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Pharmacoeconomics

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Introduction

The pressure to examine the allocation of health care resources has greatly increased in recent years for several reasons, including escalating health care costs, new health care technologies that are increasingly effective, but increasingly expensive, and health care budgets that have been reduced. The above pressures are forcing decision makers to seek new principles for the adoption of new technologies. Consequently, health economics, which studies the economic aspects of health care interventions, has become a rapidly growing field.

The fundamental issue health economics addresses is value for money. It helps make decisions based on both costs and outcomes, and determines what interventions should be made to gain the highest value for the money invested. Pharmacoeconomics, an area that falls within health economics, specifically addresses the economic impact of pharmaceuticals.

Types of pharmacoeconomic evaluations

There are many types of monetary analyses. To be called a pharmacoeconomic evaluation, three conditions should be met: 1) at least one drug must be compared with one or more alternative drug or non-drug treatments, 2) both costs and patient outcomes must be considered, and 3) the result should incorporate both costs and patient outcomes between comparators, preferably in the form of a ratio of incremental costs over incremental outcomes.

The table below summarizes the types of pharmacoeconomic analyses:

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Type of analysis	Definition	Advantages	Limitations
Cost-minimization	Assumes treatment outcomes to be equal; Simply compares all costs of treatments	Simplicity	Sufficient evidence is required to demonstrate that treatment outcomes are equal between alternatives
Cost-effectiveness	Relates cost of treatments to natural units of health benefits (years of life gained, percent	Does not require translation of health benefits to monetary terms; versatile since many different	Requires a common outcome of interest between alternatives; cannot value intangibles such as pain or suffering

	reduction in mortality, or cost per cure)	outcomes possible	
Cost-benefit	Relates cost of treatments to health benefits, all of which are expressed in monetary terms; Provides a numerical ratio	Alternatives with different outcome of interest, or common outcomes achieved to different degrees may be compared	Requires translation of health benefits to monetary terms; difficult to measure loss of life, lost wages in homemakers and elderly
Cost-utility	Relates cost of treatments to years of life gained, adjusted by various measures e.g., quality-adjusted life-years (QALY)	Alternatives with different outcome of interest, or common outcomes achieved to different degrees may be compared	Requires translation of health benefits to utility (worth of certain health status). Utility values vary between patients and non-patients
Cost-consequence	Presents expected cost per patient treated plus a list of all outcomes, but not combined or aggregated	Simplicity. Quantifies all outcomes in the analysis; used to clarify benefits when there is dominance (i.e., new drug costs less and is more effective)	Not "true" pharmacoeconomic analysis; unlike the other analyses, it does not provide an incremental ratio or single summary value

Methods/Data sources

In order for a pharmacoeconomic analysis to aid decision making, great emphasis should be placed on its methodology and design. It is of primary importance to state from which perspective the analysis is performed (e.g., societal, hospital, third party payer, etc.), to identify all relevant comparators and to establish effectiveness of the treatments under consideration.

Costs in economic analyses are defined somewhat differently from costs in the accounting sense. The true cost of a health intervention in the economic sense does not refer to only dollar expenditures, but to the value of all of the inputs into the patient's care. Included are both direct and indirect costs (discussed below). The benefits that could have been realized if the resources in question were allocated to their best alternative use represent an "opportunity cost", which pharmacoeconomic analyses attempt to measure.

Pharmacoeconomic analyses deal with various types of costs. Direct costs are defined as costs that are related to the changes in resource use that are attributable to the intervention, and include costs that are borne by both the health care system (organizing and operating costs) and the patient (out-of-pocket expenses related to treatment). Included are the costs of drugs, as well as their preparation, administration, and monitoring, costs of medical care, hospitalization, and laboratory tests. Indirect costs describe the loss in productivity (e.g., time lost from work) that results from the patient receiving the treatment in question. The costs of consumed resources should always reflect the current "market value" of that resource. Normally, standard published lists are used to cost items for pharmacoeconomic analyses (e.g., hospital per diem data, Ontario Drug Benefit Formulary, Schedules of Benefits for costs of physician visits and laboratory tests). The current market value of an intervention/service is often more accurately described by the dollar value that was paid for that item.

Pharmacoeconomic studies utilize three analytic models to collect data. These are:

1. Prospective (i.e., as part of a clinical trial)
2. Retrospective (i.e., data are extracted from an existing database or medical charts), and
3. Predictive (which is modelling, using a decision tree or an existing randomized controlled trial).

The third type is perhaps the most common. Decision trees visually depict the alternative therapies and all the outcomes that are potentially realized. Success rates form the probabilities for each branch and costs are their utilities. The figure depicts a hypothetical simple decision tree for an antibiotic. The drug either is successful (upper branch) and may continue to be, or there is a relapse and re-treatment is required. The lower branch indicates a failure, which necessitates the use of a backup treatment. The branches of the tree would then be populated with probabilities of success, failure, or relapse derived from the literature or from a clinical trial. Costs would then be calculated for each branch of the tree, multiplied by the corresponding probabilities, and summed to arrive at the Expected Cost and Expected Effectiveness of treatment. Expected Costs and Expected Effectiveness are compared between drugs to determine which is most cost-effective.

Who uses pharmacoeconomic data?

While effective, but costly technologies are rapidly entering the health care arena, resources remain scarce. New products often provide additional benefits over existing ones, but most often have substantially increased costs. As a result, making decisions for the adoption of new health care technologies is becoming increasingly difficult, and the spectrum of decision-makers who benefit from pharmacoeconomic evaluations is continuously growing. The most important parties are:

Government - federal (for marketing approval)

Government - provincial (for formulary approval)

Pharmaceutical industry

Third party payers (health insurance companies such as Liberty Mutual, Green Shield)

Hospitals and other institutions (for formulary approval)

HMOs/ health plans.

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Table 1. Main types of pharmacoeconomic analyses

Recognizing the expanding role of economic evaluations, Australia¹ and Canada² were the first countries to publish formal guidelines for the economic analysis of pharmaceuticals. Since then, others have followed suit. Presently, pharmacoeconomic analyses meeting specific provincial guidelines are required for submissions to the Ontario Drug Benefit as well as other plans³. At the federal level, the Canadian Coordinating Office for Health Technology Assessment (CCOHTA) has been established to evaluate technology, including drugs such as submissions from pharmaceutical firms. CCOHTA enforces the Canadian Guidelines and is presently updating them.

Publications of pharmaceutical analyses

The number of papers addressing the economic impact of drugs has been constantly growing. The titles of some leading journals which focus on pharmacoeconomics are:

Pharmacoeconomics, Journal of Health Economics, Health Economics, Medical Decision Making, International Journal of Technology Assessment in Health Care, and American Journal of Managed Care.

Pharmacoeconomics, a new discipline in pharmacy and medicine, is rapidly developing. Because it will certainly have an increasingly significant impact on decision making in health care, it is important that all stakeholders in the process become familiar with these analyses.

References

1. Department of Health. Guidelines for the pharmaceutical industry on preparation of submissions to the Pharmaceutical Benefits Advisory Committee. Canberra: Australian Government Publishing Service, 1992.
2. Guidelines for Economic Evaluation of Pharmaceuticals: 1st edition. Ottawa: Canadian Coordinating Office for Health Technology Assessment, November, 1994.
3. Ontario Guidelines for economic analysis of pharmaceutical products. Toronto: Ontario Ministry of Health, 1994.