ing at work. Transfer to another department or leaving with the best possible financial settlement may be possible. Periods of sick leave are often needed to give breathing space from victimisation in order to consider options adequately.

(4) After all of these are in place start tackling the malpractice.

The doctor may be able to advise on external sources of help and support. But what helped many whistleblowers in this study most was the opportunity to meet others in the same situation. Most did so for the first time through Whistleblowers Australia. If there is no such contact point available it would be worth considering setting one up by advertising locally.

PREVENTION

Prevention of the problem, rather than its management, is obviously preferable. Given the importance of the issues, preventing whistleblowing itself is not really an option. Prevention of the workplace reaction is essential, which the legislation tries to do. Unfortunately, the reaction nearly always starts immediately after the first (internal) complaint. By the time whistleblowers realise that the complaint is not being handled appropriately it is already too late—the employer has victimised (possibly dismissed) them and is unable to withdraw without losing face and possibly being liable for damages.

Educating managers is essential—on group dynamics, the damage done to whistleblowers, their families, and the community, and the damage that failure to correct malpractice will in due course do to the organisation their denial tries to protect. More research, including both managers and staff, is

urgently needed to find ways of changing this important and potentially devastating aspect of human behaviour.

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- 1 Warden J. Speaking out in the NHS. *BMJ* 1992;305:1180.
- 2 Dyer C. RHA told to reinstate "redundant" Helen Zeitlin. *BMJ* 1992;305:1177.
- 3 Dyer C. NHS whistleblower wants charter. *BMJ* 1992;304:203.
- 4 Smith R. Whistle blowing: a curse on ineffective organisations. *BMJ* 1992;305:1308-9.
- 5 Essex C. New Zealand doctors strike over contracts. *BMJ* 1993;306:291-2.
- 6 Anonymous. Doctor gag—an election issue. *Australian Medicine* 1992;Oct 5:5.
- 7 Anonymous. Blowing the whistle on incompetence—one nurse's story. *Nursing* 1989;19(7):47-50.
- 8 Andersen S. Patient advocacy and whistle-blowing in nursing: help for the helpers. *Nursing Forum* 1990;25:5-13.
- 9 John D. McBride found guilty of scientific fraud. *BMJ* 1993;306:541.
- 10 McMillan J. Legal protection of whistleblowers. In: Prasser S, Wear R, Northercote J, eds. *Corruption and reform, the Fitzgerald vision*. Brisbane: University of Queensland Press, 1990.
- 11 Myers B. *Gifts differing*. Palo Alto: Consulting Psychologists Press, 1980.
- 12 Ewing DW. How bureaucrats deal with dissidents. In: Hammer WC, ed. *Organization shock*. New York: Wiley, 1980:328-31.
- 13 Hoffman W. The Ford Pinto. In: Hoffman W, Moore J, eds. *Business ethics: readings and cases in corporate morality*. New York: McGraw-Hill, 1984: 249-60.
- 14 Lampert N. *Whistleblowing in the Soviet Union: a study of complaints and abuses under state socialism*. Birmingham, New York: Schocken Books in association with the Centre for Russian and East European Studies, University of Birmingham, New York, 1985.
- 15 Macmillan J. Principled organizational dissent: whistle blowing in response to corruption. In: *Proceedings of the fourth international anti-corruption conference*. Canberra: Australian Government Publishing Service, 1989: 91-6.
- 16 Martin B. In: Martin B, Baker A, Manwell C, Pugh C, eds. *Intellectual suppression*. North Ryde, New South Wales: Angus and Robertson, 1986:79-86.
- 17 Milgram S. *Obedience to authority—an experimental view*. New York: Harper and Row, 1974.
- 18 Koryagin A. The involvement of soviet psychiatry in the persecution of dissenters. *Br J Psychiatry* 1989;154:336-40.

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Economic Evaluation and Health Care

What does it mean?

Ray Robinson

This is the first in a series of articles that describe the ways in which methods of economic evaluation may be used to assess the economic costs and consequences associated with different forms of health care intervention.

Ever since the concept of value for money in health care was introduced into the NHS, economic terms and jargon have become part of our everyday lives—but do we understand what the different types of economic evaluation all mean, particularly those that sound similar to the uninitiated? This article introduces readers to the purpose of economic evaluation, and briefly explains the differences between cost-minimisation analysis (used when the outcomes of the procedures being compared are the same); cost-effectiveness analysis (used when the outcomes may vary, but can be expressed in common natural units, such as mm Hg for treatments of hypertension); cost-utility analysis (used when outcomes do vary—for example, quality of life scales); and cost-benefit analysis (used when a monetary value is being placed on services received). Further articles will deal with each one in more detail.

Economic evaluation is a technique that was developed by economists to assist decision making when choices have to be made between several courses of action. In essence, it entails drawing up a balance sheet of the advantages (benefits) and disadvantages (costs) associated with each option so that choices can be

made. Although the precise forms of economic evaluation may vary, the "cost-benefit" framework is common to all of them and constitutes the distinctive feature of this approach.

Origins

The most widely known form of economic evaluation, cost-benefit analysis, was developed over 50 years ago to assist public sector investment planning. Unlike the private sector, where costs, prices, and profits can be used as a guide to decisions about investment, goods and services provided by the public sector are often provided free (or at least substantially below their costs of production) or the prices charged to the consumer do not reflect the full social benefit of the service. In such cases there is a need for an alternative to private sector profit and loss accounting.

Early applications of cost-benefit analysis were undertaken in the United States during the 1930s in connection with flood control programmes. In Britain, it started to be applied widely during the 1960s to transport investment projects (for example, the M1 motorway, the Victoria underground line, and the proposed third London airport). Since then it has been applied in various forms and contexts, including education, town planning, and health care.

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Can the NHS really be "costed" like an airline?

ZIFA

Viewpoint of an economic evaluation

It is important to determine at the outset from whose viewpoint an economic evaluation is to be carried out. It may be based on one or more of the following: the viewpoint of an individual patient, the hospital or other provider, the NHS, the government, or society in general. The broadest viewpoint is that of society in general, as this will include all the costs and benefits, no matter to whom they accrue. For this reason, it is the preferred approach.

Adopting this approach has two main implications which distinguish it from approaches with more limited perspectives. Firstly, it usually involves measuring and valuing items that do not have market prices attached to them, such as the time costs that patients incur when undergoing treatment and recuperating. Secondly, it means that certain costs, or cost savings, or both, should not be included in the evaluation because they are transfers from one sector to another rather than a net cost on society. For example, sickness payments made to patients through the social security system will be viewed as a cost to government but they are not a net cost to society because they are merely a transfer from taxpayers to recipients of social security.

Scarcity and health care resources

The fundamental aim of any health care system is to maximise the health and welfare of the population, but because resources will always be scarce in relation to the health care needs which they could be used to meet, a series of choices must be made. Those responsible for allocating resources need to prioritise between competing uses so that maximum benefit (health gain) can be obtained from any given budget. Prioritising may take place at the district health authority level as commissioners decide on the specialty mix they wish to purchase for their residents. Or it may take place at the hospital level when decisions are made about the purchase of medical and surgical equipment. And, at the level of the individual clinician, it can be expected to exert increasing influence as medical audit and other forms of peer review lead towards protocols defining what should be done, how it should be done, and for whom it should be done. Economic evaluation provides a decision making framework that can be used to assist all these decisions.

Economic evaluation of health care

Within the health care sector, economic evaluation (or economic appraisal as it is sometimes called) is used as a generic term for a range of techniques that may be used to assemble evidence on the expected costs and consequences of different procedures or programmes. The four main approaches that are currently in use are:

- Cost-minimisation analysis
- Cost-effectiveness analysis
- Cost-utility analysis
- Cost-benefit analysis.

Each of these approaches involves the systematic identification, measurement, and, where appropriate, valuation of all the relevant costs and consequences of the options under review. The remainder of this article provides a brief account of the main elements of each approach. Subsequent articles will describe each of them in more detail.

Before outlining the different approaches, however, I will discuss two general considerations—the viewpoint which an economic evaluation should adopt, and its relation to clinical evaluation.

Clinical evaluations

Economic evaluation covers only one dimension of the overall evaluation process. It should be based on clinical or other evaluations of health care which establish the efficacy and effectiveness of the procedures or programmes under consideration. Economists rely heavily on clinical evidence for establishing the consequences of different interventions. In economic jargon, this provides information on the production function relationship; that is, how the inputs are related to the outputs (outcomes).

Ideally, economic evaluation should be undertaken alongside clinical trials so that the appropriate data collection can be built in as an integral part of the study. Unfortunately this is rarely the case, and so existing medical publications usually provide the main source of data on effectiveness and outcomes. Drummond and Davies, for example, discuss trial design and guidelines for carrying out economic analysis alongside clinical trials.¹

Cost-minimisation analysis

Cost-minimisation analysis is an appropriate form of evaluation to use when there is reason to believe that the outcomes of the procedures under consideration are the same. A comparison of day surgery with inpatient treatment of hernias or haemorrhoids might be suitable for a cost-minimisation study. Here there is strong evidence to suggest that there are no great differences in clinical outcomes for defined groups of patients and so analysis can concentrate on identifying the least cost option.

A word of caution is in order, however. Cost minimisation should be undertaken only when there is evidence to suggest that outcomes are the same or similar. If this evidence is not available, simply

Methods of economic evaluation. All relevant costs are measured in monetary terms

Type of study	Measurement/valuation of consequences
Cost-minimisation analysis	Outcomes the same between options; no measurement necessary
Cost-effectiveness analysis	Outcomes measured in natural units—for example, life years gained
Cost-utility analysis	Utility measures—for example, QALYs
Cost-benefit analysis	Outcomes valued in money terms

concentrating on costs runs the obvious danger of ignoring differences in outcome and obtaining misleading results.

Cost-effectiveness analysis

Cost-effectiveness analysis is an appropriate technique to use when the outcomes of the different procedures or programmes being considered may be expected to vary, but these outcomes can none the less be expressed in common natural units. For example, there is a range of treatments available for the control of hypertension. These vary in terms of their outcomes, side effects, and so on, but they may all be measured primarily in terms of the reductions in diastolic blood pressure (mm Hg) that they achieve. Other examples of effectiveness measures have included "life years gained" in the case of treatments for chronic renal failure,² "healthy days" achieved through drug treatments of duodenal ulcers,³ and "positive cases detected" by diagnostic and screening procedures.⁴

With a common unit of outcome or effectiveness, different procedures can be expressed in terms of cost per unit of outcome.

Cost-utility analysis

Information provided by cost-effectiveness analysis can be extremely useful in clarifying choices between different treatments for particular diseases or disabilities. It is, however, limited in its ability to assist choices between treatments for different diseases, or between programmes, because the units of outcome often vary—for example, reductions in blood pressure compared with cases of cancer of the cervix diagnosed. Moreover, cost-effectiveness analysis is not able to combine reductions in morbidity and reductions in mortality into a single index and thereby permit direct comparison between treatments that vary on these two

dimensions. Because of these and other limitations a considerable amount of work in recent years has been devoted to the development of "utility" based measures of outcome.

Utility is a term that was developed by economists (it actually derives from the work of the early nineteenth century economist and philosopher Jeremy Bentham, who developed the "utilitarian" school of thought), which refers to the subjective satisfaction that people derive from consuming goods and services. In the health care context, it is used to refer to the subjective level of wellbeing that people experience in different states of health.

To measure utility, various quality of life scales have been developed.⁵ Quality adjusted life years (QALYs) combine a particular utility-based measure of the quality of life with a quantitative measure of life years to obtain a single measure of lifetime utility. Hence, alternative interventions that influence both the quantity and quality of life can be expressed in terms of a universal unit—namely, cost per QALY gained.

Cost-benefit analysis

Cost-benefit analysis is sometimes used loosely as a general term covering all types of economic evaluation, but among health economists the term is usually restricted to those forms of evaluation that are used to place a monetary value on benefits or outcomes.

In those countries in which prices are charged for health care there is some basis for placing monetary values on the services that people receive. There are, however, no charges for most NHS services. This has led economists using cost-benefit analysis to rely on "shadow" prices—that is, prices that reflect the value of health services even though they are not actually charged. Using wage rates as a shadow price for the production gains resulting from people returning to work after a successful treatment is one such approach.

Clearly, however, this is a coarse measure that will fail to capture the full complexity of many programmes. An alternative is to seek to establish what people would be willing to pay for goods or services if they were required to pay for them. This approach was used by Thompson, who sought to establish how much people would be willing to pay for a hypothetical cure for rheumatoid arthritis.⁶ Specially trained interviewers posed the following question to 247 patients: "What percentage of your family's (household) total monthly income would you be willing to pay regularly for a complete cure for arthritis?"

Of the patients questioned, 84% gave what were considered to be plausible responses; these indicated a willingness to pay a mean of 22% of the household income.

Conclusion

The appropriate method of economic evaluation will depend on the context in which choices need to be made. When outcomes are identical the most straightforward form of cost minimisation can be applied. When this condition does not apply other forms of evaluation that require the more difficult task of outcome or benefit measurement should be applied. Until about 10 years ago cost-effectiveness analysis was the most commonly applied approach. Since then, however, its limitations have meant that considerable research effort has been devoted to the development of cost-utility analysis. Beyond this cost-benefit analysis offers the most comprehensive and theoretically sound form of economic evaluation, but its application in the context of health care is fraught with practical problems.⁷

Subsequent articles in this series will examine the

Summary

- Economic evaluation provides a framework for assisting decision making when choices have to be made
- A fundamental feature of the approach is that both the costs and benefits of the available options are taken into account
- The costs and benefits will vary according to the viewpoint adopted in the analysis. The broadest and most preferred viewpoint is that of "society in general"
- Ideally, economic evaluation should be undertaken alongside clinical trials so that appropriate data may be collected
- The four main variants of economic evaluation used in the context of health care are: cost-minimisation, cost-effectiveness, cost-utility, and cost-benefit analysis

strengths and weaknesses of each of these approaches in more detail.

- 1 Drummond MF, Davies L. Economic analysis alongside clinical trials. *Int J Technol Assess Health Care* 1991;7:561-73.
- 2 Ludbrook A. A cost-effectiveness analysis of the treatment of chronic renal failure. *Applied Economics* 1981;13:337-50.

- 3 Sintonen H, Alander V. Comparing the cost-effectiveness of drug regimens in the treatment of duodenal ulcers. *Journal of Health Economics* 1990;9:85-101.
- 4 Hull RD, Hirsh J, Sackett DL, Stoddart GL. Cost-effectiveness of clinical diagnosis, venography and non-invasive testing in patients with symptomatic deep-vein thrombosis. *N Engl J Med* 1981;304:1561-7.
- 5 Teeling-Smith G, ed. *Measuring health: a practical approach*. Chichester: John Wiley, 1988.
- 6 Thompson MS. Willingness to pay and accept risks to cure chronic disease. *Am J Public Health* 1986;76:392-6.

Taking babies' temperatures: science versus social taboos in battle over Baby Check

Stuart Handysides

Baby Check, a scoring system for assessing the severity of illness in babies under 6 months old, has not met with the success its developers expected. The inclusion of rectal temperature in the assessment was strongly opposed by the Royal College of Midwives, which refused to alter its view despite evidence of the safety and accuracy of rectal thermometry. British parents appear not to like rectal thermometers either. Most other medical bodies have supported Baby Check and the reason for midwives' opposition may have more to do with professional pique at not being consulted than clinical wisdom.

Babies have bad days when they cry, refuse to feed, and worry their parents and doctors. It is hard to tell whether the baby is seriously ill or just out of sorts and to know whether it should be cared for at home or in hospital. Baby Check is probably the best researched attempt to improve the discrimination of serious and trivial illness in infants,¹ but it has also been the most controversial. Its launch in January 1991 was hijacked by an unexpectedly fierce attack from the Royal College of Midwives. The college refused to endorse

the project and issued a press release which said that Baby Check would make parents more anxious and that taking a rectal temperature (one of 19 observations in Baby Check) would cause rectal damage and allegations of sexual abuse. Potential sponsors for Baby Check evaporated, not wishing to be associated with a package that midwives said was dangerous. Was the college's attack justified or was there a hidden agenda? Was it attuned to public opinion, or did it express its own taboos and resistance to change? The story is one of conflict between science and sensitivity.

The development of Baby Check

Baby Check is a scoring system devised to help parents, doctors, midwives, and health visitors assess the severity of acute illness in infants under 6 months old.¹ It was the result of four years of research by Dr Colin Morley and his colleagues in Cambridge and Melbourne, Australia, culminating in the publication of four consecutive papers in the *Archives of Diseases in Childhood*.¹⁻⁴ Dr Morley said, "A House of Commons Select Committee report on post neonatal mortality found that mothers were slow to seek help, and that general practitioners do not appreciate the severity of a child's illness.⁵ We realised this from our own experience and decided to set up a big study."

Morley and colleagues collected data on 1007 infants and used logistic and ordinal regression analyses to identify which symptoms and signs best distinguished well babies from seriously ill babies. Baby Check asks about seven symptoms over the past 24 hours including the nature of the baby's cry, fluid intake and output, vomiting, blood in the nappy, and drowsiness. The observer has to assess the baby's muscle tone, alertness, and breathing and whether there is pallor, cyanosis, or a rash; look for a hernia; and take the rectal temperature. Each symptom and observation is weighted, and the score increases with the severity of the baby's condition. Field trials of Baby Check were done with mothers at home,² general practitioners,³ and hospital doctors.⁴ The Royal College of Midwives and other interested parties had received copies a month before the system was launched. Other professional bodies in Britain and abroad welcomed Baby Check.

Professional responses

The British Association for Accident and Emergency Medicine was very keen on the system, and asked to have the Baby Check score card for professionals in casualty departments. Parents who had used Baby Check and brought their children to hospital would then meet staff who were familiar with the system. Mr Stephen Miles, the association's honorary secretary said, "Baby Check is a potentially good triage system. It is a shame that it has not been taken up more widely."

Seriously ill or just out of sorts?

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