Patients' Willingness to Take Risks in the Management of Pharyngitis

James M. Herman, MD, MSPH
Winston-Salem, North Carolina

Choosing a management plan for pharyngitis involves considering the risks and benefits of alternatives. Using a sick-day equivalent scale, this study examined patients' willingness to be ill with pharyngitis compared with their willingness to risk two outcomes: a penicillin reaction and rheumatic fever. On average, patients preferred 1.5 to 2.5 days of illness with pharyngitis over risking a 5-percent chance of developing a mild penicillin reaction. Willingness to risk the outcomes decreased with increasing probabilities of their occurrence. Subjects were more willing to risk a penicillin reaction than rheumatic fever. Healthy subjects receiving sick pay were more willing to risk varying probabilities of a mild penicillin reaction than subjects not receiving sick pay. Patients ill with pharyngitis, however, were not more willing to take similar risks if they received sick pay. Illness may, therefore, modify some aspects of risk-taking behavior. It is reasonable to conclude that some patients with pharyngitis would prefer early antibiotic treatment for the chance of earlier recovery over waiting for throat culture results despite the risk of a penicillin reaction.

Decisions in the management of pharyngitis must often be made before complete diagnostic information is available. The possible benefits of early treatment without precise diagnostic information need to be compared with the risks of treatment. Treating before obtaining throat culture results provides opportunity for early recovery, but exposes individuals to possible penicillin reactions. Treating only culture-positive individuals exposes fewer to possible reactions but delays recovery of some and risks an 8- to 20-percent rate of false-negative cultures.[1] Not treating or culturing individuals at risk of streptococcal disease increases the likelihood of acute rheumatic fever, and probably is not sound medicolegal practice.[2]

Choosing an appropriate strategy for an individual patient involves a comparison of the risks and benefits of the various choices. The physician views such tradeoffs through his or her understanding of professional norms, ethics, and a sub-

From the Department of Family and Community Medicine, The Bowman Gray School of Medicine of Wake Forest University, Winston-Salem, North Carolina. At the time this study was undertaken, Dr. Herman was a Fellow in the Robert Wood Johnson Foundation Fellowship Program, School of Medicine, University of Missouri–Columbia, Columbia, Missouri. Requests for reprints should be addressed to Dr. James M. Herman, Department of Family and Community Medicine, the Bowman Gray School of Medicine of Wake Forest University, 300 South Hawthorne Road, Winston-Salem, NC 27103.

jective view of the patient's life situation available through brief encounters with the patient. The patient's views may differ in the importance given to the effect of various outcomes on family, work, finances, or lifestyle.[3] A judicious decision allows for the patient's individual judgment as to "what risks are worth running" as well as the provider's medical opinion.[4]

This study was designed to study patients' attitudes toward the risks involved in the management strategies available for pharyngitis. The first hypothesis was that patients would differ in their willingness to take risks involved in managing pharyngitis. Such variability would support a selective approach to management including the use of patients' preferences. The second hypothesis explored was that illness would have an effect on willingness to take risks. To study this effect, healthy individuals and patients with pharyngitis were compared in terms of their willingness to risk complications. The third hypothesis investigated was that social, demographic, occupational, or behavioral factors would influence willingness to take risks. These variables were tested within each group of patients to look for overall and interactive effects.

Methods

Subjects belonged to one of two categories of visitors to the Family Medical Care Center of the University of Missouri–Columbia. Patients with sore throats and patients presenting with a variety of nonacute health care needs (eg, physical examinations, Papanicolaou smears) were approached after their visit was completed. After informed consent was obtained, subjects read and discussed with one of two interviewers several clinical descriptions. The first was of a typical streptococcal sore throat, and the others of a mild penicillin reaction (hives), a serious penicillin reaction (anaphylaxis), rheumatic fever, and rheumatic fever with cardiac valvular damage (Appendix). They then compared their willingness to be ill with pharyngitis with their willingness to risk the occurrence of these latter complications of pharyngitis or its treatment. To compare having a sore throat with the possibility of a mild penicillin reaction, for example, subjects were asked: "If you had a choice between an x percent chance of a mild penicillin reaction occurring, or y days of being ill with the symptoms of pharyngitis, which would you prefer?" By repeating this question with y varying from "zero days" to "forever," the number of days deemed equivalent by the subject to the x percent chance of a mild reaction was determined. This process was enacted with x fixed at 5 percent, 50 percent, and 100 percent chances of each of the four complications listed above. In this way, the relative willingness of the subjects to take each of 12 risks of a complication was expressed on a single "sick day equivalent" scale relative to the symptoms of sore throat. Each of these 12 risks was considered a separate outcome variable (Table 1). If a subject considered an outcome to be equivalent to a whole life of being ill with pharyngitis, the number of sick day equivalents for that outcome was defined as 9,999 to allow for machine coding.

Table 1. Summary of Outcome Variables: Days Ill With Symptoms of Pharyngitis Considered by Subject Equivalent to Four Variables*

Variables
Mild Penicillin Reaction
Serious Penicillin Reaction
Rheumatic Fever
Rheumatic Fever, Complicated

*Each variable is divided into three risk levels (5%, 50%, 100%), for a total of 12 outcome variables

Demographic, historical, and social information thought to influence people's willingness to take such risks was gathered by way of questionnaire and interview. Particular attention was paid to the presence or absence of sick-time compensation at work, type of job, level of education, and the prior experience of subjects with sore throats. Information pertaining to past experience with penicillin reactions and rheumatic fever was noted. Patients with pharyngitis provided information about the length of their illness, their symptoms, and how

Table 2. Summary of Sick-Day Equivalents

Outcome*	Healthy Subjects (n = 56) Median	Healthy Subjects (n = 56) Percentile (25th to 75th)	Subjects With Pharyngitis (n = 48) Median	Subjects With Pharyngitis (n = 48) Percentile (25th to 75th)
Mild Penicillin Reaction				
5%	2.5	(0-7)	1.5	(1-7)
50%	6.0	(2-21)	7.0	(2-19)
100%	12.5	(3-30)	14.0	(3-56)
Serious Penicillin Reaction				
5%	7.0	(2-41)	10.5	(3-60)
50%	45.0	(16-146)	60.0	(30-259)
100%	180.0	(60-360)	180.0	(60-1035)
Rheumatic Fever				
5%	90.0	(12-270)	90.0	(14-360)
50%	270.0	(90-900)	360.0	(180-1670)
100%	1,530.0	(360-9999)	1,080.0	(540-9300)
Rheumatic Fever, Complicated				
5%	360.0	(68-3413)	360.0	(68-1800)
50%	1,530.0	(360-9999)	1,800.0	(405-9502)
100%	9,999.0	(1125-9999)	5,400.0	(1125-9999)

*A comparison of the proportions for the healthy and pharyngitis groups by the Mann-Whitney test was not significant (NS) for all 12 variables

they had decided to seek medical care. Pertinent physical signs were obtained by direct observation (physician interviewer) or from the subject's provider (nonphysician interviewer). Variable and outcome values were coded and analyzed using the statistical analysis package (SAS).[5]

Patterns of sick-day equivalents between and within the two groups of subjects were identified. Because of the presence of small numbers of extreme values, medians were used as measures of central tendency. Spearman's rank correlation coefficient was used to relate sick-day equivalents with appropriate ordinal- or interval-level independent variables. When dealing with discrete independent variables, the Mann-Whitney and Kruskal-Wallace tests were used to compare distributions of sick-day equivalents between levels of independent variables.

Results

Overall Structure of Patients' Preferences

Table 2 summarizes the distribution of sick-day equivalents that participants would accept for each level of the risk-outcome variables listed in Table 1. The central tendencies are represented as the 50th percentile (median) of sick-day equivalents for each outcome. Each median may be considered the average number of days ill with pharyngitis considered equivalent by subjects to that particular outcome.

In general, the higher the number of sick-day equivalents associated with a given outcome variable, the less willing subjects were to risk that outcome. Thus, subjects in the heatlhy group would, on average, prefer up to six days ill with pharyngi-

tis rather than risk a 50-percent chance of a mild penicillin reaction. They would prefer up to 45 days of these symptoms, however, over a 50-percent chance of a serious penicillin reaction. Thus, they were less willing to risk a 50-percent chance of the serious penicillin reaction than the 50-percent chance of a mild reaction.

On the whole, subjects were less willing to risk a serious penicillin reaction than a mild penicillin reaction, less willing to risk complicated rheumatic fever than uncomplicated rheumatic fever, and less willing to risk rheumatic fever than a penicillin reaction. The higher the probability of a complication considered, the less willing subjects were to risk it. For example, patients with pharyngitis preferred on average to experience 1.5 days of symptoms of pharyngitis rather than take a 5-percent chance of a mild penicillin reaction. They preferred 14 days of the same symptoms, however, over the prospect of a 100-percent chance of a mild penicillin reaction.

Variability of Patients' Preferences

Variation about each median is expressed as the range between the 25th and 75th percentiles of sick-day equivalents for that outcome. For example, 50 percent of healthy subjects would prefer between 2 and 21 days ill with pharyngitis rather than risk a 50-percent chance of a mild penicillin reaction. As expected, a large amount of variability existed for all outcomes in both groups of subjects.

Comparison of Healthy and Pharyngitis Groups

The two groups of subjects were comparable on the basis of sex, sick-time compensation, employment status, educational level, prior history of penicillin allergy and rheumatic fever, and prior experience with the medical management of pharyngitis. The group of subjects of pharyngitis was somewhat younger, had more recent sore throats, and included more medical professionals than the group of healthy subjects.

The two groups were also similar in overall willingness to risk complications. No significant difference with respect to willingness to risk any of the outcomes was demonstrated between the two groups (Table 2, $P > .3$).

Social, Demographic, Occupational, and Behavioral Effects

Age, sex, marital status, employment status, type of job, educational level, prior experience with the various types of management available for sore throats, number of recent sore throats, and the duration of symptoms did not significantly influence the distributions of the sick-day equivalents for any of the outcomes in either group of subjects.

Healthy subjects not receiving sick pay were less willing to risk the 5-percent chance of a mild penicillin reaction than those receiving sick pay ($P = .01$). A similar relation held for the 50-percent chance of the mild penicillin reaction ($P = .005$), the 100-percent chance of the mild penicillin reaction ($P = .03$), the 5-percent chance of a serious penicillin reaction ($P = .009$), and the 50-percent chance of a serious penicillin reaction ($P = .03$). There were no significant differences between the two groups for the other more serious outcomes. Receiving sick pay was not related to type of job, age, sex, or educational level.

Although similar trends showing risk aversion among individuals not receiving sick pay were found in the pharyngitis group for the 100-percent chance of mild penicillin reaction and the 50-percent chance of a serious penicillin reaction, these did not achieve statistical significance. The sample sizes within the group of patients with pharyngitis should have been sufficient to detect differences one-half the size of those shown in the healthy population with a probability of 80 percent.

Discussion

This paper describes the use of a sick-day equivalent scale as a method for examining patients' willingness to risk complications of streptococcal pharyngitis.

The patterns of sick-day equivalents reported by the subjects are interesting in several respects. Streptococcal pharyngitis is considered by patients to be a significant illness in terms of the impact it has on their daily lives. For instance, subjects were, on average, willing to accept only two to three days of pharyngitis symptoms to

avoid a 5-percent chance of a mild penicillin reaction. This point has two ramifications. First, symptom resolution is important to patients who have pharyngitis. Physicians making decisions regarding such patients should be sensitive to this concern and consider symptom resolution as well as the need to avoid acute rheumatic fever. Second, because the natural history of streptococcal pharyngitis is one of spontaneous recovery over a period of about one week, treatment differences restricted to symptom resolution one to two days earlier should not be dismissed as insignificant.

The avoidance of rheumatic fever is supported by the fact that complicated and uncomplicatd rheumatic fever were the outcomes that subjects were least willing to risk. Obtaining a throat culture or definitively treating individuals thought possibly to have streptococcal disease accomplishes this goal. Although the attack rate of rheumatic fever per case of streptococcal pharyngitis has been stated to be 6×10^{-3},[6] recent evidence points to an apparent decline in the prevalence of acute rheumatic fever.[7,8] It is probable that this decline represents both an increase in the availability of appropriate medical care aimed at prevention and a change in the disease itself. Rheumatic fever remains, however, a significant health problem and must still be considered in the management of pharyngitis.

Patients' preferences regarding the avoidance of penicillin reactions were less strong. Patients preferred on average only up to two to three days of pharyngitis symptoms rather than risk a 5-percent chance of a mild penicillin reaction. As the risk of such a reaction for an average patient is less than 5 percent, and because most reactions are mild, it would seem that some patients would prefer the small risk of a penicillin reaction to the possibility of extra days ill with symptoms.

Other studies have shown that patients' preferences may vary depending on whether favorable or adverse effects of alternatives are emphasized to them.[9,10] In this study, subjects were asked to compare lengths of time ill with pharyngitis to probabilities of adverse effects of streptococcal disease or its therapy. People's willingness to take some of the risks of therapy (such as a mild penicillin reaction) to avoid being ill would be compatible with such a framing effect. However, subjects repeatedly mentioned the negative effects the symptoms of pharyngitis have upon their lives, which undoubtedly contributed to their willingness to risk a penicillin reaction.

The two groups of subjects differed with respect to age and number of recent sore throats. These differences were not, however, associated with a difference in subjects' willingness to take risks. Another difference between groups was the higher proportion of medical professionals in the group with pharyngitis. The proximity of the Family Medical Care Center to the hospital allows employees easy access to the office when ill, and may help explain this difference. Although this difference between groups existed, medical and nonmedical subjects were not significantly different in their willingness to take risks.

Overall willingness to take risks did not differ significantly between healthy and ill subjects; however, the availability of sick pay exerted an influence predominantly on healthy subjects, an interaction that may relate to an effect of the presence of illness on evaluating choices. Yet before this conclusion is made, it is important to realize that sick pay was one of approximately ten variables used to search for determinants of subjects' willingness to take risks. Such multiple comparisons may have, by chance, produced the statistically significant relationship demonstrated between sick pay and willingness to take risks. The small P values associated with these differences (clustering about .01) tend to make this association less likely. Further studies aimed specifically at documenting the relationship between sick pay and illness behavior are needed.

Discussing risks and benefits directly with individual patients may allow clinicians to determine patients' preferences directly. The sick-day equivalent scale described in this study is not meant to replace such patient-provider communication: rather, the scale is a research tool allowing quantification of information regarding willingness to take risks. In this study, the use of the scale allowed the documentation of wide variability in subjects' willingness to risk complications, thus providing support for the use of patients' preferences in management decisions. Similarly, a variable potentially important in determining patient values (sick pay) was uncovered, and the need for further documentation of its effect noted. Future use of such sick-day equivalent scales should help

assess the effect of using patient preferences on suitable health-care outcomes.

References

1. Caplan C: A case against the use of the throat culture in the management of streptococcal pharyngitis. J Fam Pract 1979; 8:485-490
2. Curran WJ: Glaucoma and streptococcal pharyngitis. New Engl J Med 1974; 291:508-509
3. Vertinsky IB, Thompson WA, Uyeno D: Measuring consumer desire for participation in clinical decision making. Health Serv Res 1974; 9:121-134
4. Pellegrino ED, Thomasma DC: A Philosophical Basis of Medical Practice. New York, Oxford University Press, 1981, p 124
5. Helwig J, Council KA: SAS User's Guide, 1979 ed. Raleigh, NC, SAS Institute, 1979
6. Valkenberg HA, Goslings WRO, Bots AW, et al: Attack rate of streptococcal pharyngitis, rheumatic fever, and glomerulonephritis in the general population. N Engl J Med 1963; 268:694-701
7. Allen WC: Rheumatic fever and rheumatic heart disease in Missouri. Mo Med 1982; 79:219
8. Land MA, Bisno AL: Acute rheumatic fever—A vanishing disease in suburbia. JAMA 1983; 249:895-898
9. Eraker SA, Politser P: How decisions are reached: Physician and patient. Ann Intern Med 1982; 97:262-268
10. Eraker SA, Sox HC: Assessment of patients' preferences for therapeutic outcomes. Med Decis Making 1981; 1:29-39

APPENDIX

Clinical Descriptions

Streptococcal Sore Throat

You have a sore throat which makes swallowing difficult. You have swollen glands in your neck. You have a fever of about 101 °F and may have chills, nausea, and muscle aches.

Mild Penicillin Reaction

You are given a ten-day prescription for penicillin tablets. After taking the first one or several pills, your body develops a reaction to the drug that consists of extremely itchy, red raised welts on your skin (hives), which requires you to contact and probably see a physician at the time it happens so that antiallergic medication and therapy may be instituted. Following this episode, you would recover without permanent damage.

Serious Penicillin Reaction

You are given a ten-day prescription for penicillin tablets. After taking the first one or several pills, your body develops a reaction to the medicine that consists of itching, a sensation of flushing, hives, and swelling of the face, tongue, and voicebox (larynx). Tightness in the chest may occur as well, making breathing difficult. A rapid fall in blood pressure may occur, leading to shock. Hospitalization would be necessary, usually lasting one to two weeks.

Rheumatic Fever

Following a streptococcal sore throat, you develop the following symptoms: fever and pain or swelling of the larger joints of the body. At the same time, inflammation of the heart may occur (in 30 to 50 percent of cases) requiring absolute bed rest and treatment with medication. Hospitalization would be necessary in this case. There would be a 75 percent chance of the disease getting better in 6 weeks, but a 5 percent chance of it lasting up to 6 months. Following recovery, there would be an increased risk of getting rheumatic fever again, so that treatment with penicillin tablets twice daily for at least 5 years would be necessary to prevent streptococcal infections (sore throats).

Complication Rheumatic Fever

During an episode of rheumatic fever, the valves of the heart can suffer damage, leading to conditions in which one gradually becomes increasingly short of breath over months or years. If the damage becomes serious enough, open-heart surgery to replace the damaged valve with an artificial valve may be necessary. To avoid infection of damaged valves, penicillin or other antibiotic drugs would have to be taken prior to any dental or surgical procedure.