

The economics of anaesthesia

Introduction

In common with other areas of health care provision, anaesthesia is subject to cost-containment pressures. Drug costs are easily identifiable targets for savings, so anaesthesia is likely to feel the pressure of cost-cutting initiatives. More economic evaluations of anaesthesia are published every year, and anaesthetists are called upon increasingly to incorporate this information into their decisions. We examine the framework of economic evaluation and its application to anaesthesia.

What is economic evaluation?

An economic evaluation is the comparison of the costs and benefits of two or more alternative interventions, for example the use of total intravenous anaesthesia (TIVA) vs. balanced anaesthesia. An intervention is expressed as a process whereby inputs (resources incurring costs) are utilized to produce output (patient outcomes or benefits) (see Fig. 1).

Outcomes

Outcomes are measured in three principal ways, giving rise to the four types of economic evaluation [1]:

- Clinical effectiveness measured by natural units [e.g. postoperative nausea and vomiting (PONV) rates are used in cost effectiveness analysis (CEA). When the effectiveness of two alternatives is shown to be equivalent, the evaluation becomes a cost minimization analysis (CMA)].
- Utility (a subjective measure of the value of a health state) is used in cost utility analysis (CUA). Quality adjusted life years (QALYs) are the usual unit of measurement.
- Cost benefit analysis (CBA) uses monetary valuations of outcome (e.g. willingness to pay) to quantify outcome.

Clinical indicators, such as time to eye-opening and awareness in the recovery room, have been used extensively in the assessment of anaesthetic drugs. However, statistically significant differences between early postoperative indicators do not necessarily translate into clinically significant differences that persist beyond the first few postoperative hours. In these situations, they have little role in evaluating the impact of anaesthetic techniques. Longer term clinical indicators, such as postdischarge PONV, unanticipated readmissions and time taken to return to work, are more useful.

CUA and CBA try to encompass valuations of the whole impact of the intervention on the patient, not captured by CEA. Currently, patients' perceptions and preferences for anaesthesia do not necessarily drive treatment choices. However, there is now emerging evidence that patients have strong preferences and attitudes about the anaesthetic process [2]. As these studies increase in quality and quantity, their results will need to be considered by practitioners.

Measuring costs

In economic evaluation, the whole cost of the intervention is quantified. Costs are divided in the following way [1]:

- Direct medical costs: incurred by health care provider (e.g. drugs);
- Direct nonmedical costs: incurred by patient (e.g. child care);
- Indirect costs: incurred by society due to illness or procedure (e.g. production loss);
- Intangible costs: occur but cannot be quantified (e.g. anxiety).

Direct medical costs are the category principally reported in economic evaluations because these are most relevant to the service provider. They occur as fixed, semi-fixed and variable costs:

- Fixed costs: not related to patient activity (e.g. equipment);

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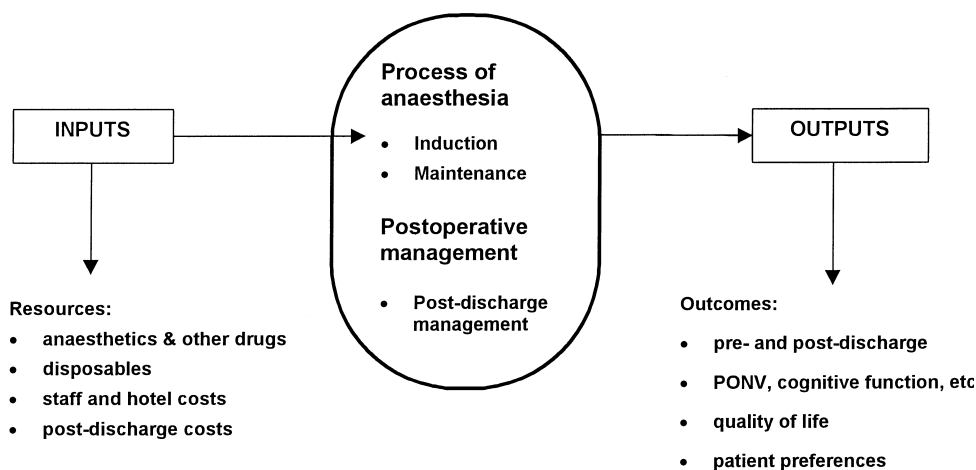


Fig. 1. The process of anaesthesia.

- Semi-fixed costs: sensitive only to large patient activity changes (e.g. staff);
- Variable costs: directly related to patient activity (e.g. disposables).

Costing anaesthesia has historically been combined with surgical costs, partly due to ease. However, there are increasingly robust anaesthesia costing methods available [3, 4]. The use of patient-based (bottom-up) costs, rather than average (top-down) costs or charges is required if differences between anaesthetic techniques are to be identified.

Anaesthesia costing studies show that the cost of drugs is a small proportion of the total anaesthetic cost, as low as 4% in day surgery [4] and sometimes less than 1% in inpatient surgery [3]. Organizational and operational factors within institutions are likely to have a much more significant effect on costs. A 30-min delay in the start of an operating session can be equivalent to the cost of a 2-h propofol infusion [4].

The impact of organizational factors means that extrapolating costs from one centre to another needs to be done with care, both within and between countries. A comparison of anaesthetic resource use between Germany, France and the UK found that there were many differences in practice, Germany having a shorter length of stay for day cases, and the UK having a shorter inpatient length of stay [5]. These practice differences had a much greater impact on costs than did the variations in drug use between countries.

Incremental economic analysis

The incremental difference in cost and outcome between two interventions provides decision-makers with information on the clinical and financial implications of choosing one of the alternatives. The incremental cost effectiveness ratio (ICER) is expressed as follows:

$$\text{ICER} = \frac{\text{cost (treatment a)} - \text{cost (treatment b)}}{\text{Outcome (treatment a)} - \text{outcome (treatment b)}}$$

If one treatment is more effective and less costly, it is the dominant therapy. Usually, one treatment will be more effective, but at a greater cost. To use this treatment, the decision-maker must obtain funds from elsewhere in the budget. This may not be possible, or desired, if it would mean reducing another service. Furthermore, cost savings identified by economic evaluation may not be translatable into budget savings. For example, if an intervention results in the use of less staff time, this saving may not be seen in the staff budget. This is because economic evaluation is concerned with the opportunity cost of resources, not budget structures. The staff time will be freed for use elsewhere, improving the quality of another aspect of the service.

Economic evaluations of anaesthetic drugs are now commonplace, but vary in quality and design. For example, there have been three recent studies on the anaesthetic techniques used in day case knee

arthroscopy [6–8]. All three studies used time to home readiness as their outcome measure and found no differences between their alternatives. Two studies reported PONV rates, one finding no PONV [6] and one finding rates in excess of 40% [7], suggesting large practice differences. Each reported a reduction in costs for the inhalational techniques over the intravenous (principally propofol) techniques and thus recommended the inhalational option. Costs reported were variable and staff costs [8], drug and nursing costs [7] and drug costs only [6]. These design and practice differences limit comparability between the studies in terms of costs or outcomes, which then limits their use to inform decision-making.

Conclusions

Economic analysis in anaesthesia can provide clinicians and managers with information about the consequences of their decisions, in terms of costs and patient outcomes. However, vigilance is required when interpreting studies. The reader must be able to assess the quality of the evaluation, which can be done using guidelines [9]. They must also be aware that economic evaluation is a moving target due to contract price changes, practice developments and losses of patents. Extrapolating results between countries or procedures should be done with caution. Finally, economic evaluation of anaesthetic drugs will only provide one piece of the jigsaw of optimizing resource use in anaesthesia.

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