Effect of a Standardized Pharyngitis Treatment Protocol on Use of Antibiotics in a Pediatric Emergency Department

Maria Carmen G. Diaz, MD; Nadine Symons, MD; Maria L. Ramundo, MD; Norman C. Christopher, MD

Background: Pharyngitis is a common complaint in pediatric patients. If clinical parameters are used alone, bacterial pathogens will be wrongly implicated in many cases. A nonstandardized approach to the treatment of children with pharyngitis in an emergency department setting may lead to inappropriate empirical therapy, contribute to increased bacterial resistance, and result in adverse events related to the treatment provided.

Objective: To implement evidence-based guidelines for the diagnosis and treatment of children with pharyngitis in an emergency department setting and thereby influence practices of prescribing antibiotics.

Design and Methods: An evidence-based guideline for the evaluation and treatment of patients with pharyngitis was developed and implemented in our emergency department. Preintervention and postintervention patient cohorts were identified by a search of the emergency department’s clinical repository. A medical record review was performed using a standardized data abstraction form (history and examination data, diagnostic testing, and therapy provided). Treatment decisions were judged as appropriate if the diagnosis of pharyngitis caused by group A β-hemolytic streptococci was based on confirmatory microbiological testing rather than on the history and physical examination findings alone.

Results: We included 443 patients for study (219 preintervention and 224 postintervention). In the preintervention group, 97 (44%) of 214 received appropriate treatment. In the postintervention group, 204 (91%) of 224 received appropriate treatment.

Conclusion: An evidence-based clinical guideline can influence and improve practices of prescribing antibiotics by pediatric emergency physicians in a teaching hospital setting.


SORE THROAT IS ONE OF THE most common complaints in the pediatric population. Most sore throats are caused by viral agents,1 and only 15% to 20% are caused by group A β-hemolytic streptococci (GABHS).2,3 Accurate diagnosis and treatment of patients with GABHS are essential in the prevention of rheumatic fever and other complications.4 The distinction between viral and bacterial etiologies of sore throat can be challenging because many experts agree that GABHS infection “cannot be diagnosed on clinical grounds in most patients.”2(p291) Certain symptoms such as prominent rhinorrhea, cough, and hoarseness are more suggestive of a viral etiology.5 However, physicians may overdiagnose GABHS infection 80% of the time because physical examination findings alone do not adequately distinguish streptococcal from nonstreptococcal pharyngitis.6

To avoid complications associated with inappropriate use of antibiotics, various confirmatory microbiological tests for GABHS are available. Throat cultures are the gold standard; however, rapid antigen detection tests have become a useful aid.7 Rapid streptococcal antigen tests (RSTs) have been shown to have variable sensitivity but high specificity; therefore, negative results on these tests require culture confirmation, but positive findings allow treatment without performing a culture.2,8-10 Results of rapid tests or cultures for GABHS should be positive before beginning antibiotic treatment.

There has also been much discussion regarding choice of antibiotics in the treatment of GABHS11,12; however, penicillin remains the drug of choice for the treatment of this type of infection.12 No GABHS organisms are resistant to penicillin, and treatment is effective for the elimination of GABHS and prevention of rheumatic fever.13

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Well-constructed evidence-based guidelines allow the physician to use scientifically based clinical parameters to improve patient care. They also provide a means by which physicians may enhance their own education and quality of their practice. We hypothesize that implementing evidence-based guidelines for the diagnosis and treatment of patients with pharyngitis will influence antibiotic prescribing practices.

**METHODS**

The Pediatric Emergency Department at the Children’s Hospital Medical Center of Akron (Akron, Ohio) is a 32-bed department with an annual census of 65,000 patient visits. It is a teaching hospital for Northeastern Ohio Universities College of Medicine and is staffed by board-certified pediatric emergency medicine attending physicians, fellows, and general pediatricians.

All patients who require a rapid test for GABHS or a throat culture undergo 2 simultaneous throat swabs in the emergency department (ED). These swabs may be performed by medical students, residents, fellows, or attending physicians. The obtained specimens are then processed by our laboratory technicians. One of the swabs is used for an RST; the other is held for confirmation using a substrate kit (PYR Kit; Remel, Lenexa, Kan). Samples suggestive of GABHS are confirmed using a substrate kit (PYR Kit; Remel, Lenexa, Kan).

A series of articles detailing the recommended diagnosis and treatment guidelines of pharyngitis were distributed to and discussed with all of our ED physicians. From this, an evidence-based pathway (Figure) for the evaluation and treatment of pharyngitis was created and fully implemented in July 2003.

This pathway is entered by the triage nurse into the medical records of all patients with a complaint of sore throat. The development, evaluation, and implementation of this guideline was the result of numerous meetings and discussions among the faculty. It was emphasized among our physician staff that exacerbates or enlarged tonsils, lymphadenopathy, and lack of cough or upper respiratory tract infection symptoms were all highly suggestive of GABHS infection. However, during each clinical visit, the physician had the discretion of determining which patients warranted an investigation for GABHS. In the presence of a high index of suspicion, physicians were encouraged to initiate the pathway and withhold antibiotics in the absence of confirmatory microbiological testing.

We identified the medical records of all patients who came to our ED with a complaint of sore throat from August 1, 2002, through November 30, 2002 (preintervention) and August 1, 2003, through November 30, 2003 (postintervention). Using a standardized statistical program, a random sample of 300 medical records from each subset (preintervention and postintervention) was generated, and all 600 records were reviewed. Records were excluded if they were incomplete or if the physician did not follow the protocol.

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The age range in our study population was 1.5 to 19 years with a median of 9 years (interquartile range, 6-13 years). The male-to-female ratio was 1:1.7 (185:238).

**PREINTERVENTION DATA**

From August 1, 2003, through November 30, 2003, 546 patients were evaluated in our ED with a triage complaint of sore throat (Table 1). A random sample of 300 patients was generated from this dataset. Of these, 219 patients met our study inclusion criteria and comprise the preintervention database. In the preintervention group, 97 (44%) of 219 patients received appropriate treatment; 21 of these 97 were given appropriate antibiotic therapy based on a positive RST result. Therapy was withheld in 45 of 97 cases in which the rapid test results were negative and throat cultures were pending. In addition, 20 of 97 patients did not have an RST, but antibiotic therapy was withheld pending throat culture results. Finally, 11 of the 97 patients did not have an RST or a throat culture and were not given antibiotics.

Of the remaining 122 (of 219) patients in the preintervention group, 88 were treated empirically based on clinical examination; 29 (33%) of these 88 had positive throat culture results. In addition, 26 of the 122 were given antibiotics other than penicillin, a macrolide, or clindamycin in response to a positive RST result. The remaining 8 (of 122) patients did not receive appropriate treatment because they had a negative RST result but no follow-up throat culture was performed. In the preintervention group, 3 patients with a negative RST result were later found to have a positive throat culture result, giving a false-negative rate of 4.4% (3/67).

**POSTINTERVENTION DATA**

From August 1, 2002, through November 30, 2002, 603 patients were evaluated in our ED with a triage complaint of sore throat (Table 2). From this data, a random sample of 300 patients was generated; 224 of the 300 patients met our study inclusion criteria. These 224 patients seen in 2003 comprise the postintervention data.

In the postintervention database, 204 (91%) of 224 patients received appropriate treatment based on our parameters; 42 of 204 were given appropriate antibiotic therapy based on a positive RST result. Therapy was withheld in 149 of 204 cases in which the RST results were negative and throat culture results were pending. In addition, 3 of the 204 did not have an RST but antibiotic therapy was withheld pending throat culture results. Finally, 10 of the 204 did not have an RST or a throat culture and were not given antibiotics.

Of the remaining 20 (of 224) patients not included in the appropriate treatment subset, 9 were empirically treated based on a clinical examination; 6 (66%) of these 9 had positive throat culture results. Of the 20 patients, 6 did not receive appropriate treatment because they were given antibiotics other than penicillin, a macrolide, or clindamycin in response to a positive RST result. In addition, 4

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**Table 1. Preintervention Data: Numbers of Patients With a Complaint of Sore Throat, Types of Tests Performed, and Therapy**

<table>
<thead>
<tr>
<th>Antibiotics Given in the ED</th>
<th>Antibiotics Withheld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive RST result (throat culture not done)</td>
<td>47 (21 appropriate, 26 inappropriate)</td>
</tr>
<tr>
<td>Negative RST result</td>
<td>1</td>
</tr>
<tr>
<td>Positive throat culture result</td>
<td>1</td>
</tr>
<tr>
<td>Negative throat culture result</td>
<td>1</td>
</tr>
<tr>
<td>Throat culture not done</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 2. Postintervention Data: Numbers of Patients With a Complaint of Sore Throat, Types of Tests Performed, and Therapy**

<table>
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<tr>
<th>Antibiotics Given in the ED</th>
<th>Antibiotics Withheld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive RST result (throat culture not done)</td>
<td>48 (42 appropriate, 6 inappropriate)</td>
</tr>
<tr>
<td>Negative RST result</td>
<td>3</td>
</tr>
<tr>
<td>Positive throat culture result</td>
<td>3</td>
</tr>
<tr>
<td>Negative throat culture result</td>
<td>0</td>
</tr>
<tr>
<td>Throat culture not done</td>
<td>0</td>
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</tbody>
</table>

Abbreviations: ED, emergency department; RST, rapid streptococcal antigen test.

*Indicates patients who received appropriate treatment.
of 20 had a negative rapid test result but no follow-up throat culture; 1 of 20 had a positive rapid test result but was not given antibiotics in the ED. In the postintervention group, 19 patients with a negative rapid test result were later found to have a positive culture result, giving a false-negative rate of 12.2% (19/155).

CHOICE OF ANTIBIOTICS

Of the 47 patients in the preintervention group given antibiotics for a positive RST result, 18 (37.5%) were given penicillin (16 orally and 2 intramuscularly), 26 (55%) were given amoxicillin, and 3 (6%) were given azithromycin. All 3 patients given azithromycin were allergic to penicillin.

In the postintervention group, 48 patients were given antibiotics for a positive RST result: 34 (70.8%) were given penicillin (30 orally and 4 intramuscularly), 5 (10%) were given amoxicillin, and 8 (16%) received either a macrolide or clindamycin owing to a penicillin allergy. One patient was given a combination of amoxicillin and clavulanate.

COMMENT

Our preintervention data confirm prior studies that have shown that GABHS is often erroneously implicated as the cause of sore throat.5,10,13 Our physicians offered an incorrect clinical diagnosis in 59 (67%) of the 88 patients given antibiotics in this dataset. After the implementation of our pathway, the error rate in prescribing antibiotics for sore throat based purely on clinical examination decreased. More important, we were able to increase our appropriate treatment rate from 44% to 91%.

In our evaluation of patients with a complaint of sore throat, 24 (6 preintervention and 18 postintervention) were excluded because of an alternate diagnosis requiring specific antibiotic therapy (eg, urinary tract infection, otitis media, or pneumonia). Although we believe that appropriate treatment was rendered in all of these cases, the analysis of data from these patients was not included because their alternate diagnoses required that antibiotic therapy was indicated. Many of our physicians are hesitant to use penicillin because of the risk of adverse reactions and poor compliance.12,20 However, a broader antibiotic spectrum may contribute to greater resistance.

There has been some focus on the efficacy of cephalosporins in the eradication of GABHS.21,22 However, the current recommendation by the American Academy of Pediatrics Committee on Infectious Diseases regarding first-generation oral cephalosporins is that they be used only in patients allergic to penicillin; their cost and wider range of antibiotic activity preclude their use in those who are not allergic to penicillin.10 Cephalosporins were not listed in our clinical pathway as an alternative in patients allergic to penicillin because of concerns of allergic cross-reactivity.

The reported specificity of the Thermo BioStar assay is 95% with a sensitivity of 85%.24 In the analysis of our RST characteristics, we did not include calculations for sensitivity or specificity because it is our institutional policy that positive test results do not receive culture confirmation. We chose to focus our calculations on the test’s false-negative rates. However, as a retrospective medical record review, our study was limited by a lack of patient follow-up. We were therefore unable to determine the costs associated with delays in the treatment of patients with false-negative rapid test results or the costs associated with follow-up or repeated visits. As an additional limitation, we were also unaware of the adverse reaction rate to penicillin in our study population. Perhaps a better awareness of patient compliance and adverse reactions could have a stronger effect on prescribing practices among ED physicians.

This study shows that physician practice can be influenced by the implementation of evidence-based guidelines. We concur with the recommendations from prior studies that patients should be treated for pharyngitis caused by Streptococcus infection only if there is a documented positive RST or culture result.25 Many studies have argued the cost-effectiveness of various tests used in the treatment of sore throats.7,26 Although we did not quantify costs in this study, we believe that those associated with making an accurate diagnosis far outweigh the implications of inappropriate antibiotic prescribing practices. The potential effect of increased antibiotic resistance should make physicians more aware of their prescribing practices. These guidelines need to be applied to general pediatric practices throughout the community.

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REFERENCES