

Willingness to Pay for Complete Symptom Relief of Gastroesophageal Reflux Disease

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Background: Over \$6 billion per year is spent on prescription medication for gastroesophageal reflux disease (GERD). This study is an economic analysis of patients' willingness to pay for a prescription medication that offers complete relief of GERD symptoms.

Methods: The study was a cross-sectional, nonrandomized design recruiting patients from 5 clinical sites. A computer-administered discrete-choice questionnaire was used to explore patients' willingness to pay for various attributes (time to relief, amount of relief, side effects, and out-of-pocket cost) associated with GERD treatment. Patients chose between 2 different combinations of attributes by indicating which scenario they preferred. Data were gathered on health status, health-related quality of life, and sociodemographic characteristics.

Results: Two hundred five patients completed the discrete-choice questionnaire with a consistency rate of 99.5%. All attributes were relevant to patient decision making. Respondents were willing to pay up to \$182 to obtain complete relief in a short period of time without side effects. Patients with less severe GERD symptoms were willing to pay more to avoid side effects (\$58.25 vs \$38.43). Older patients were less willing to pay for better relief than younger patients.

Conclusions: Results demonstrate that patients are willing to pay more per month for a medication that provides more complete and faster relief from GERD symptoms. This information can guide clinicians and formulary committees in evaluating optimal treatment for GERD.

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GASTROESOPHAGEAL reflux disease (GERD) is a common, chronic condition characterized by the symptom of heartburn. Eighteen percent of the adult population in the United States reports having had heartburn at least once a week and almost half of these people have had their symptoms for 10 years or longer.¹ Gastroesophageal reflux disease is associated with substantial use of both prescription and over-the-counter medication and accounts for several million outpatient visits annually.² One recent study estimated that over \$10 billion is spent annually for the care of GERD, of which \$6 billion is for prescription medication.²

The present study focuses on patient willingness to pay (WTP) for prescription medication to relieve GERD symptoms. Willingness to pay is defined as an indication of the monetary value of a commodity or service. Prescription medications for GERD include H₂-receptor antagonists and proton pump inhibitors (PPIs). Proton pump inhibitors have been

shown to be more effective than H₂-receptor antagonists³; however, these medications are costly to patients and insurers. In an effort to control costs, physicians may choose to manage GERD through an initial trial of H₂-receptor antagonists; if these do not provide symptom relief, patients are switched to PPIs. Debate continues as to whether this "step up" strategy is preferable to initial therapy with PPIs.⁴ Patients may also use over-the-counter antacids or lower-strength H₂-receptor antagonists either alone or as part of their medication regimen. The presence of GERD is associated with impaired functioning and quality of life, even with treatment.^{5,6}

Symptom reduction and complete cure are important goals of medical care and WTP has been applied to both, depending on the disease or condition in question. For example, a study of WTP in urinary incontinence⁷ demonstrated that patients were willing to pay substantially for a 25% to 50% reduction in symptoms (\$87.74 and \$244.54 per month, respectively). Patients with psoriasis or atopic ec-

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PARTICIPANTS AND METHODS

The study was a cross-sectional, nonrandomized, experimental design in which subjects with GERD provided information regarding WTP for complete relief of GERD symptoms using a computer-administered questionnaire. This study uses discrete-choice experiments (DCEs) to obtain WTP estimates; other methods to assess WTP are also available.¹⁰⁻¹² Discrete-choice experiments are a type of conjoint analysis. Conjoint analysis was originally developed for market research and has recently been adopted by health economists to assess the value to consumers of changes in levels of health care interventions. In a DCE, individuals are presented with hypothetical scenarios involving different levels of attributes that have been identified as important in the provision of a good or service such as a prescription medication. Attributes are characteristics of the service; in the case of a medication they might include time to relief, presence and type of side effects, dosing frequency, and so forth. If one of these product attributes is a payment vehicle, such as "cost," the DCE can yield marginal WTP estimates for the other attributes as well as total WTP for combinations of the attribute levels.¹³

We explored 4 attributes of treatment relevant to prescription medication use for GERD, each with 2 to 4 levels. Attributes and levels must be mutually exclusive, comprehensive, and quantifiable. The attributes used here, determined through literature review and discussion with expert reviewers, included time to relief (2, 4, 7, or 14 days until resolution of symptoms), amount of relief (complete, partial, or none), side effects (presence or absence), and out-of-pocket cost per month of medication (\$5, \$15, \$35, or \$60). The "time to relief" and "cost" attributes were coded as continuous variables while "amount of relief" and "side effects" were coded as discrete variables.

The 4 attributes with their levels represented 96 unique scenarios. Experimental design software (SPEED; Hague Consulting Group, Leiden, the Netherlands) was used to reduce the number of scenarios to a manageable number while still

permitting inferences about all possible scenarios. Sixteen pairs of scenarios, that is, pairs of combinations of attributes, were selected to obtain maximum information from as few paired scenarios as possible. Scenarios were both exhaustive (so as to explore the full range of attribute levels) and parsimonious (such that respondents were presented with a relatively small number of scenarios). Patients selected the scenario they preferred from each pair presented. An example of a discrete-choice question is provided in **Figure 1**. Three of the 16 discrete-choice scenarios were tests of consistency. These scenarios presented choices where one scenario is superior on all attributes than the other. Respondents would be expected to choose the better scenario. The interpretation of these consistency checks allowed for random error; a participant could have failed 1 consistency check without his or her data being excluded, while patients failing 2 or more were excluded from the analysis.

The remainder of the questionnaire gathered information on health status, disease-specific quality of life, and sociodemographic characteristics.

STUDY SAMPLE

Patients were recruited from 5 clinical sites across the United States. Sites included gastroenterology clinics within larger health care systems, a stand-alone gastroenterology clinic, and a research-oriented gastroenterology facility.

Study participants were 18 years or older, diagnosed as having GERD for a minimum of 6 months, and under active treatment with prescription medication for GERD. Patients with concomitant gastrointestinal disorders were excluded. No random selection or randomization of participants was performed in this study. Sites were asked to identify and recruit up to 50 study patients.

STUDY SITES AND DATA COLLECTION PROCEDURES

Institutional review board approval was obtained at each site. After obtaining informed consent, study participants

zema were willing to pay between 1253 and 1956 Swedish krona (\$151.89-\$237.11, 1998 US dollars) for a psoriasis cure and between 960 and 1083 Swedish krona (\$116.37-\$131.28, 1998 US dollars) for an atopic eczema cure.⁸ Patients with asthma have been shown to be willing to pay between \$200 and \$350 more per month for a cure.⁹

This study describes an approach to examining attributes of medication as perceived by GERD patients whose therapy includes prescription drugs and presents findings. Using an economic methodology known as WTP, the study offers new insight on the relative importance of specific aspects of treatment.

RESULTS

Two hundred five patients completed the DCE, comprising 3280 individual observations. There were 33 missing dependent variables that were removed for analysis purposes, leaving 3247 observations. Results of the consistency checks showed that only 6 observations from

within 5 individuals' responses were inconsistent. This figure represents an extremely high consistency rate (99.5%). All observations from the participant who failed this consistency check were removed for analysis purposes, resulting in 3231 observations from 204 participants.

Over 60% of the patients were women with an average age of 50 years. More than half the sample had moderate GERD (score of >1 and <4 on the Gastrointestinal Severity Rating Scale, heartburn subscale). Demographic and socioeconomic characteristics of the study participants are summarized in **Table 1**. In general, Quality of Life in Redux and Dyspepsia subscale scores were high (range, 5.1-6.2), indicating that patients believed their health-related quality of life was good. The SF-12 scores were similar to other populations with chronic mild conditions (physical component summary, 47.7 ± 9.6; mental component summary, 50.1 ± 10.2).¹⁵

Results from the DCE analysis are shown in **Table 2**. All the marginal effects were significant and had the ex-

were interviewed at the clinic site prior to any scheduled medical encounter or procedure. Questionnaires were administered using a touch-screen–equipped computer system (Assist Technologies, Scottsdale, Ariz) that has been used successfully in previous studies of patients with GERD and has proven easy for patients of any age to use.^{14,15} The study coordinator instructed each patient on its use at the beginning of the session. Each of the 16 DCE pairs (Figure 1) was displayed sequentially (ie, 1 pair displayed per screen). When a response was entered, the next item automatically appeared. Patient records were stored on the hard drive and transmitted by modem to a central location for review and aggregation across sites. The entire study appointment, including obtaining consent and completing the questionnaires, took approximately 45 minutes.

OTHER STUDY MEASURES

Disease severity was measured using the heartburn subscale of the Gastrointestinal Severity Rating Scale.¹⁴

The SF-12, a generic health status measure,¹⁵ and the disease-specific questionnaire Quality of Life in Reflux and Dyspepsia,¹⁶⁻¹⁸ were included in the questionnaire to help characterize the study population. Questions were also asked about age, marital status, employment, income level, ethnicity, sex, educational level, health insurance, and prescription benefit coverage. All questionnaires were scored according to developer instructions.

ANALYSES

The theoretical framework of the analysis is based on an equation describing the relationship between the attributes and utility. The simplest specification of the utility function, the linear additive model,¹⁹ assumes that each attribute has an independent and linear effect on consumer preference. Thus, the marginal effects for each attribute (the amount of extra satisfaction a consumer gets from obtaining an additional unit of an attribute) were calculated using a linear additive model. Results

were then used to estimate (1) marginal rate of substitution between the marginal effects of the attributes (the amount of one attribute an individual is willing to give up to obtain an additional unit of another attribute while maintaining equal satisfaction), (2) WTP for changes in levels of specific attributes by estimating the marginal rate of substitution between the marginal effects on the attributes and the marginal effect on the “cost” attribute, and (3) overall WTP for a drug with specified levels of the attributes.

Analysis of DCE data was performed with a random effects probit model using commercially available software (LIMPED; Econometric Software Inc, Bellport, NY). A probit model is a form of regression analysis used to estimate a binary response (ie, the probability of an individual choosing scenario A over scenario B).

Two models were estimated: a basic model and a segmented model. The basic model explores mean preferences across the entire group while the segmented model explores how preferences vary according to predefined subgroups, such as disease severity. Segmenting the model by income permits the testing of theoretical validity, whereby it was hypothesized that as income increases, people are willing to pay more for improvements in symptoms based on an assumption of more discretionary income being available.

The model was also analyzed by site to assess site-specific variation. The Wald test¹⁹ was used to assess whether these segmented coefficients are statistically different from each other within groups. It was expected that increased symptom severity would result in increased marginal WTP for time to relief, amount of relief, and absence of side effects.^{20,21} Wald tests were used to test for significant differences between marginal effects and further *z* tests²² were used to test for significant differences in the resulting WTP values obtained by taking the ratio of these marginal effects with cost. According to a priori theory, it would be expected that WTP values for reductions in amount of relief would increase with increasing severity of symptoms.

pected sign (+ or –), validating the theoretical construct of the model. The negative sign on “time to relief” indicated that respondents preferred a reduction in the amount of time required to obtain relief from their GERD symptoms. The cost coefficient had the expected negative sign demonstrating that the more expensive the medication, the less likely a person is to prefer it. The positive sign on amount of relief indicated that the greater the amount of relief provided by the medication, the more likely a person is to prefer it.

Using the marginal effects from Table 2, the marginal rates of substitution between the 4 drug attributes are estimated and the WTP for changes in levels of these attributes are obtained. The basic probit model demonstrated that respondents were willing to pay (1) \$2.50 per month for a 1 day reduction in time to onset of relief, (2) \$35 per month for an increase in amount of symptom relief from little to some, (3) \$110 per month for an increase in amount of symptom relief from little to complete, and (4) \$41.66 per month for a change in side effects from presence of side effects to absence of side effects.

Thus, the marginal WTP for a drug that produces no side effects improves amount of relief from little to complete and reduces the time to relief of symptoms from 2 weeks to 2 days is \$181.66 ($[\$2.50 \times 12] + \$110 + \41.66).

Table 3 shows the results of the segmented random effects probit model assessing the role of symptom severity on WTP values. The Wald test and the *z* test confirm, however, that the marginal effect and resulting WTP values for people who have moderate disease are greater than those with severe disease for an improvement in symptoms of “little to some” relief. As expected, however, the *z* test shows that people with mild disease are willing to pay significantly less for improvements in amount of relief (from little to some) than people with moderate disease. As expected a priori, the Wald test confirms that people with moderate disease value improvements in symptom relief (from little to complete) significantly more than people with mild disease, although the *z* test does not confirm this difference to be significant when extracting the WTP estimate from the ratio

Choice 1	Treatment A	Treatment B
Time to Symptom Relief	2 d	4 d
Amount of Relief	Some Relief	Some Relief
Side Effects	No Side Effects	Side Effects
Cost per 1 mo Prescription	\$15	\$5

Which Option Would You Prefer? Prefer Treatment A Prefer Treatment B

Figure 1. Example of a discrete-choice questionnaire.

Table 1. Demographic and Socioeconomic Characteristics of the 205 Study Patients*

Age, mean (SD), y	50.5 (14.5)
Sex, male	38.0 (78)
Marital status, married	74.0 (151)
Educational attainment	
Less than high school	6.3 (13)
High school graduate	26.3 (54)
Some college	28.8 (59)
College or graduate degree	38.5 (79)
Severity of GERD	
Mild	14.6 (30)
Moderate	62.4 (128)
Severe	22.9 (47)
Employment status	
Employed full time	58.0 (119)
Employed part time	10.7 (22)
Not employed	20.0 (41)
Homemaker	11.2 (23)
Income, \$	
<20 000	12.4 (25)
20 000 to 39 999	25.9 (52)
40 000 to 59 999	21.9 (44)
60 000 to 79 999	19.4 (39)
80 000	12.4 (25)
No response	8.0 (16)
Missing	4
Insurance type	
Private	71.7 (147)
Medicare	17.1 (35)
Other (Medicaid, CHAMPUS/military, uninsured, don't know)	7.8 (16)
Insurance covers prescriptions	76.0 (155)
Insurance requires co-pay	73.5 (36)

*Values are percentages unless otherwise indicated. GERD indicates gastroesophageal reflux disease; CHAMPUS, Civilian Health and Medical Program of the Uniformed Services.

of the marginal effects. Finally, and against a priori hypotheses, the results show that people with severe disease value improvements in amount of symptoms from little to complete less than people with moderate disease, although again the z test does not confirm this difference to be significant when extracting the WTP estimate from the ratio of the marginal effects (Figure 2).

Based on these results, further analysis explored a possible "income" effect, in which respondents with higher incomes would be willing to pay more than those with lower incomes. Subgroups were created to test for both

Table 2. Results From the Basic Probit Model

Attributes	Marginal Effect (SE)*	Marginal Willingness to Pay per Month
Time to relief (days)	-0.015 (0.003)	-0.015/0.006 = \$2.50
Amount of relief (base = little)		
Some	0.21 (0.02)	0.21/0.006 = \$35.00
Complete	0.66 (0.03)	0.66/0.006 = \$110.00
Side effects (0 = no, 1 = yes)	-0.25 (0.13)	0.25/0.006 = \$41.66
Costs (\$ per month)	-0.006 (0.0003)	Not applicable

* $P < .001$ for all marginal effects.

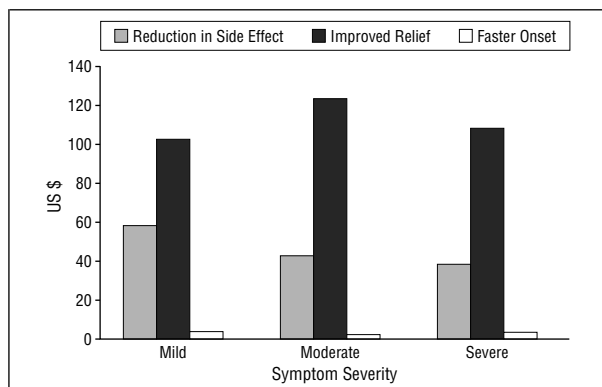


Figure 2. Symptom severity and willingness to pay. Reduction in side effects is from some to none; improved relief is from little to complete; and faster onset is by 1 day.

income and severity of illness simultaneously in a bid to control for the possible effect of income on the WTP values. Each disease severity group was also characterized by income category. Findings indicated that people with mild disease and a higher income were willing to pay significantly more to move from little to some relief than people with mild disease and a lower income (\$64.85 vs \$32.19)—this is what we would expect theoretically. However, people within any single income level (low or high) with mild disease were willing to pay significantly more to move from little to some relief than those with either moderate or severe disease (\$124.91, \$108.25, and \$108.86, respectively). Such a result is not what we would expect theoretically and cannot be explained by an income effect.

Finally, we also examined the effect of demographic characteristics; no sex effects were demonstrated, but age effects were found. As age increases, WTP was greater for reduction in time to onset of relief. People older than 60 years were willing to pay significantly less for a unit change in amount of relief than those in the youngest age group (<46 years). Finally, the oldest participants were willing to pay more to avoid side effects.

COMMENT

Gastroesophageal reflux disease and GERD-like symptoms affect a large proportion of the US population.⁶ This relatively common condition has a detrimental effect on health-related quality of life and other measures of func-

Table 3. Willingness to Pay for Amount of Symptom Relief: Comparison of Subgroups Segmented by Severity of Illness

Segmented Attributes, Severity*	Marginal Effects	Wald χ^2 (i,j)†	Willingness to Pay (WTP) (SD‡), \$	WTP z Statistic (i,j)†
1, Mild, some relief	0.174617	0.107 (1, 2)	30.73 (2.86)	3.12 (1, 2)
2, Moderate, some relief	0.2345675	0.05977* (2, 3)	41.28 (6.42)	-3.30 (2, 3)
3, Severe, some relief	0.183383	0.83381 (1, 3)	32.27 (2.04)	0.44 (1, 3)
4, Mild, complete relief	0.5837064	0.00092§ (4, 5)	102.72 (10.51)	1.47 (4, 5)
5, Moderate, complete relief	0.7027219	0.00316§ (5, 6)	123.66 (9.67)	-1.29 (5, 6)
6, Severe, complete relief	0.616184	0.415 (4, 6)	108.44 (6.76)	0.46 (4, 6)

*Significant at $P = .01$.

†i, j indicates comparing severity groups i and j.

‡Variance estimated from the Taylor series approximation to the variance of random variable: $\text{Var}(WTP) = 1/b_i^2[\text{var}(b_i) - 2WTP\text{cov}(b_i, b_j) + WTP^2\text{var}(b_j)]$, where b_i = coefficient for cost variable and b_j = coefficient for the j th segmented variable.

§Significant at $P = .05$.

tioning. Billions of dollars are spent annually for over-the-counter medications for GERD. This study demonstrates that patients are willing to pay fairly large amounts above their insurance prescription copayments to find effective symptom relief. Results further demonstrate that DCE is a feasible approach to collecting WTP information in this population.

The basic model showed that overall, patients were willing to pay nearly \$200 additional per month to resolve symptoms, decrease time of onset to relief, and have no side effects. The level of relief was much more important than either the presence of side effects or the time to relief. Both physicians and policy personnel (such as formulary committees) can use this information to make decisions about prescribing more recent and more expensive medications for GERD (if these medications can provide the type of relief described in this study). Physicians can use this information to guide the most appropriate choice of therapy for an individual patient. Managed care organizations and insurance companies can use these data to determine copayment for PPIs.

Discrete-choice experiments have been applied successfully in establishing preferences in several areas of health care decision making.²³⁻³¹ Further, DCEs have been used to evaluate costs and benefits directly in respiratory and cardiovascular conditions³² and osteoarthritis.³³ The present study not only adds to the literature on WTP for GERD medications but also used a novel data acquisition method to do so. Commonly, data for DCEs are obtained via the use of self-completed mail questionnaires. This study used computer administration as a simple method of presenting competing scenarios to the patient. The high level of consistency found in scenario selection indicates that patients had no difficulty using the computer.

Many of the relationships explored here in segmented models were hypothesized based on intuition rather than published literature. One would expect that the relationship between disease severity and WTP is linear, suggesting that as disease severity increases, people have higher WTP values for relief of symptoms. However, our results contradict this. Our results suggest that patients who have mild symptoms might not find them troublesome enough to incur additional cost whereas patients with severe symptoms while taking medication might be influenced by this less successful treatment re-

sult and in turn have rescaled their WTP values for symptom relief downwards. This latter “recalibration” phenomenon is referred to as “response shift.”³⁴⁻³⁶ Schwartz and Sprangers³⁴ define response shift as a change in the meaning of one’s self-evaluation of a target construct; this may explain our finding that WTP values were not linearly related to disease severity. Because little is known about this relationship, we offer these analyses as exploratory and encourage further research. Research in other areas suggests that the presence and severity of symptoms as well as whether patients attribute their symptoms to aging or to the disease may affect their interpretation of the symptoms.^{20,21}

Only 1 other study has assessed WTP in GERD; however, it did not evaluate WTP for relief of symptoms. The WTP of patients vs proxy decision makers, namely, physicians and payers, for diagnostic certainty in GERD was assessed by Hirth and colleagues.³⁷ As expected, patients were more likely than the other decision makers to value diagnostic certainty.

Willingness to pay values derived from a DCE are more flexible than those used exclusively in a cost-benefit analysis because marginal WTP estimates are obtained for each of the individual attributes; hence, this approach facilitates the estimation of total WTP values for any possible combination of the attribute levels. Thus, a WTP value for a new drug, not yet on the market, can be estimated and combined with the projected costs in a bid to determine its worth.

One limitation of the study concerns the sample size. Although the target sample size included 50 patients from each site, 2 sites did not reach their enrollment goal, and, consequently, all sites did not contribute equally. We found no differences between sites, suggesting this limitation is minor. The sites as well as the patients participating in the study were a convenience sample; participants were established patients at gastroenterology clinics who responded to an invitation to participate. Because these persons were self-selected, they may not be generally representative of GERD patients. However, the sample was well balanced across disease severity.

Willingness to pay exercises involve hypothetical expenditures rather than a respondent’s actual purchasing decisions. The magnitude of the monetary values that respondents accorded some attributes appeared rather large, such as \$110 per month for complete relief of symp-

toms. Results indicate that respondents valued the “perfect” drug, one with the optimal level of each attribute, at \$182 per month. It is not clear that consumers would commit to payments this great over the long term. However, other WTP studies have reported similar findings.

The information resulting from this research can be used as a guide by clinicians while they interact with the patients to determine an optimal treatment approach for GERD. By questioning patients on their preferences, and with knowledge of the patients’ prescription benefit plan, clinicians can be in a position to provide a treatment with the highest patient desirability. Many managed care plans are instituting multitier copay systems in which the patient must assume a greater personal financial burden to have access to the most current, and sometimes more effective, branded medications. The clinician will need to be skilled in understanding these differences and listening to how willing a patient may be to pay this additional cost.

Money is the most simple and unambiguous way for individuals to express the strength of their preferences for treatment characteristics. While 2 patients may disagree on what the terms “a little” or “somewhat” mean, they are highly likely to understand the difference between \$10 and \$20. While these study results indicate that statistically significant differences were observed in marginal effects, the real significance of the findings and the message for the clinicians is the substantial value that patients placed on achieving complete relief of GERD symptoms, even a willingness to trade-off time to relief, side effects, and increased out-of-pocket costs. We encourage clinicians to be aware of this as they are making treatment decisions.

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