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Pharmacoeconomics

Principles and Practice



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TABLE OF CONTENTS

Preface	5
Introduction	7
Health Care Dilemma.....	7
Opportunity Cost	9
Efficiency and Equity.....	10
Pharmacoeconomics	12
Sensitivity Analysis	15
Summary	16
Further Readings	17
1 Definitions and Basic Concepts	19
1.1 Definitions.....	19
1.2 Costs	20
1.3 Consequences.....	22
1.4 Perspectives.....	24
1.5 Time Horizon	25
2 Pharmacoeconomic Evaluations	27
2.1 Introduction	27
2.2 Cost Analysis.....	28
2.3 Cost-outcomes Analysis	28
2.4 Utility.....	34
2.5 Psychometrics	36
3 Modeling Frameworks	39
3.1 Steps in Decision Analysis.....	39
3.2 Influence Diagrams	46
3.3 Markov Models.....	47
3.4 Discrete-event Simulation	51
3.5 Agent-based Models.....	55

4	Budget Impact Analysis	59
4.1	Introduction	59
4.2	Example: Budget Impact Analysis of Clinical Guidelines in COPD Patients	62
5	Patient Reported Outcomes	67
5.1	Introduction	67
5.2	From Biological Measures to Patient Reported Outcome ...	68
5.3	Quality of Life, Health Related Quality of Life, and Patient Reported Outcomes	68
5.4	PRO Dimensions	71
5.5	Every Patient has Individual Health Perceptions	72
5.6	Applications of PRO Instruments.....	74
5.7	Identifying an Appropriate Instrument for Measuring PRO ...	75
5.8	PRO Instruments	77
5.9	When are the Results of PROs Relevant?	80
5.10	Summary and Conclusion.....	80
6	Data Sources and Accounting for Uncertainty	83
6.1	Data Sources	83
6.2	Statistical Analysis	91
6.3	Accounting for Uncertainty	92
6.4	Pharmacoeconomic Studies.....	97
6.5	Conclusions: Evaluating Pharmacoeconomic Studies	101
	References	103
	Glossary	115
	Authors	121

PREFACE

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Honestly, when I was first asked to serve as editor for a manual on pharmacoeconomics and outcomes research, my first thoughts were: “Another one? Are there not enough around?” and my skeptical face must have shown this, although I did answer that I would take a look on what was already available before making my decision. But then, as I actually did take a look around, I noticed that most of the literature is either academic in style (and weight!), or thought as a textbook for students, while not much is available for people who have to deal with economic evaluations in health care, but do not engage themselves in performing such studies.

So we decided to try and provide a text which can serve as a quick reference and as an aid to understand papers dealing with pharmacoeconomics and outcomes research, providing a slim basis of the theoretical background, but then exemplifying the concepts through examples taken from the literature, with the ambition to ease a sound acquaintance without the redundancy of technical details.

Accordingly, we structured the book in a first, short section in which the basic definitions commonly used in the jargon are provided, followed by a more in-depth exposition of the main methods and techniques, explained by the description of actual studies retrieved in the published literature.

The result is the present text, which the on-field experience of all involved authors has made, in our opinion, a practical tool that can guide stakeholders involved in the decision making process in health care to a robust insight of the theoretical and methodological aspects of modern pharmacoeconomics.

INTRODUCTION

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The assessment of pharmaceuticals has, in recent years, expanded beyond efficacy and safety to cover economic implications and other consequences. The incorporation of an economic perspective into the decision-making process as to which therapies will be reimbursed and made available by respective health care systems has aroused much debate and discussion, which at times has been quite heated. Newspaper headlines of people having to re-mortgage their houses to pay for “life-saving” therapies and media frenzy when “effective” treatments are denied to desperate patients are becoming all too common occurrences. The intention of this introductory Chapter is to explore some of the concepts that underpin the economic assessment of pharmaceuticals in order to appreciate the rationale for economic considerations and how the approaches and instruments used in undertaking the economic assessments can be applied to everyday decision-making processes.

Health Care Dilemma

It cannot have escaped the attention of anyone involved in health services that there is a shortage of more or less everything that is needed to adequately provide services. The nature of the health care dilemma, which confronts all health care systems, is a microcosm of the basic economic problem: that of reconciling infinite wants, needs and demands with finite resource availability, in terms of income, time, expertise, and so on. The exponential increase in demand for health care services

has been occurring at the same time as pressures on governments and funding agencies to carefully manage the volume of resources available for health care services. It is not simply a lack of finance – although that does feature prominently – but as individuals we are continually faced with the consequences of not having enough time to fit in everything that needs to be done and would very much like to do. In addition, shopping lists far exceed abilities to purchase everything they contain, while good intentions to maintain strict exercise routines are often thwarted by the lack of energy after a busy day at the office, in the surgery or in the operating theatre!

The fundamental economic problem is that while we all have unlimited wants and desires, we only have limited resources (time, energy, expertise and money) at our disposal to satisfy them. This situation has become particularly evident in health care and has been compounded by factors such as increasing expectations of people in relation to what can actually be delivered by health care services, continuing advancements in health technology and medical science and the increasing health needs and demands of an ageing population. As individuals we are constantly making choices as to how we use our time, into which activities we channel our energies and on what we spend our available funds. In spending time on one activity or purchasing a certain commodity, means that period of time and those funds are not available for other activities and other purchases. The same issues relate to health systems: which patients to treat, when and with what therapies? The answers do not lie in spending more money: how do we know whether any additional expenditure will actually produce additional health care benefits? Health care systems will never be a position to meet everyone's health care needs let alone people's wants and desires. The politicians, managers and other officials who run the services veer between trying to contain costs, and defusing the anger of patients, families and the electorate for the inadequacies in the services that are provided. Media focus on the pressures and problems, rather than the successes, do little to remedy the situation, while

professionals' frustration and anger with what they see as the inadequacies in the systems and their effects on patient care are increasingly apparent.

Opportunity Cost

It is therefore apparent that in making a choice to use funds and resources in one way means that they are not available for other purposes. As a result the benefits, which would have been derived, are sacrificed. These sacrifices are referred to as **opportunity cost**. Their very existence provide a rationale for economists to take an interest in all resources that are used, whether by individuals, governments, health services or societies, regardless of whether or not money is paid for them, in order to achieve the maximum benefit. Questions of resource allocation, that is how scarce resources are, could be or should be allocated amongst the infinite variety of competing activities, are therefore fundamental to any study of economics. The wide range of economic systems, which have existed and evolved over time, have all attempted to address the basic economic problem of allocating resources in such a way as to maximize the benefits for society. Similarly, the variety of approaches employed to fund and finance health care by different countries all have the same basic aim of seeking to maximize the health benefits for their citizens, given the resources they have available at that point of time. The nature, type and funding of health care systems continue to exercise the minds of many policy makers, and stimulate debate in academic institutions, the media and other popular centers of debate and discussion.

In developing a cost profile, it is important that the resource implications associated with the particular therapy being appraised in comparison with treatments that are currently provided should be identified, measured and valued within a relevant context and should include a comment on the validity of using resource data from other locations, if local data are not available. The appraisal should present direct health care

resource usage for the therapy and its comparator(s) separately and in natural units, such as hospital days, dosage and duration of treatment, with data sources cited. These would constitute the costs to the respective health care system. However, patient resource use in accessing and using treatment should also be included where felt to be significant, particularly where there are major differences between the therapy and its comparator(s). Other resource use may also be presented separately where differences arise between the therapeutic agent and its comparator(s) e.g. direct non-health care resource use, such as those by other agencies, while productivity losses attributable to changes in health outcomes might also warrant some discussion.

Efficiency and Equity

The term **efficiency** is used by economists to consider the extent to which decisions relating to the allocation of limited resources maximize the benefits for society. The concept of efficiency embraces inputs (costs) and outputs and/or outcomes (benefits) and the relationship between them, with a society being judged in efficiency terms by the extent to which it maximizes the benefits for its population given the resources at its disposal. The simplest notion of efficiency is the one synonymous with economy, and is often referred to as **efficiency savings**, where output is expected to be maintained, while at the same time making cost reductions, or where additional output is generated with the same level of inputs. This type of efficiency has also been referred to as **cost-effectiveness**. It is applied where a choice needs to be made between alternatives, which seek to achieve the same goal, and exists when output is maximized for a given cost, or where the costs of producing a given output are minimized. It is widely used in the context where new therapies are compared against existing treatments and authorities have to decide whether it is worth paying more for the potential additional benefits which the new therapy offers.

However, cost-effectiveness is not sufficient in order to establish priorities, both within health care systems, and when comparing the provision of health care with other publicly funded services. In order to determine whether and how much of certain services should be provided and in order to establish priorities, allocative efficiency must be used. This type of efficiency exists when it is impossible to make one person better off without at the same time making someone else worse off. It represents a situation where no input and no output can be transferred so as to make someone better off without at the same time making someone else worse off.

However, it is impossible to separate the drive towards an efficient allocation of resources from its impact on income distribution. A move towards efficiency may well result in a redistribution of income in favour of the well off, which may not be acceptable on grounds of fairness and equity. Virtually all health care systems employ a mix of libertarian and egalitarian values. The notion of equity is inextricably linked with notions of fairness and justice, but it is important to distinguish it from the concept of equality. Policies designed to achieve equality of opportunity, or access, or utilization or outcome may well be desirable but they need not necessarily be equitable.

The extent of health inequalities within countries and across international boundaries continues to ensure that equity remains high on the list of health policy objectives. Many influential national and international policy documents highlight the importance of equity as a goal of policy and the on-going need to implement remedial measures to reduce inequalities both between and within populations, which remain frustratingly large. It is widely acknowledged that people's environment, social status, educational achievements, ethnic origin, age, gender, etc. affect their state of health, and equally that their conditions and characteristics result in some being better able to respond to treatments and enjoy longer life expectancy. An issue which has really polarized opinion, both within the health care professions and among decision-makers, for example, is whether people who knowingly engage in health-

damaging behavior should receive treatment – is it fair and equitable that limited health care resources are allocated to these people, while others, who have attempted to live healthy lives, have to wait for treatment or access the services of the private sector? The very fact that service provision is limited makes it inevitable that some people will not receive all that is wanted or even required. The decision-making process as to who should receive services, treatments and interventions is littered with casualties, who can lay legitimate claim to claiming that such decisions are unfair and inequitable. In addition, there is a lack of consensus on how to deal with policies that improve efficiency while increasing inequalities or those that improve fairness while decreasing efficiency.

It is therefore very evident that in setting the economic objectives of health care systems, both efficiency and equity considerations are vital components and must be given serious consideration. However, it is inevitable that in seeking to achieve a more equitable allocation of resources, a level of efficiency will have to be sacrificed, or, in attempting to move to a more efficient health care system, inequalities in provision or access to services may have to be compromised.

Pharmacoeconomics

It is these issues that health economic evaluation seeks to address and, specifically in relation to pharmaceuticals, provides the underlying premise on which pharmacoeconomics is based. The term **pharmacoeconomics** has been coined to depict the economic assessment of pharmaceuticals, to assess the extent to which they provide additional benefits relative to the additional costs incurred. What is required is information that guides decision-makers as to which therapy provides the greatest bang per buck! In other words, is it worth paying more for the potential additional benefits which a new therapy offers when compared with existing treatments? The term **cost-effectiveness** has become synonymous with pharmacoeconomics and has

been used (and misused) to depict the extent to which interventions measure up to what can be considered to represent value for money – what is the additional bang and what is the additional buck? Strictly speaking, however, cost-effectiveness analysis (CEA) is one of a number of techniques of economic evaluation, where the choice of technique depends on the nature of the benefits specified. CEA has been defined by NICE¹ as an economic study design in which consequences of different interventions are measured using a single outcome, usually in “natural” units (for example, life-years gained, deaths avoided, heart attacks avoided, or cases detected), and the interventions are compared in terms of cost per unit of effectiveness.

However, given that outputs and outcomes are highly specific and differ according to the nature of the condition, it is necessary to utilize “common currencies” so that apples and pears can be compared – that is outputs in obstetrics and gynecology need to be compared with outputs and outcomes in renal disease, care of the elderly, musculoskeletal disorders, etc. – so that the cost-effectiveness of an intervention in one therapeutic area can be compared with the cost-effectiveness of an intervention in a different area. The usual common currency that is employed is that of the quality adjusted life year (QALY), which is derived by the combination of the impact of the intervention on both quantity and quality of life. A QALY embraces both quantity and quality of life and is the arithmetic product of life expectancy and a measure of the quality of the remaining life-years. It provides a common currency for measuring the extent of health gain that results from health care interventions and, when combined with the costs associated with the interventions, can be used to assess their relative worth from an economic perspective. The quantity of life, expressed in terms of survival or life expectancy, is a traditional measure that is widely accepted and has few problems of comparison – people are either alive or not. Quality of life, on the other hand, embraces a whole range of different facets of people’s lives, not just their health

¹ <http://www.nice.org.uk/media/B52/A7/TAMethodsGuideUpdatedJune2008.pdf>

status. Even restricting the focus to a person's health-related quality of life will result in a number of dimensions relating to both physical and mental capacity. A number of approaches have been used to generate these quality of life valuations, referred to as health utilities: for example, standard gamble, time trade-off and the use of rating scales. The utilities that are produced represent the valuations attached to each health state on a continuum between 0 and 1, where 0 is equivalent to being dead and 1 represents the best possible health state, although some health states are regarded as being worse than death and have negative valuations. The specific type of cost-effectiveness analysis that is undertaken when using QALYs is referred to as cost-utility analysis (CUA).

There may be occasions when the outcomes generated by interventions are virtually equal or at least very similar. In such circumstances it might be possible for a cost-minimization analysis (CMA) to be undertaken, where only the cost differences between the interventions are needed to establish which of them provides the best value for money. However, caution should be exercised in relation to what is meant by equivalence or similarity – the condition for use of CMA is that the outcomes should be identical – since while both oral and IV modes of a drug can provide equivalent therapeutic outcomes, the outcomes from a patient's perspective can be very different.

In cost-benefit analysis (CBA) the costs and outcomes are expressed in monetary terms, so as well as being able to make comparisons across all areas of health care, comparisons can also be made with programmes and schemes in education, transport and the environment, for example. The difficulty arises, however, when trying to place a monetary value on the intangible benefits, where market prices do not exist. There are two main techniques that can be used here: these are willingness-to-pay and discrete choice experiments.

What is important to bear in mind is that the aim of all approaches used to undertake pharmacoeconomic assessments is to maximize the level of benefits – health effects – relative to the level of resources available. However, the complexities and

contentions relating to the assignment of monetary valuations to health care outcomes and the inadequacies of CEA and CMA has meant that CUA has become the primary technique used in conducting pharmaceconomic evaluations.

Further discussion on these approaches forms the basis of the remainder of this book.

Sensitivity Analysis

Pharmacoeconomics is far from being a precise science and the findings emerging from such evaluations should be treated with a degree of caution. There is often considerable uncertainty associated with the findings with wide variation surrounding the results generated and it is therefore imperative that all pharmaco-economic assessments should be subjected to a sensitivity analysis. The need for sensitivity analysis arises because of a number of factors:

- methodological issues arising from different approaches and methods employed in the evaluation;
- potential variation in the estimates of costs and effects used in the evaluation;
- extrapolation from observed events over time or from intermediate to final health outcomes;
- transferability of results and the validity of results from different populations/patient groups.

The findings from cost-effectiveness assessments therefore require some indication of the confidence that can be placed in them. What would happen, for example, if the “true cost” of one of the treatment strategies was somewhat higher or lower than the estimate used in the investigation or if there were significant changes in the life-years gained or other parameters used? Sensitivity analysis tests all the assumptions used in the model and enables the impact of changes on the baseline estimates. More information on sensitivity analysis will be provided later in the book.

Summary

The decision-making process in determining which services and treatments should be provided is highly complex and involves a number of different, often conflicting, factors. The utilization of pharmacoeconomics can assist decision makers to utilise the information relating to the effectiveness and efficiency of an intervention. They can also go some way to contributing to the process of determining health care priorities and in seeking to ensure that the most efficient use is made of resources available within limited health care budgets. Health care professionals are increasingly being exposed to extremely powerful and emotive choices, and in no way can pharmacoeconomics provide the solution to such complex and difficult issues. What it does offer is a mode of thinking which can assist in arriving at possible solutions (notice the use of the term "assist" here – pharmacoeconomics cannot by itself offer the solutions, it has to be part of a wide-ranging approach to decision-making) to these often contentious problems. It aims at identifying which therapies would provide the maximum health care benefit for society within the envelope of resources available. It is the same process as we go through as individuals, in making that decision between a holiday abroad or a new kitchen – the one will provide us with significant benefits within a short period of time but the duration of these will soon diminish as we return to our normal existence.

The kitchen, on the other hand, will provide fewer benefits immediately in comparison, but the duration of the benefits will extend for a number of years. The prices of the alternatives are basically the same but we can only afford one of them. What factors should be considered in making the decision? How should these difficult choices be made? How should it be decided which therapies to fund? The use of pharmacoeconomics techniques can help in making these decisions but they should always be just one part of a multi-faceted process, with other factors also being considered.