A Primer on Health Economic Evaluations in Thoracic Oncology

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ABSTRACT

There is growing interest for economic evaluation in oncology to illustrate the value of multiple new diagnostic and therapeutic interventions. As these analyses have started to move from specialist publications into mainstream medical literature, the wider medical audience consuming this information may need additional education to evaluate it appropriately. Here we review standard practices in economic evaluation, illustrating the different methods with thoracic oncology examples where possible. When interpreting and conducting health economic studies, it is important to appraise the method, perspective, time horizon, modeling technique, discount rate, and sensitivity analysis. Guidance on how to do this is provided. To provide a method to evaluate this literature, a literature search was conducted in spring 2015 to identify economic evaluations published in the *Journal of Thoracic Oncology*. Articles were reviewed for their study design, and areas for improvement were noted. Suggested improvements include using more rigorous sensitivity analyses, adopting a standard approach to reporting results, and conducting complete economic evaluations. Researchers should design high-quality studies to ensure the validity of the results, and consumers of this research should interpret these studies critically on the basis of a full understanding of the methodologies used before considering any of the conclusions. As advancements occur on both the research and consumer sides, this literature can be further developed to promote the best use of resources for this field.

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Introduction

Economic evaluation can be used to aid decision makers in the best use of resources to promote health. As diagnostic and therapeutic interventions become increasingly costly, there is growing interest in economic evaluation to illustrate the value of these interventions as an aid to stewards of health care utilization. Additionally, as new drug therapies, screening strategies, and identification tests are brought to market, economic evaluations become even more essential in comparing these new technologies with current practices by incorporating both economic and effectiveness data.

An emphasis on the costs associated with health care has expanded to national policy in the United States with the Medicare Access and Children's Health Insurance Program Reauthorization Act of 2015, which seeks to attribute quality and cost of patients' health care to their health care providers.[1] Oncologists, like other health care providers, can expect reimbursement adjustments dependent on whether they are practicing quality care and abiding by specified economic parameters relative to other physicians.[1] Furthermore, discussion around the value of therapeutic strategies and treatments is increasing with the development of the European Society for Medical Oncology's Magnitude of Clinical Benefit

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Scale[2] and the American Society of Clinical Oncology's Conceptual Framework to Assess Value of Cancer Treatment Options.[3] The value discussion extends beyond economic evaluation as it integrates and balances clinical benefit and cost but is informed by the results and rigor of economic evaluation.[2] A strong understanding of the principles of economic evaluation will aid oncologists in understanding the costs of care and adding to the broader value discussion.

The purpose of this study is to review standard practices in economic evaluation. This article first provides an overview of the foundations of economic evaluations and key features inherent to their design, implementation, and interpretation. Then, examples of how economic evaluations have been operationalized using citations from the *Journal of Thoracic Oncology* are presented to provide readers with a framework for evaluating this literature and identifying key study design features.

Context

Foundations of Economic Evaluation

Well-conducted economic evaluations can provide evidence to guide decision making for populations and on a per-patient basis. Health care resources are finite, and thus allocation of these limited resources among competing interventions that vary both in cost and effectiveness is inevitable.[4] Economic evaluations assist one in decision making by suggesting which among several interventions is likely to be the most efficient use of resources. In an economic evaluation, an incremental analysis is conducted to determine the incremental costs and effects of one intervention compared with another. This affords one the ability to make informed decisions about which health care intervention to implement in situations of uncertainty.[5] The purpose of an economic evaluation is to indicate whether the added cost of one intervention over another is justified by the improvement in health.

For a study to be considered an economic evaluation, it must meet two criteria. First, the study must evaluate both the costs and consequences of the intervention.[6] Costs include the value of the resources used by the intervention, and the consequences include the positive and negative effects of the intervention.[6] Second, the costs and consequences of the intervention must be compared with those of an alternative intervention, often the current standard of care or no intervention.[5] If a study does not meet both of these criteria, it is not a complete economic evaluation.

Key Features of Economic Evaluations

This section discusses the key features of an economic evaluation to be considered when designing, implementing, and interpreting these types of studies. This includes selecting the appropriate method, perspective, time horizon, modeling technique, discount rate, and sensitivity analysis. Guidance for the selection of each of these features is provided in the following sections.

Method. There are three main types of economic evaluation: cost-effectiveness analyses (CEA), cost-utility analyses (CUA), and cost-benefit analyses (CBA). These analyses account for costs in the same way by presenting them as monetary units; however, the analyses differ in how they measure and value the effect of an intervention.[6] Each type of analysis is described in the following paragraphs, and key differences are presented in Table 1.

CEAs are most frequently used in economic evaluations in the health field.[5] These analyses measure the effectiveness of interventions as a single health outcome, such as progression-free survival or life-years gained.[6] The results of a CEA are presented as an incremental cost-effectiveness ratio (ICER) which is computed by dividing the difference in cost by the difference in effect between the two interventions. The ICER simply displays the additional cost required to gain one more unit of effect.[5] CEAs can compare interventions with common goals, for example, to compare two treatments in terms of progression-free survival.

Table 1. Methods to Conduct an Economic Evaluation

Characteristic	Cost-Effectiveness Analysis	Cost-Utility Analysis	Cost-Benefit Analysis
Costs	Monetary units	Monetary units	Monetary units
Effect	Single health outcome	QALYs	Monetary units
Summary measure	ICER $= \frac{Cost_2 - Cost_1}{Effect_2 - Effect_1}$	ICER $= \frac{Cost_2 - Cost_1}{Effect_2 - Effect_1}$	Benefit-cost ratio
Advantage	Can compare interventions with common goals	Accounts for both quantity and quality of life gained	Can compare the cost and benefit of resource utilization across initiatives with different outcomes
Disadvantage	Cannot compare interventions with different goals	Sensitive to the utility weights selected	Controversial to assign a dollar value on a human life

ICER, incremental cost-effectiveness ratio; QALYs, quality-adjusted life-years.

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