure of Response

- Peritonsillar or retropharyngeal abscess: REQUIRES a prompt ENT evaluation.
- Failure of antibiotic to eradicate Strep.
- Pharyngitis due to virus or other bacteria
- Compliance problem with medication

Table 13. Examples of Antibiotic Treatment [a] for Group A Streptococcal Pharyngitis

DRUG	DOSE	COST [b] Generic	COST [b] Brand
Preferred Treatment			
Pediatrics (40 kg child)			
Amoxicillin [c]	40 mg/kg/d divided TID	$9	$9
Penicillin VK	250 mg BID–TID	$2	$2
Benzathine penicillin G [d]	600,000 U (wt<60lb) IM	NA	$10
IN PENICILLIN-ALLERGIC			
Erythromycin			
Ethyl succinate (EES)	40 mg/kg/d divided BID–QID (max 1 g/d)	$14	$17
Estolate	20-40 mg/kg/d divided BID-QID (max 1 g/d)	$10-20	NA
Adolescents and Adults			
Penicillin VK	500 mg/dose BID–TID	$2	$2
Amoxicillin	1000 mg BID for 6 days	$8	$10
Benzathine penicillin G [d]	1.2 million U (wt > 60lb) IM	NA	$18
IN PENICILLIN-ALLERGIC			
Erythromycin			
Erythromycin base			
• Ery-tab (enteric-coated)	250 mg QID; 333 mg TID; 500 mg BID	$7; $10;	$10; $11;
• E-Mycin (enteric-coated)	250 mg QID; 333 mg TID	$11	$8
• PCE Dispertab	333 mg	$7; $10	$12; $15
(polymer-coated tabs)		NA	$46
• Eryc (delayed release caps with	250 mg		
enteric-coated pellets)		$10	$20
Ethyl succinate (EES)	400 mg/dose QID		
		$9	$9
Alternative Treatment			
Pediatrics (40 kg child)			
Cefixime	8mg/kg/d QD	NA	$70
Cefuroxime axetil	20 mg/kg/d divided BID	NA	$57
Cephalexin	25–50 mg/kg/d divided BID–QID	$8	$35–70
Clindamycin	20–30 mg/kg/d divided QID	NA	$55–73
Cefprozil	15mg/kg/d divided BID	NA	$43
Cefadroxil	30 mg/kg/d divided BID/QD	NA	$33
Adolescents and Adults			
Augmentin	250 mg TID; 500 mg TID	NA	$72; $106
Azithromycin	500 mg first day, then 250 mg on days 2-5	NA	$41
Cefixime	400 mg/dose QD	NA	$78
Cefuroxime	250 mg/dose BID	NA	$82
Cephalexin	250–500 mg/dose QID	$2–4	$32–62
Clindamycin	300–450mg/dose QID	$91–137	$143–214

Note: Antibiotics not effective against GABHS: tetracyclines, trimethoprim, sulfonamides, chloramphenicol and Fluoroquinolones. NA = not available

[a] All treatments are for 10 days unless otherwise stated.
[b] Generic based on HCFA price; brand based on AWP. All 2000 Red Book drug costs rounded to the nearest dollar.
[c] Amoxicillin costs more than penicillin, but may have higher compliance (tastes better)
[d] Somewhat better efficacy than po, ideal if compliance is in doubt, painful for 2–3 days at site of injection, increased risk of anaphylaxis.

Clinical Problem (continued)

Treatment goal: The goal in treating GABHS infection is to decrease the occurrence of acute rheumatic fever (ARF). The endemic incidence is somewhere around 0.23-1.88 / 100,000 (1980's data). In epidemics of rheumatologic strains of strep ARF has occurred in up to 1% - 3% of patients with untreated GABHS pharyngitis. It generally occurs 10–14 days post acute pharyngitis onset. Post-streptococcal glomerulonephritis (PSGN) is another sequela of GABHS infection, but usually occurs after a streptococcal skin infection. Treating GABHS pharyngitis does not appear to diminish the risk of PSGN.

Diagnostic difficulty: The diagnostic impression cannot be used to accurately identify all cases of GABHS. Associations between symptoms and GABHS are stronger in adults than in children, but adding epidemiologic criteria strengthens the diagnostic impression in children. The usefulness of laboratory tests for GABHS depends on the prior probability of the disease. Laboratory testing and treatment may be under or over utilized in the absence of a reasoned, cost-effective diagnostic strategy.

Decisions about antigen screens v/s culture: No clear strategy has been proposed for the cost/effective use of antigen screens and cultures. Cultures are the "gold standard" but involve a delay of 24 to 48 hours in diagnosis. The current GABHS antigen detection tests (rapid strep screens) have a high degree of specificity, but their sensitivity can be variable. The benefit of a more rapid positive diagnosis for a minority of patients must be weighed against the doubling of laboratory costs for the majority of patients whose rapid strep screens are negative and require a follow-up culture.

Overuse of antibiotics: Indiscriminate antibiotic use may increase the incidence of allergic reactions to antibiotics and lead to the emergence of resistant strains of GABHS or other pathogenic bacteria.

Rationale for Recommendations

Identifying the high risk patient: It is important to identify patients who have a personal history or family member with a history of acute rheumatic fever (ARF); specifically, those who have had rheumatic carditis or valvular disease. These patients are at high risk for complications of GABHS pharyngitis (see Table 1 or 7). ARF can occur more rapidly in someone who has had a previous episode of ARF, especially if there was prior valvular involvement. A high-risk patient presenting with a sore throat should be prescribed immediate antibiotic treatment while awaiting culture results. Discontinue antibiotics if the culture returns negative.

Diagnosis based on symptoms: Symptoms are more predictive of GABHS pharyngitis in adults than in children.

- **In adults:** In adults, the three findings of history of fever, of tender anterior nodes, and of swollen exudative tonsils have been demonstrated to have a positive correlation with GABHS. Two symptoms, cough and post nasal drainage, lower the pretest probability of GABHS pharyngitis. A total symptom score can be calculated by adding +1 for each positive symptom present and -1 for each negative symptom present, producing scores ranging from -2 to +3. (See Table 2.)
  - The high probability group of adults (symptom score of 3) has a pretest probability of GABHS of about 28% - 67%. They comprise approximately 10% - 15% of the adult pharyngitis population.
  - The intermediate probability adult group (symptom scores of 0, 1, or 2) poses the greatest diagnostic problem. In addition to the least clear pretest probability, the group is large, about 55% of the population.
  - The low probability adult group (symptom scores of -1 or -2) have a pretest probability of 2.5% - 4%. They comprise approximately 30% of the adult pharyngitis population.

  The above probabilities vary with the prevalence of GABHS, which can vary across seasons, between communities, and between sites within a community. For example, an office based practice may have a lower prevalence of GABHS than an emergency room.

- **In children:** In children, (1) fever of at least 38.3 in the past 24 hours, (2) age between 5-15 years, (3) tender anterior cervical nodes, (4) erythema, swelling or exudate on tonsils or pharynx, and (5) occurrence between November and May, (6) all in the absence of conjunctivitis, cough or rhinorrhea, predicts a positive culture in 75%. Even with 5 of the 6 above criteria present, a positive culture can be predicted in 59%. All other combinations carry a positive predictive value of less than 50%. (See Table 8.)

Laboratory diagnosis: Laboratory diagnosis of GABHS pharyngitis can be important because of lower sensitivity of clinical impressions. Correct swabbing of the oropharynx is of paramount importance. Both tonsillar fauci and the posterior oropharynx must be vigorously swabbed. False negative cultures may result from an inadequate specimen collection process.

- **GABHS culture:** The gold standard of diagnosis for GABHS is a throat culture (>99% sensitivity). Results are available in 24 to 48 hours. (The blood agar plate should be held for 48 hours prior to discarding.)

- **GABHS antigen screen:** The GABHS antigen screen is a rapid immunoassay method for determining the presence of GABHS in a throat swab. Results should be available within a few minutes in the office. The antigen testing is reported to have a sensitivity ranging from

67% to 84% and a specificity of 85% to 99%. A common recommendation is that a negative screen should be confirmed by a culture in intermediate probability patients.

- **Laboratory charges:** The UMHS laboratory charge for a GABHS culture alone is $18. The charge for a GABHS antigen screen is $18. If a screen is negative and a follow-up culture is performed, the total cost is $36 for both a screen and culture. (Other laboratories may structure charges for GABHS screens and cultures in other ways.)

Choosing between a screen or culture. When a clinician has decided to order a laboratory test to diagnose GABHS, the choice between starting with an antigen screen or simply obtaining a culture should consider the benefits and costs in the context of the individual patient. Early positive diagnosis and initiation of therapy with the use of the rapid strep screen may reduce the period of infectivity and morbidity and may allow the patient to return to normal activity sooner. However, the value of early diagnosis in the minority of cases when strep is present and identified must be weighed against the higher total laboratory charges for the majority of cases screened. Most screens are negative and additional charges will be incurred for a subsequent culture.

When should a strep testing be done? Decisions regarding any testing for GABHS must consider the added value of the information given the prior probability that GABHS is present based on symptoms.

- **For adults:** For adults, consideration of the prior probabilities provided by symptom scores and of the costs associated with laboratory tests suggests that diagnostic testing is generally not worthwhile for high risk and low risk groups, but is worthwhile for intermediate risk groups.
  - If all <u>high probability adults are not tested, but immediately treated,</u> about 1% - 5% of the population would be over treated. However, expensive testing would be avoided for everyone in the 10% - 15% of the population that falls into this group. If the provider or patient wishes to avoid a potential antibiotic reaction, then testing could be carried out prior to treatment.
  - <u>All intermediate probability adults should be tested.</u> Testing will assure appropriate treatment for the 55% of the population that falls into this group. The substantial minority with GABHS will be appropriately treated and the majority will not be over treated with antibiotics. With an intermediate likelihood of GABHS, when a rapid strep screen is chosen, a negative result should be confirmed by culture.
  - If <u>all low probability adults are not tested and not treated,</u> about 1% of the population would have GABHS and would not be treated. However, expensive testing would be avoided for everyone in the 30% of the population that falls into this group. If a physician elects to perform an antigen screen on a low risk patient and the result is negative, only 0.3% of those patients would have GABHS. Confirming cultures would not be necessary.

- **For children:** For children, the higher risk of non-suppurative complications associated with GABHS infection increases the need for laboratory testing to assure appropriate treatment. If the symptoms suggest against GABHS, laboratory testing is likely not to be worthwhile. If the symptoms are uncertain or suggest GABHS, testing should be used: A laboratory test should be performed to assure that treatment is appropriate. If a rapid strep screen is chosen and is negative, the result should be confirmed by culture. Laboratory confirmation may not be necessary if there is another household member with a positive culture or if the clinical findings indicate scarlet fever.

Treatment of GABHS pharyngitis: Examples of preferred and alternative treatments are presented in Table 13. In a patient with no prior history of ARF, antibiotics may be given up to nine days after onset of symptoms and still be effective at preventing ARF.

- **Preferred treatment:** GABHS still demonstrates susceptibility to penicillin in North America, thus penicillin is the drug of choice in those not allergic to penicillins. Although somewhat more expensive, children may tolerate amoxicillin (taste) better than penicillin and thus have better compliance. Erythromycin is the appropriate alternative to penicillin in penicillin-allergic patients. It is recommended that an entire ten days of antibiotics must be given in order to adequately treat GABHS and thus decrease the risk of ARF. One French trial of amoxicillin 1000 mg bid for 6 days found clinical and microbiological outcomes equivalent to penicillin VK 625 mg tid for 10 days. A single intramuscular injection of benzathine penicillin has been shown to be slightly more efficacious than oral penicillin VK and ensures compliance It does, however, produce a significant amount of pain at the injection site which may last a number of days.

- **Alternative treatments:** A non-beta-lactam or beta-lactam combined with a beta-lactamase inhibitor should be chosen for failure of treatment or frequent recurrences. If compliance or GI intolerance is an issue, other antibiotics have been shown to be effective in eradicating GABHS from the oropharynx. These antibiotics can offer more convenient dosing schedules and sometimes better tolerability, which may increase compliance. However, these antibiotics are significantly more expensive than PCN. Examples of effective alternative antibiotics are: cephalexin, cefuroxime axetil, cefprozil, clindamycin, cefixime, Augmentin, and azithromycin (5-day treatment is approved for this indication). Sulfonamides, fluoroquinolones and tetracyclines are not acceptable for the treatment of GABHS pharyngitis.

Failure to improve with treatment: Any patient with documented GABHS infection who fails to improve, despite an appropriate course of antibiotics, should be reevaluated.

- **Local complications:** An exam should be performed to rule out occurrence of a local complication such as peritonsillar abscess (Quinsy) or retropharyngeal abscess. These complications require immediate consultation with otolaryngology as they necessitate surgical drainage and pose a serious threat to the patient's well being.

- **No local complications:** In the absence of local complications, another swab should be performed to determine whether GABHS is still present. The persistence of GABHS despite adequate therapy suggests a number of possibilities:

  - **The organism is present as a colonizer** and does not pose a threat. This occurs often in those treated for true GABHS pharyngitis. However, it is not easy to decide whether the GABHS isolated from the oropharynx is a colonizer, or not. Thus GABHS persisting in a SYMPTOMATIC individual should be retreated.
  - **The organism was not killed** by the antibiotic treatment. This could be due to "co-pathogenicity" with oral bacteria secreting beta-lactamases into the oropharyngeal environment, thus passively protecting GABHS from the actions of penicillin. In this case, reasonable treatment would be clindamycin or possibly a penicillinase-resistant antibiotic.
  - **The patient did not take the entire course** of antibiotics. The decision may be made to opt for intramuscular benzathine penicillin in order to ensure adequate treatment, or one of the once-a-day or short-course antibiotics (azithromycin) could be given.

Special Circumstances

Reevaluate high risk patients: High risk patients (see above) should be reevaluated 2 to 7 days after the end of treatment in order to ensure that an adequate response has been obtained. This means that symptomatic improvement should be noted and re-swabbing of the throat should be performed to ensure eradication of GABHS. The presence of GABHS in an asymptomatic, as well as symptomatic, high risk patient should be retreated (as above).

Controversial Areas

Treatment over the phone based on symptoms. Some evidence suggests that adolescents and adults might be managed over the phone. A study showed that three symptoms (fever, difficulty swallowing, and cough) can predict which adult patients have absence of or higher probability of GABHS. Management of children over the phone is more problematic. Symptom models have not been studied as much for children as for adults, with the limited available information suggesting that symptoms are less accurate predictors in children.

Family member with GABHS pharyngitis: A patient with a sore throat who has a family member with confirmed GABHS may be treated presumptively without evaluation in the office. This may be cost-effective when handled over the phone. However, it is preferable to perform a culture when empiric treatment may not be easily performed (e.g., patients with multiple antibiotic allergies, patients on anticoagulants) even if a family member has documented GABHS.

Treatment of viral upper respiratory system symptoms: Two randomized, controlled trials have shown a decrease in symptoms with the use of zinc. Patients who used zinc acetate lozenges every two to three hours, while awake, noted significant benefit in terms of a decrease in symptoms. Side effects, mainly bad taste, are common in those using zinc.

Information the Patient Needs to Know

- The majority of sore throats are not caused by GABHS and do not require antibiotic therapy.
- Symptomatic treatment with salt water gargles and lozenges is helpful.
- Throat cultures may take up to 48 hours, but the majority are positive within 24 hours.
- Therapy may be initiated as late as 9 days after onset of symptoms and still be effective.
- Patients are considered noncontagious 24 hours after starting therapy.
- Antibiotics need to be taken for the entire 10 days, even if you are feeling better.
- Symptoms which require early follow-up include: persistent fever or throat pain lasting greater than 48 hours, increasing difficulty swallowing, or development of new symptoms.
- Side effects of antibiotics include rash, nausea, diarrhea.

Patient education information about sore throats is available to provide more detail and reinforce instruction.

Strategy for Literature Search

The literature search for this project was conducted prospectively using the major keywords of: *GABHS* (*streptococcal infections, streptococcus pyogenes, pharyngitis, pharynx*), *clinical trials* (MeSH: *clinical*

trials, phase IV; controlled clinical trials; multicenter studies; randomized controlled trials; cohort studies. Publication types: *clinical trials; multicenter studies; cohort studies; randomized controlled trials; controlled clinical trials*), *guidelines* (Mesh: *clinical protocols; physician practice patterns; algorithms; practice guidelines; outcome and process assessment [health care]; NIH consensus development conferences; consensus development conferences.* Publication types: *practice guideline; guideline; NIH consensus development conference; consensus development conference),* since 1996 (i.e. since our previous search) on Medline. Terms used for specific diagnosis and treatment topic searches within the major key words included: *history (medical history taking, recurrence), physical exam (physical exam, signs and symptoms), throat culture (bacteriological techniques, "throat adj3 culture"), rapid strep (bacterial antigens, immunoassay, diagnostic reagent kits, "rapid strep"), diagnosis (diagnosis [subheading], diagnostic use (subheading), sensitivity and specificity, false negative reactions, false positive reactions, likelihood functions, "sensitivity", "specificity") observation (decision making, "observation"), antibiotics, treatment (treatment, therapeutic use), and alternative medicine (alternative medicine, zinc, ascorbic acid, medicinal plants, vitamin A, beta carotene).* The search was conducted in components each keyed to a specific causal link in a formal problem structure (available upon request). Negative trials were specifically sought. The search was a single cycle. Conclusions were based on prospective randomized clinical trials if available, to the exclusion of other data; if RCTs were not available, observational studies were admitted to consideration. If no such data were available for a given link in the problem formulation, expert opinion was used to estimate effect size.

Disclosures

None of the members of the Pharyngitis guideline team have a relationship with commercial companies whose products are discussed in this guideline. The team members are listed on the front page of this guideline.

Annotated References

Centor RM, Witherspoon JM, Dalton HP, Brody CE, Link KL. The diagnosis of strep throat in adults in the emergency room. *Med Decision Making*. 1981;1:239-245

This is a study that generated the symptom score for pharyngitis and was subsequently used in the decision papers of Centor et al. It demonstrates a clear correlation between symptom score and probability of presence of GABHS.

Dajani AS, Taubert K, Ferrieri P, et al. Treatment of acute streptococcal pharyngitis and prevention of rheumatic fever: A statement for health professionals. *Pediatr*. 1995;4:758–764.

This is a special statement published by the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease for the American Heart Association and provides a complete overview, with recommendations and rationale, for treatment of streptococcal pharyngitis and secondary prevention of rheumatic fever.

Dajani AS. Current Status of nonsuppurative complications of Group A streptococci. *Pediatr Infect Dis J*. 1991;10:s25–s27.

This article discusses the incidence and diagnosis of acute rheumatic fever briefly but completely.

Hillner BE, Centor RM. What a difference a day makes. A decision analysis of adult streptococcal pharyngitis. *J Gen Int Med*. 1987;2:244-250.

This article analyzes the treat/test/symptomatically treat model, using assumptions with regard to sequelae of treating, not treating and estimated benefits of treatment, produced a pretest probability threshold of 47%, over which treatment without testing was most cost effective. Under 47%, the best approach was test and treat only positives, assuming good follow-up can be anticipated.

Peyramond D, Portier H, Geslin P, Cohen R . 6-day amoxicillin versus 10-day penicillin V for group A beta heamolytic streptococcal acute tonsillitis in adults: a French multicentre, open-label, randomized study. Scandinavian Journal of Infectious Diseases. 28 (5):497-501, 1996

This trial of several hundred adults found GABHS eradication of 92 % in the amoxicillin group and 92.7% in the penicillin group, clinical success rates were 96% for amoxicillin and 95.4 % for penicillin.

Pichichero ME. Group A streptococcal tonsillopharyngitis: Cost-effective diagnosis and treatment. *Ann Emerg Med*. 1995;25:390–403.

This article, along with the accompanying editorial, provides some basic cost analysis data on possible approaches to diagnosis and treatment. It explores possible explanations for treatment failure.

Shulman ST. Complications of streptococcal pharyngitis. *Pediatr Infect Dis J*. 1994;13:s70–s74.

This article focuses primarily on the suppurative complications of streptococcal pharyngitis.

Wald ER, Green, MD, Schwarz, B, Barbadora, K. A streptococcal score card revisited. Pediatric Emergency Care, 14:109-111, 1998.

This prospective study explored the utility of a symptom scoring scheme to predict a positive throat culture for group A streptococcus (GAS) among 365 children with

acute pharyngitis. A score of 5 or 6 predicted a positive culture for GAS in 59 and 75% of children, respectively. The score can be used to predict the likelihood that a culture will be positive for GABHS.