The Effects Of The Rapid Strep Test On Physician Management Of Streptococcal Pharyngitis

Charles H. Bryars III, M.D., Frank V. deGruy, M.D., M.S.F.M., Linda C. Dickinson, M.S., and Anita M. Waller

Abstract: **Management of pharyngitis remains an important and controversial subject. A retrospective chart review at the University of South Alabama Family Practice Center was undertaken to assess changes in physician prescribing and testing patterns since the advent of rapid testing of streptococcal pharyngitis (rapid strep tests [RST]). Charts for study were identified by encounter form coding of a diagnosis of streptococcal pharyngitis or pharyngitis not otherwise specified. Control and test groups were formed based on the availability of the RST, and a stratified sample was drawn from each group. In the group of patients studied after the RST became available, data analysis showed a significantly increased likelihood that patients received antibiotics with a positive RST (odds ratio [OR] = 6.42), whereas those patients with a negative or no RST were significantly less likely to receive antibiotics (OR = 2.50 and 2.48, respectively). Group assignment was a significant predictor of test-ordering behavior ($P < 0.05$). A higher than expected rate of streptococcal pharyngitis was noted in the group of patients who had the RST available to them. The RST plays an important though not fully defined role in the current management of pharyngitis. (J Am Board Fam Pract 1991; 4:139-43.)**

The abundance of writing about sore throat reflects both the frequency of its occurrence[1] and the lack of consensus on its management. Acute and chronic morbidity associated with group A streptococcal (GAS) pharyngitis can be prevented by timely treatment.[2-4] In addition, a resurgence of acute rheumatic fever[5] and increased concern about cost containment have heightened interest in the accurate diagnosis and cost-effective treatment of pharyngitis.[6-9] Because clinical criteria alone are not reliable in differentiating GAS pharyngitis from pharyngitis caused by other organisms,[10] diagnostic tests, especially the throat culture and rapid antigen detection tests, have received attention. Their promise of rapid and accurate diagnostic information has the potential to alter pharyngitis management strategies, particularly decisions about testing and antibiotic usage.

A recent study found a significant increase in the appropriateness of antibiotic prescribing since the advent of the rapid stress test (RST); however, the study group obtained throat cultures on almost all patients who complained of sore throat, which is not consistent with the use of throat cultures by most primary care physicians.[12,13] These results, therefore, may not be generalizable to all primary care physicians.

Our practice uses a more selective approach to testing for GAS pharyngitis that may be more representative of most primary care practices. This study was done to measure the effect of the RST on physicians' test-ordering and prescribing behaviors. We hypothesized that with the advent of the RST, more tests would be done and that antibiotic prescribing patterns would correlate better with test results.

Methods

This study was conducted at the University of South Alabama Family Practice Center, a freestanding outpatient facility. Eighteen residents and 6 faculty family physicians see about 1000 patients each month. A retrospective chart review of these patients was undertaken in which the patients were divided into two groups according to the availability of the rapid streptococcal antigen test. Group 1 comprised patients seen in our clinic between 1 July 1983 and 30 June 1984, when throat cultures were used to test for streptococcal infections. Group 2 patients were seen

From the Department of Family Practice, University of South Alabama College of Medicine, Mobile. Address reprint requests to Charles H. Bryars III, M.D., Family Practice Associates of Mobile, 2270 Hillcrest Road, Mobile, AL 36695.

Table 1. Diagnosis and Demographic Characteristics.

	Study Sample		
	Group 1 7/83–6/84	Group 2 7/85–6/86	Total
Diagnosis			
Pharyngitis not otherwise specified	134	71	205
Streptococcal pharyngitis	16	79*	95
Age distribution (years)			
0–4	17	18	35
5–9	21	28	49
10–14	23	22	45
15–19	17	21	38
20–24	14	13	27
25–29	25	11	36
30–34	12	13	25
35–39	4	13	17
>39	17	11†	28
Sex			
Men	65	65	130
Women	85	85‡	170
Total	150	150	300

*χ^2 = 61.14, df = 1, $P < 0.001$, odds ratio = 9.32.
†N.S. by Kolmogorov-Smirnov two-sample test.
‡χ^2 = 0.00, P = N.S.

between 1 July 1985 and 30 June 1986 when the RST was used to test for streptococcal infection. Charts were selected for review if the physician coded the encounter diagnosis as either streptococcal pharyngitis or pharyngitis not otherwise specified. We also reviewed charts from a sample of visits during these same study periods that were coded as viral syndrome or upper respiratory tract infection but excluded them from analysis because the number of patients with pharyngitis was insignificant.

During the first period, the diagnosis for 221 patients was pharyngitis not otherwise specified, and 27 patients had streptococcal pharyngitis diagnosed. During the second period, 265 patients had a diagnosis of pharyngitis not otherwise specified, and 210 had streptococcal pharyngitis diagnosed. A stratified random sample of 150 patients was drawn from each time frame, preserving proportionate numbers of each diagnosis. Patient age, provider level, present complaint, and pertinent information concerning history, physical findings, laboratory tests, and treatment were recorded. Particular attention was paid to the use of antibiotics, including those prescribed or discontinued after throat culture results were available. Throat cultures were obtained in a standard fashion in which a specimen obtained by a throat swab was inoculated on 5 percent sheep blood agar plates and incubated at 37°C in room air. Group A hemolytic streptococci were identified by bacitracin disc growth inhibition. The Culturette™ brand 10-minute Group A Strep ID test was used according to manufacturer's instruction. Data were analyzed using chi-square and log-linear analysis.

Table 2. Test versus No Test, by Group Assignment.

Test Performed	Group 1	Group 2	Total
Yes	94	116*	210
No	56	34	90
Total	150	150	300

*χ^2 = 7.21, $P < 0.05$, odds ratio = 2.03.

Results

The composition of the two groups is displayed by diagnosis and demographic characteristics in Table 1. Chi-square and log-linear analyses were performed to test the two principal hypotheses that differences in testing behavior and antibiotic usage would occur between the two groups. Aside from a significant difference in the distribution of diagnoses (χ^2 = 61.14, OR = 9.32), the two groups appear comparable. This difference in diagnoses distribution reflects discrepancies in frequency of diagnoses, the reasons for which are explored below.

Group assignment was a highly significant predictor of whether a diagnostic test was ordered ($P < 0.05$). Patients in group 2 (who were tested with the RST) were approximately twice as likely to be tested (OR = 2.03) than were patients in group 1 (who were tested with a throat culture) (Table 2). This finding confirms the hypothesis that the RST changes physician test-ordering behavior.

Two interesting findings are shown in Table 3. The positive test rate for both groups is higher than would normally be expected, suggesting that the rate of streptococcal pharyngitis is unusually high in our practice. The table also reflects that patients in group 2 were significantly more likely to have a positive test than were those in group 1.

Table 4 presents the results of the log-linear analysis for the outcome variable antibiotic prescribed versus no antibiotic prescribed. The predictor variables were diagnostic testing (a three-level variable: no test, positive test, negative test) and group assignment (1 or 2). The table illustrates that, after adjusting for test results, group assignment significantly affects physician-prescribing behavior (adjusted $\chi^2 = 4.57$, $P < 0.05$). Likewise, test outcome, after adjusting for group assignment, significantly affects antibiotic usage ($\chi^2 = 66.75$, $P < 0.01$). In addition, there was a significant test-by-group interaction effect ($\chi^2 = 6.14$, $P < 0.05$).

To clarify this interaction effect, it was necessary to look at each test result separately. We found that even though patients in the two groups received antibiotics in roughly equal numbers, test results affected prescribing behavior differently in each group (Table 5). For instance, patients with a positive RST in group 2 were 6.4 times more likely to receive antibiotics than were those patients in group 1 with a positive throat culture. On the other hand, those patients in group 1 with no or negative throat cultures were more likely to receive antibiotics than were corresponding patients in group 2 with no or negative RSTs (OR = 2.50 and 2.48, respectively). Taken together, these findings strongly support our hypothesis that the availability of the RST resulted in the more appropriate use of antibiotics in group 2. That some patients with a negative test from both groups received antibiotics probably reflects the physician's belief that an additional diagnosis required antibiotic therapy.

Discussion

The significant difference between the groups in numbers of patients having streptococcal pharyngitis diagnosed and positive test results is probably related to several factors. First, we believe a difference in diagnostic coding behavior was brought about by the rapid streptococcal antigen test. By using the RST, it was possible to make a definitive diagnosis of streptococcal pharyngitis during the patient encounter, when coding is done. Before the RST was available, most encounter forms were coded as pharyngitis not otherwise specified pending the result of the throat culture. This diagnosis was entered onto the encounter form at the time of the visit and could not be changed after the throat culture was read. Also, the increased testing frequency in group 2 could have increased the number of patients with streptococcal pharyngitis diagnosed. Physicians in group 1 might have been more inclined to treat (empirically) those patients most likely to have a positive throat culture but were reluctant to code the encounter as streptococcal pharyngitis without more objective supporting evidence. When the RST became available, however, these same physicians were able to obtain evidence of streptococcal infection immediately and so could have used the RST more frequently to confirm their diagnostic impression. We speculate that the differences observed between the two groups are due to this change in coding, but we cannot exclude the possibility that the groups are not comparable. Apart from a growth in the practice population, however, no discernible changes in practice composition were noted; therefore, we assume that the occurrence and presentation of sore throat were comparable in the two time frames. Finally, the RST may be more sensitive than throat culture, with its use resulting in more true-positives as well as false-positives.

The reason for the significantly greater overall number of patients with the diagnosis of pharyngitis in group 2 is unknown. A sample of charts taken from the same study periods noting the diagnoses of upper respiratory tract infection and viral syndrome was examined and found not to contain significant numbers of patients with the complaint of sore throat. Likewise, practice expansion did not sufficiently explain the differences. With the dissimilarity primarily due to more patients with the diagnosis of streptococcal pharyngitis in group 2, changes

Table 3. Test Results, by Group Assignment.

	Group 1	Group 2	Total
Positive test results	39	78*	117
Negative test results	55	38	93
Total	94	116	210

*$\chi^2 = 13.96$, $P < 0.01$.

Table 4. Prescribing Behavior, by Test and Group Assignment.

Variable	df	Unadjusted χ^2	P	Adjusted χ^2	P
Group assignment	1	0.08	N.S.	4.57	< 0.05
Diagnostic testing	2	62.26	< 0.01	66.75	< 0.01
Group-test interaction	2			6.14	< 0.05

Table 5. Antibiotics versus No Antibiotics by Group Assignment and by Test Results.

	Group 1	Group 2	Total
Antibiotics prescribed?			
Yes	117	115	232
No	33	35	68
If positive test, antibiotics prescribed?			
Yes	36	77	113
No	3	1	4
If no test, antibiotics prescribed?			
Yes	47	23	70
No	9	11	20
If negative test, antibiotics prescribed?			
Yes	34	15	49
No	21	23	44

in coding behavior could be responsible. Also, because testing in this group was increased, it is possible that streptococcal pharyngitis was underdiagnosed before the availability of the RST or that physicians increased their selection of this diagnosis to justify their use of the RST.

Our findings corroborate those of True, et al.[11] and in a setting where the practice of selective testing of patients with pharyngitis is more representative of the behavior of most primary care physicians.[12,13] Whether physicians in our clinic consciously or unconsciously use decision rules (such as those advocated by Tompkins, et al.,[6] Breese,[8] and Hillner and Centor[14]) or employ some other as yet undefined method for selecting those patients to be tested and treated is unknown.

Table 6. Recommendations for the Diagnosis and Treatment of Group A Streptococcal Pharyngitis.*

1. Treat all adult patients having clinical signs and symptoms predicting a high probability (> 47%) of streptococcal pharyngitis without further diagnostic efforts.
2. If rapid tests with known quality-control data are available, test all adult patients with pretest probability of < 47%, and treat only those having positive test results on rapid tests.
3. If rapid tests are not available and follow-up is possible, treat all adult patients with a pretest probability of > 11%. Cultures should be done for patients having pretest probabilities of < 11%, and only those having a positive culture should be treated.

*Used with permission from Centor, et al.[15]

That antibiotic usage was more closely coupled with a positive RST in group 2 and that testing increased in this group suggest physicians more often relied upon test data for making treatment decisions. Also, because antibiotic usage was essentially equivalent in the two groups, patients with non-GAS pharyngitis were more likely to be spared the expense and risk of unneeded antibiotic treatment. Taken together, these findings imply a more rational and appropriate usage of antibiotics in the group of patients who had the RST available to them.

Our data suggest that clinicians use the RST to make more appropriate prescribing decisions when other information, such as symptoms, physical signs, and prevalence statistics, is inconclusive. This selective testing is consistent with recommendations for using the RST in the management of acute pharyngitis made by Centor, et al. (Table 6).[15] They recommend immediate treatment should signs and symptoms predict a high (> 47 percent) probability of streptococcal pharyngitis, while suggesting that patients with a lower probability should be tested and only those with a positive test treated. If an RST is unavailable, then Centor, et al. recommend reducing the probability threshold for treatment to less than 11 percent, reserving throat culture for those having a lesser probability of the disease. Follow-up is mandatory because antibiotics are begun only for those with positive cultures. Penicillin is the drug of choice, with erythromycin an alternative in those who are allergic to penicillin.

Recent studies by Pichichero, et al.[16] and Wald[17] raise questions about the desirability of immediate treatment of GAS pharyngitis. While reports of early treatment have proved to decrease symptom duration and severity,[2-4] these and similar studies may alter currently accepted ideas about early treatment. As studies further refine management strategies, the role of the RST may change. Until then, however, the RST will continue to be an important tool in the effective management of pharyngitis.

References

1. Cypress BK. Office visits for diseases of the respiratory system: the national ambulatory medical care survey, United States, 1975-6. Hyattsville, MD: US Dept of Health, Education and

Welfare, 1979. (DHEW publication no. (PHS) 79-1793).
2. Krober MS, Bass JW, Michels GN. Streptococcal pharyngitis. Placebo-controlled double-blind evaluation of clinical response to penicillin therapy. JAMA 1985; 253:1271-4.
3. Randolph MF, Gerber MA, DeMeo KK, Wright L. Effect of antibiotic therapy on the clinical course of streptococcal pharyngitis. J Pediatr 1985; 106:870-5.
4. Nelson JD. The effect of penicillin therapy on the symptoms and signs of streptococcal pharyngitis. Pediatr Infect Dis 1984; 3:10-3.
5. Bernhard R. The mysterious return of acute rheumatic fever. Emerg Med 1987; 19:3.
6. Tompkins RK, Burnes DC, Cable WE. An analysis of cost-effectiveness of pharyngitis management and acute rheumatic fever prevention. Ann Intern Med 1977; 86:481-92.
7. DeNeef P. Selective testing for streptococcal pharyngitis in adults. J Fam Pract 1987; 25:347-53.
8. Breese BB. A simple scorecard for the tentative diagnosis of streptococcal pharyngitis. Am J Dis Child 1977; 131:514-7.
9. Cebul RD, Poses RM. The comparative cost-effectiveness of statistical decision rules and experienced physicians in pharyngitis management. JAMA 1986; 256:3353-7.
10. Physicians not very accurate at diagnosis, treatment of strep. Fam Pract News 1987; Nov 1:1,52.
11. True BL, Carter BL, Driscoll CE, House JD. Effect of a rapid diagnostic method on prescribing patterns and ordering of throat cultures for streptococcal pharyngitis. J Fam Pract 1986; 23:215-9.
12. O'Malley MS, Frey JJ, Hoole AJ. The clinical management of sore throat: a comparison of three ambulatory settings. N C Med J 1984; 45:291-5.
13. Holmberg SD, Faich GA. Streptococcal pharyngitis and acute rheumatic fever in Rhode Island. JAMA 1983; 250:2307-12.
14. Hillner BE, Centor RM. What a difference a day makes: a decision analysis of adult streptococcal pharyngitis. J Gen Intern Med 1987; 2:244-50.
15. Centor RM, Meier FA, Dalton HP. Diagnosis and treatment, diagnostic decision: throat cultures and rapid tests for diagnosis of group A streptococcal pharyngitis. Ann Intern Med 1986; 105:892-99.
16. Pichichero ME, Disney FA, Talpey WB, Green JL, Francis AB, Roghmann KJ, et al. Adverse and beneficial effects of immediate treatment of group A beta-hemolytic streptococcal pharyngitis with penicillin. Pediatr Infect Dis J 1987; 6:635-43.
17. Wald ER. Rapid therapy for group A strep may increase reinfection risk. Family Practice News 1989; Feb 15.