

HEALTH POLICY AND ECONOMICS

Getting Better Value for Money: The Use of Economic Evaluations in Several Surgical Subspecialties

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ABSTRACT

Health care economic analyses are becoming increasingly important in guiding health care resource allocation decisions. This paper defines the components of a full economic evaluation and highlights the four types of economic evaluations, using examples from surgical subspecialties, namely otolaryngology and ophthalmology. The economic evaluations discussed include (1) cost-minimization analyses; (2) cost-effectiveness analyses; (3) cost-benefit analyses; and (4) cost-utility analyses. The significance for clinicians of this focus on economics within the health care system is also addressed.

THE IMPORTANCE OF ECONOMIC EVALUATIONS IN MEDICINE

Research techniques for economic analysis are well-established,¹ however, it was not until the early 1990s that the medical literature began to include many examples of such analyses. Given the scarcity of resources such as people, time, equipment, and knowledge, and in light of the ever-increasing demands placed on our healthcare system, caregivers are now being asked to consider cost in their clinical decisions in an effort to obtain greater value for money. As such, many professionals working in areas of health policy and health practice now require some understanding of health economic principles and methods.

In order to achieve such an understanding, three important and unique principles of economic evaluations must be considered:² (1) *Systematic Evaluations*. Unless evaluations are performed in a systematic manner, identifying relevant alternatives to an intervention will be difficult. For example, when evaluating the outcomes of CO₂ laser resection of a laryngeal tumour, one must consider outcomes from currently available alternatives (i.e., radiation therapy, chemotherapy, and/or laryngectomy). (2) *Study Perspective*. The analysis must also consider which viewpoint makes the most sense in a given context. Though a treatment may seem unattractive from one perspective, the same may not be true when looking at outcomes from another vantage-point.

Perspectives to consider include those of the patient, the institution providing treatment, the government paying for some (or all) of the treatment, and society. Consider using preoperative imaging in the surgical treatment of primary hyperparathyroidism: from the patient's perspective, preoperative imaging results in more efficient localization of the offending parathyroid adenoma thus reducing the intraoperative time, in addition to minimizing both the surgical exploration to which the patient is subjected and the time spent under general anaesthesia. From a hospital standpoint, however, performing such imaging is expensive and time-consuming, and does not change patient-care management, therefore it is not as enticing. (3) *Cost and Outcome Measurements*. The ability to measure the costs and outcomes of alternative choices is critical for a meaningful economic evaluation. This is often important in the analysis of potentially novel screening methods. For example, in the evaluation of diabetic retinopathy screening by mydriatic indirect ophthalmoscopy using a slit lamp, the costs and outcomes of this screening method require comparison to the costs and outcomes related to diabetic retinopathy testing, diagnosis and treatment.³ Following the analysis, the ability to measure the magnitude of the effect of the ensuing decision (given a certain perspective) allows health economists to realize the *opportunity* cost of a decision, i.e. the cost of choosing to commit a certain amount of resources to a particular program over another.

WHAT IS AN ECONOMIC EVALUATION?

Health care professionals often oversimplify the term “economic evaluation” due to a lack of understanding of what it encompasses. A recent study by Keziran and Yueh (2001)⁴ examined articles in several peer-reviewed otolaryngology journals whose titles indicated different types of economic analysis, and reviewed both their use of terminology as well as established methodology guidelines. Of those reviewed, 53% of terms such as “cost-effective” were used incorrectly, and 60% confused “charge” (i.e., the price set by an institution) and “costs” (i.e., the true value of all resources consumed). Overall, the use of accepted definitions and research methods was inconsistent. This is an important finding as it demonstrates that even health care professionals who conduct economic evaluations often misunderstand and misuse economic terminology and methodology, which may in turn lead to incorrect conclusions among health care decision makers.

An economic evaluation is comprised of two key features (Table 1); it must deal with costs and consequences, and must also concern itself with a choice between alternatives. Therefore, any type of economic evaluation must identify, measure, value, and finally, compare the costs and the consequences of each alternative being evaluated. Without these characteristics, the analysis is considered a *partial* evaluation.² A *full* economic evaluation, in contrast, takes into account both the costs and consequences of proposed alternatives, and is conducted using one of four different methodologies. In order of increasing complexity, these include (1) cost-minimization analysis; (2) cost-effectiveness analysis; (3) cost-benefit analysis; and (4) cost-utility analysis.^{2,5,6}

Table 1. Distinguishing Characteristics of Health Care Evaluations²

		Are both costs and consequences of the alternatives examined?		
		NO		YES
Is there comparison of two or more alternatives?	NO	Examines only consequences	Examines only costs	Partial Evaluation
		Outcome Description	Cost Description	Cost-outcome description
YES		Partial Evaluation		Full Economic Evaluation
		Efficacy or effectiveness evaluation	Cost analysis	1. Cost-minimization analysis 2. Cost-effectiveness analysis 3. Cost utility analysis 4. Cost benefit analysis

Redrawn from "Methods for the Economic Evaluation of Health Care Programmes 2/e" (Table 2.1, page10), Drummond, M.F. (1997). Reprinted with permission from the Oxford University Press (www.oup.com).

1. Cost-minimization analysis

Cost-minimization analysis represents the simplest of the four types of analyses, and compares at least two alternatives (diagnostic tools, preventive interventions, treatments, etc.). It is assumed that all alternatives have the same outcome, and as a result, it is not possible to compare just two alternatives. For instance, in evaluating two surgical procedures for a given illness, surgical outcomes may differ: one may cause significant post-operative morbidity secondary to pain, whereas the other may contribute more significantly to the patient’s time lost from employment. Complication rates in comparing various procedures can often be quite different. For this reason, cost-minimization analyses are quite restricted. Ultimately, the goal of the analysis is to find the treatment option that yields the lowest cost per patient treated; the analysis may consider various costs that the patient, institution, government and society will face in light of the intervention, thus allowing one to determine which represents the least costly alternative.

A good example of how this type of analysis has been implemented within the field of ophthalmology is the comparison among different approaches to cataract surgery presented by Cresswell *et al* (1996).⁷ Not surprisingly, the investigators were able to demonstrate similar clinical outcomes, but at a lower cost when the surgery was performed at an institution dedicated solely to cataract surgery versus a facility where all forms of ophthalmic surgery are conducted.

2. Cost-effectiveness analysis

Because the outcomes of different interventions are rarely the same, a method is required that incorporates the end-results of trials comparing these interventions; cost-effectiveness analysis represents an extension of cost-minimization analysis. The objective of conducting a cost-effectiveness analysis is to show the relative costs and consequences of alternative interventions for improving health. It measures the resources spent for a given endpoint, such as years of extended life, disability avoided, diagnosis or any other end result. Thus for example, in considering two different forms of cancer therapy, a cost-effectiveness analysis may compare the cost of extending a patient’s life by one year for each treatment.

Wilson *et al.* (2003)⁸ recently conducted a study examining the cost-effectiveness of intraoperative facial nerve monitoring in middle ear or mastoid surgery. The routine use of facial nerve monitoring is quite controversial, despite its utility in reducing the risk of iatrogenic facial nerve injury during neurosurgery. A major barrier to its acceptance is reportedly cost.⁸ To assess this further, comparisons were made between intraoperative facial nerve monitoring for both primary and revision middle ear or mastoid surgeries, facial nerve monitoring for revision surgeries only, and no monitoring for any of those surgeries.⁸ Taking into account patient outcomes and costs for each of the aforementioned groups, facial nerve monitoring has been shown to be cost-effective compared to no monitoring at all, leading Wilson *et al.* (2003)⁸ to recommend its routine use in order to reduce the risk of iatrogenic facial nerve injury during otologic surgery.

3. Cost-benefit analysis

In contrast to cost-effectiveness analysis, cost-benefit analysis represents a more universal way of performing an economic evaluation, in that this approach takes into account situations in which two alternatives may have multiple consequences, each of which may be of interest. Cost-benefit analysis measures both the costs and the outcomes of interventions in units of currency (e.g., dollars); that is to say, one can compare the cost of a treatment to the monetary benefits of improved survival (using income, or value of leisure time), with results often expressed as dollars spent for dollars gained. Although this type of economic evaluation is quite straightforward to interpret, there are often significant barriers with respect to translating health outcomes to dollar amounts. For example, it can be difficult to take into account the quality of life associated with a given health state.⁵

There have been relatively few cost-benefit analyses performed within the field of ophthalmology. However, Javitt *et al.* (1999)⁹ conducted a study addressing the cost-benefit of controlling retinopathy in Type I diabetes. In order to do this, a computer simulation model was designed to predict the medical and economic effects of applying currently accepted methods for the control of diabetic retinopathy. Over a period of 60 years, the model predicts that 72% of Type I diabetics will develop proliferative diabetic retinopathy and that 42% will develop macular edema. If treatments are delivered as recommended in current clinical trials, the model predicts a cost of \$966 per person-year for vision saved from proliferative retinopathy, and \$1 118 per person-year of central acuity saved from macular edema. This accounts for only one-seventh of the \$6 900 average annual cost of Social Security Disability for those disabled with vision loss in the United States.

4. Cost-utility analysis

Cost-utility analysis brings outcome measures to a higher level by incorporating patient preferences to measure the value of the intervention. As a result, the term “value-based medicine” has been introduced by a group of researchers.^{5,10,11} This form of economic evaluation is perhaps the most complicated of the four methodologies, employing utility as a measure with which to value benefit by providing a numerical score that patients attach to individual states of health. As a result, utility is specific to an individual patient despite the fact that the clinical outcome may be the same for many patients.

Consider two patients who both suffer end-stage glaucoma, and have almost completely lost their eyesight. One is a truck driver and the other, a professional singer. When comparing the two, eyesight has much more value for the truck driver than for the singer, which translates into the truck driver having a higher degree of benefit from treatment than the singer, even though treatment outcomes are the same. Utility, therefore, is very case-specific.

Cost-utility analyses use Quality Adjusted Life Years

(QALY) gained as the unit of measurement in order to gauge benefit. The advantage of using a QALY score as a measure of health benefit is that it encompasses both a reduction in morbidity (*quality* of life gained) and mortality (*quantity* of life gained). This form of analysis compares the QALY gained from two forms of treatment to their respective costs in dollars. The superior treatment is determined by whichever yields the greater QALY gained per case.

Many of the cost-utility analyses in the otolaryngology literature pertain to the use of cochlear implants. One study by Wyatt *et al.* (1996)¹² addressed the cost-utility of the cochlear implants in a group of Ontario residents. The study compared the health utility of 229 Nucleus 22-channel implant users and 32 cochlear implant candidates receiving medical treatment. Through methods described in the paper,¹² the health utility of the implanted group was found to be greater than the group of people awaiting surgery by 0.204 ($P < 0.0001$). Cost-utility calculations revealed that cochlear implantation costs were approximately \$15,928 per QALY gained through surgical cochlear implantation. It was determined that since hearing loss reduces quality of life significantly, cochlear implants, which provide considerable improvements in hearing, largely improve the health utility of patients. Therefore, the cost of cochlear implantation per QALY provided is significantly lower than other medical interventions that do not improve health utility by the same degree.

IN SUMMARY

Health economic analyses ultimately aim to guide more efficient expenditure of healthcare dollars, and to permit stakeholders within the health care system to appreciate the value of a given intervention in light of the amount of expended resources. By conducting and understanding such analyses, physicians and other healthcare workers will be able to achieve greater value per dollar spent.

Unfortunately, many studies in the literature are confusing as they refer to any or all economic evaluation methods as cost-effectiveness analyses when, in reality, the analysis being conducted may either represent a cost-minimization, cost-benefit, or cost-utility analysis. Economic analyses are often complex and understanding them requires training that is not usually part of a standard medical education. As depicted by Keziran and Yuek (2001),⁴ investigators are not always aware that terms, such as “cost-effective”, have specific meanings. Since economic analyses are increasingly being used to inform healthcare management and policy decisions, it is becoming increasingly important that such studies are carried out using standard and well-defined terminology and research methods. Authors, reviewers, and readers must be aware of the fundamental components of an economic analysis, and the distinction between the four types of analyses in order to ensure that these studies are both conducted and interpreted appropriately. †

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REFERENCES

- Weinstein MC, Stason WB. (1977). "Foundations of cost-effectiveness analysis for health and medical practices." *New Engl J Med.* 296:716-21
- Drummond ME, O'Brien B, Stoddart GL, et al. (1999). *Methods for the Economic Evaluation of Health Care Programs*, 2nd ed., Oxford University Press, New York.
- Javitt JC, Aiello LP. (1996). "Cost effectiveness of detecting and treating diabetic retinopathy." *Ann Intern Med.* 124:164-9
- Kezirian EJ, Yueh B. (2001). "Accuracy of terminology and methodology in economic analyses in otolaryngology." *Otolaryngol Head Neck Surg.* 124:496-502.
- Brown MM, Brown GC, Sharma S, et al. (2003) "Health care economic analyses and value-based medicine." *Surv Ophthalmol.* 48:204-23.
- Brown MM. (2003). "Health care economic analyses." *Cur Opin in Ophthalmol.* 14:117-21.
- Cresswell PA, Allen ED, Tomkinson J, et al. (1996). "Cost-effectiveness of a single-function treatment centre for cataract surgery." *J Cataract Refract Surg.* 22:940-6.
- Wilson L, Lin E, Lalwani A. (2003). "Cost-effectiveness of intraoperative facial nerve monitoring in middle ear or mastoid surgery." *Laryngoscope.* 113:1736-45.
- Javitt JC, Canner JK, Sommer A. (1989). "Cost-effectiveness of current approaches to the control of retinopathy in type I diabetics." *Ophthalmology.* 96:255-64.
- Brown MM, Brown GC, Sharma S. (2002). "Value-based medicine." *Evid Based Eye Care.* 3:8-9.
- Brown MM, Brown GC. (2002). "Outcome of corneal transplantation. Value-based health care." *Br J Ophthalmol.* 86:2-3.
- Wyatt JR, Niparko JK, Rothman M, et al. (1996). "Cost utility of the multichannel cochlear implants in 258 profoundly deaf individuals." *Laryngoscope.* 106:816-21.



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