Cost-Analyses Studies in Barrett's Esophagus

What Is Their Utility?

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KEYWORDS

• Cost-effectiveness • Barrett's esophagus • Markov model • Health-state utilities • Ablation therapy

KEY POINTS

- Cost-effectiveness analyses compare costs associated with administration of therapy for a condition and effectiveness, usually measured in life-years saved or quality-adjusted life years.
- Economic modeling studies in the areas of Barrett's esophagus (BE) have been useful to determine whether current practices of screening and surveillance are cost-effective.
- Key variables in these models include cost of therapy, progression rates from nondysplastic BE to dysplasia and cancer, and efficacy of therapy in eradication of dysplasia and prevention of cancer.
- Modeling studies have demonstrated that screening and surveillance are considered to be cost-effective, particularly for high-risk groups of patients with BE.
- Endoscopic therapy with ablative therapies is considered to be cost-effective for patients with BE and dysplasia.

INTRODUCTION

Any medical therapy rendered is associated with costs, which can include direct costs to patients, hospitals, and/or third-party payers, and indirect costs such as impact on health-related quality of life (HRQL), work productivity, and other measures. Underlying health states and therapies may also be associated with impact on quality of life due to associated symptoms, can impact duration of life expectancy, and in other cases, may affect work productivity and/or quality.

Cost-effectiveness analysis was a concept introduced in the 1990s[1] as a means to evaluate costs and effectiveness of different medical therapies. Costs are typically estimated based on third-party payers or Medicare rates for medications and

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procedures performed. Effectiveness measures can include impact on life expectancy, calculated from the US Life Tables based on patient age, or quality-adjusted life years (QALYs) adjusted by number of life years remaining. All costs and health state utility values are discounted, typically by 3% per year. Scores from generalized or disease-specific instruments cannot be used in the calculation; rather cost-effectiveness analyses require utility values, numbers representing health-quality of life states between 0 and 100. To obtain utilities, either the time-tradeoff or the standard gamble (SG) exercises can be used. Although traditionally paper probability wheels were used, most studies now use computer programs to interview patients. First, the life expectancy of the patient is calculated based on current US Life Tables. In the time-tradeoff exercise, patients are asked how much of their remaining life they would like to trade to rid themselves of their current disorder or health state. The amount traded can range from months to years and is calculated by the formula:

$$\frac{\text{Number of life years remaining} - \text{number of years traded}}{\text{Life years remaining}}$$

which generates a number between 0 and 1, where 0 represents the state of death, and a score of 1, a state of perfect health.

In the SG exercise, patients are invited to engage in a gamble exercise wherein they are told there is a cure for their underlying disorder, but the treatment is associated with a small risk of death. The patient is asked to determine the risk of death that would be acceptable to achieve a cure. In both of these exercises, a "ping-pong" strategy is used whereby patients are initially presented with large values of risk or life years to trade alternating with very small values, and this value is adjusted until the patient decides on a final value.

In the setting of Barrett's esophagus (BE) cost-effectiveness analysis, health-state utility values that might be of interest include those included with the symptoms of gastroesophageal reflux disease (GERD) in patients with BE, risks of cancer associated with states of dysplasia, symptoms associated with cancer, and symptoms that might develop after esophagectomy. Values that have been derived from the literature and have been used in the cost-effectiveness studies to be discussed are shown in **Table 1**. Based on the presence of GERD symptoms, patients with BE did not show lower quality of life scores compared with patients with GERD in one study.[2] When patients with BE were asked theoretically to imagine they had BE in association with a dysplastic state and were educated about associated risks of cancer, lower HRQL values were obtained. Of note is that values obtained using SG techniques are typically higher compared with time tradeoff techniques (TTO) because patients are less willing to undergo therapies with a certain percentage risk of death compared to a trade where they are able to give away a certain amount of time in order to eliminate a certain condition or health state.

Creation of a Decision Model

The first decision in the creation of a cost-effectiveness model is the duration of the model, based on the available literature. In situations where there are only short-term data available, such as, for example, duration of an endoscopic therapy for GERD, a model can be created in a fixed time period to reflect the available data regarding treatment duration. If patients progress in the model from one state to another without the possibility of transitioning back to the original state, then a standard decision tree can be created. If, however, the patient can transition between