

## Strategies for Treating Sore Throat in Adults

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This issue of The Journal contains a cost analysis of adult sore throat management.<sup>1</sup> Dr. DeNeef has carefully considered the variety of strategies that primary care physicians might use; he shows the effect that differing priorities would have on this decision.

Before considering the potential impact of this article, it is important to examine the methodology that DeNeef used. Then, it is possible to place this article into perspective.

DeNeef uses a decision-analytic approach to address the problem of testing adults for streptococcal pharyngitis. More specifically, the study uses threshold analyses to prescribe decisions; DeNeef then further examines these analyses using sensitivity analyses. Pauker and Kassirer<sup>2</sup> popularized the notion of threshold analysis. Such analyses assume two threshold probabilities. When the probability that streptococci are causing an adult's sore throat exceeds the test-treatment threshold, one would treat. This threshold defines a probability of disease above which one would always treat (*regardless of the test result*).

To frame this problem in another context, suppose that a physician sees a patient with a classic history for a myocardial infarction. The patient is 60 years old, is a smoker, has a known family history of heart disease, and has had stable angina for three years. The physician would admit him to the coronary care unit regardless of his electrocardiogram (ECG) because even with a normal ECG the physician would believe that probability of a myocardial infarction warrants observation and treatment.

DeNeef argues (and I agree) that some adults have a high enough probability that streptococci caused their sore throat to warrant treatment regardless of the test result. This conclusion follows from the fallibility of tests. No diagnostic test is perfect. Given a high enough initial probability of disease, one cannot exclude the disease with sufficient certainty just because of a negative test result.

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This conclusion follows from an understanding of sensitivity, specificity, and predictive value.<sup>3</sup>

Similarly, it is possible to imagine patients having such a low probability of streptococcal pharyngitis that one would assume a positive test result to be false-positive. Such a patient has a probability of disease that falls below the no-treatment-test threshold. Thus, the threshold model defines two thresholds. Below the no-treatment-test threshold, one would reassure patients; above the test-treatment threshold, patients would be treated with antibiotics; otherwise, one would use a test and base treatment on the test result.

How can these thresholds be determined? A group of expert physicians, or even just one expert, could define explicit thresholds. Expert thresholds are used, at least implicitly, in daily practice. However, these thresholds are not easily analyzed. DeNeef chose to determine thresholds using decision analysis. The decision-analytic approach assigns values to all possible outcomes of treating or not treating the patient, and the probabilities of each outcome occurring are then estimated. DeNeef used money as his *utility scale* (the decision-analytic term for the positive or negative value of an outcome). In this case, because he designed the analysis to conserve costs, the strategy that results in the least average cost per patient would be chosen.

After developing the threshold analysis, DeNeef uses a clinical prediction rule to assign a probability of streptococcal pharyngitis to each patient group. This prediction rule gives a patient a score of 0 to 4.<sup>4,5</sup> Each of four clinical variables scores one point: (1) swollen tender anterior cervical nodes, (2) tonsillar exudates, (3) fever history, and (4) lack of a cough. DeNeef then uses this model to estimate the probability of streptococcal pharyngitis while assuming a disease prevalence of 5 percent. Finally, he combines the revised probability with his decision analysis to assign the patient to a management strategy.

One problem that clinicians raise about decision analyses is the seemingly arbitrary choice of parameters (utilities and probabilities) that the analyst uses to determine thresholds. Sensitivity analyses test the importance of any estimate on the decision. A sensitivity analysis varies a parameter over a reasonable range and then again determines the thresholds. The thresholds are sensitive to a

parameter if the recommendations would change as that parameter is varied over a reasonable set of values. The analysis is insensitive to a parameter when changing that parameter over a reasonable value range does not change the recommendations.

Appropriately, DeNeef makes his assumptions explicit. His sensitivity analyses allow the physician to adopt a strategy that fits his or her personal beliefs about these utilities.

Two important points develop from this complex analysis. Good medical practice does not always require testing before treatment. Many academicians have taught that patients with a sore throat should have a throat culture and only those having a positive culture should be treated. If a test were perfect and the patient received no benefit from prompt treatment, then the culture strategy would dominate clinical decision making. However, tests are not perfect and patients do resolve their symptoms faster when treated immediately (rather than starting antibiotics one to two days later when culture results become available).<sup>6</sup> Thus, the culture strategy suffers both from the risk of false-negative tests and from the lost benefit of early treatment. The present analysis, similar to the analysis by Hillner and Centor<sup>7</sup> shows that at certain probabilities the benefits of treating all patients having the disease outweighs the adverse effects of treating some patients without streptococcal disease. This approach probably surprises few clinicians. Most have managed sore throats in this manner for years. These articles develop a rationale for current practice.

Interestingly, the risk of rheumatic fever has little influence on this decision. Two assumptions cause this counterintuitive finding. First, the risk of rheumatic fever in an untreated adult with streptococcal pharyngitis has become very low over the past 20 years. Perhaps more influential, in both this analysis and the analysis reported earlier,<sup>6,7</sup> is the effect of shortening disease duration. While 24 hours may seem a short time to a physician contemplating medical strategies, for the sore throat sufferer those 24 hours represent 20 to 30 percent of the expected disease duration. Patients visit physicians to obtain symptom relief. Few patients have ever asked me to prevent rheumatic fever. Even though 24 hours is a short time (and the \$40 estimate for the cost of one day's illness a small amount), every patient with streptococcal pharyngitis receives that benefit when treated promptly (at least in the analysis). This seemingly small effect multiplies over a large number of patients and, thus, overwhelms rheumatic fever in clinical decision making.

The current article by DeNeef adds to an active literature on the problem of sore throats. This problem has fascinated many investigators over the past 40 years. The importance of the medical problem stems from its frequency, and this same frequency makes pharyngitis trac-

table to good research. One can easily collect large amounts of data in short periods of time.

Where do physicians stand today in their approach to pharyngitis? Most physicians would agree with the general premise presented in the current article. Use tests selectively, according to individual utility scales. This analysis depends upon the sensitivity and specificity of rapid tests and cultures, numbers that must still be estimated. Moreover, the analysis addresses only group A streptococcal pharyngitis. While other organisms can cause pharyngitis, currently there is no evidence that treatment alters the clinical course of infections caused by these organisms.<sup>8</sup>

Sore throat research over the next several years should continue in three major areas. First, there must be continued assessment of the barrage of rapid tests for group A streptococcal pharyngitis. These tests are not generically equivalent, yet there are scant data comparing these tests. Second, continuing microbiologic studies are needed to ascertain which organisms are important causative agents for pharyngitis. Finally, once these organisms are identified, it should be determined whether antibiotic therapy alters the clinical course of each specific infection.

I commend DeNeef on an important paper. He helps to focus on how each physician should manage adult sore throats in 1987. I again emphasize his caveat that this analysis pertains only to adults and adolescents. Given that important caveat, his paper can be used to plan a management strategy that complements each physician's beliefs and values. DeNeef's approach adds rigor to the management of this common episodic illness. Furthermore, he establishes a sound framework that can be used to incorporate the results of future research.

## References

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