

The economic framework of day surgery: a plea for appropriate appraisal

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Abstract

It is essential to test the 'cost-effectiveness' or 'economic gains' of day surgery by the use of appropriate economic evaluation. This paper gives an overview of economic appraisal approaches, provides a framework for appraisal which covers the perspectives of both hospital decision-makers and that of society as a whole, and considers some important issues in the economic evaluation of day surgery. © 1998 Elsevier Science B.V. All rights reserved.

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1. Introduction

Day surgery has acquired great significance as a mode of delivering surgery. For example, day surgery increased more than 3-fold in Scotland between 1981 and 1995 [1]. This sharp rise in activity has been the product of advancing medical technology, a better understanding of procedures that can safely be undertaken on a day basis, and as a response to increasing pressure on hospitals to streamline care. There are major issues surrounding the social welfare implications of this development, including important economic matters that require to be addressed.

In the UK, a number of interesting papers on the economics of day surgery came out in the late 1970s, to be followed by a dearth of studies until quite recently. The change from the earlier period is startling: Russell et al. [2] compared the cost of day surgery with in-patient stays of 5 or 6 days, whilst more recent studies report in-patient stays as short as 48 h. Indeed, lengths of hospital stays in general have been falling [3]. The main message from these later studies is that day surgery is likely to be 'cost-effective' by comparison with in-patient surgery. In addition, a number of reports have urged the wider provision of day case

surgery [1,4,5]. Hence decision-makers in hospitals and health service policy-makers have been encouraged to adopt day surgery as a way of making the best use of their limited budgets.

Some key questions ought to be raised about the enthusiasm for day surgery if the full economic implications are to be assessed. Does day surgery produce an 'optimal' allocation of scarce health sector resources, and what is meant by 'optimal' in this context? Will day surgery deliver 'value-for-money' at the hospital level? Is value-for-money simply a matter of delivering 'cost-effective' care? How important are the staffing implications of shifts to day surgery delivery patterns?

This paper gives an overview of economic appraisal approaches, provides a framework for appraisal which covers the perspectives of both hospital decision-makers and that of society as a whole, and considers some important issues in the economic evaluation of day surgery.

2. Economic evaluation

If resources are to be optimally or efficiently allocated, that is, the best use is to be made of constrained

Table 1
Types of economic evaluation

Type of evaluation	Cost measurement	Outcome measurement	Outcome valuation
Cost-minimisation	Pounds (£)	Assumed equivalent	No valuation
Cost-effectiveness	Pounds (£)	Outcome common to alternatives being evaluated, but achieved to different degrees	Common units e.g. number of lives saved, number of cases treated
Cost-benefit	Pounds (£)	Any effects produced by the alternatives	Pounds (£)
Cost-utility	Pounds (£)	Single or multiple effects, common or unique to the alternatives and achieved to differing degrees	Quality-adjusted life years (QALYs), well years, other utility measures

resources in delivering health, programmes need constituent activities that are efficacious and are delivered effectively. Health interventions may be efficacious, e.g. surgical procedures may be successful, but they may not be delivered effectively (e.g. excessive use of staff time). Suppose an intervention does work and is delivered effectively, this does not guarantee efficient delivery since it could be extremely costly. Economic appraisal is about the marriage of resource use (inputs) with outcomes, it is not simply about costs, nor would outcome assessment on its own constitute an economic evaluation. Additionally equity should be addressed. This relates to 'fairness' in the allocation and distribution of resources.

Four forms of economic study are in use [6]: cost-minimisation analysis (CMA), cost-effectiveness analysis (CEA), cost-benefit analysis (CBA), and cost-utility analysis (CUA). These are listed in Table 1, where the distinctions between the approaches will be evident, appearing as they do on the outcome side. Briefly, CMA requires that outcomes be identical, a possibility in day surgery; CEA has agreed types of outcome such as life-years saved or day cases treated; CBA has no fixed outcome or type of outcome, and all elements of cost and outcome are valued in common units, usually the currency of the country of study; CUA measures the 'utility' (satisfaction, happiness, welfare) of outcomes, typically through measures of health-related quality of life [7].

Placing the word 'social' before each of the evaluation approaches indicates that the societal viewpoint is being taken. In a health system which involves public funding, taxpayers and citizens are entitled to know if the allocation of resources will maximise social welfare, and this requires that a broad approach be taken. Just how comprehensive this approach can be, in principle, is shown in the following general formula for CBA [8]:

$$\sum_{i,k,t} \left[\frac{P_{ikt} B_{ikt}}{(1+R)^t} \right] - \sum_{j,k,t} \left[\frac{V_{jkt} C_{jkt}}{(1+R)^t} \right] \cong 0$$

If a project gives a positive result, measured in pounds or dollars say, an increase in social welfare is predicted: a negative result would predict social costs to

exceed social benefits and therefore not be worth undertaking. The *B* and *C* symbols refer to benefits and costs, with different categories of benefit and cost indicated by the *i* and *j* subscripts respectively. The *k* subscript refers to the recipient of the benefit (individual or group), or the person or agency incurring the cost. Most projects have a significant time dimension: the *t* subscript caters for this. The expression C_{jkt} thus indicates *C* units of cost type *j* incurred in time period *t* by person or agency *k*. The valuation of social costs and benefits is represented in the formula by the *P* and *V* symbols. The use of a monetary unit such as the pound to value social costs and benefits does not imply that money has to change hands, simply that it is being used as the 'unit of account'.

The remaining aspect of the formula is *R*, the social discount rate, which allows adjustment for the time value of costs and benefits. This time value arises because the use or accrual of a resource within one time period is not equivalent to that in another time period. This is perhaps best understood in terms of the existence of interest rates, which requires that we either compound funds to obtain their future value, or reverse the process and discount future flows back to the present. In the UK the government specifies a cost of capital and a 'standard' discount rate, both currently set at 6% [9]: this is highly relevant in respect of the assessment of new capital expenditure, whether or not the full CBA framework is used.

There is a huge volume of literature on economic appraisal and its application in health, although only a very small proportion of this involves day surgery [10,11]. Unfortunately the quality of some of the published economic appraisals has not been of a good standard [12]. This was one reason why a multinational working party was convened to develop guidelines for authors and peer reviewers of economic papers submitted to the British Medical Journal [13]. Whilst critics have argued that guidelines can become too prescriptive, it is important to recognise that economic appraisal should be conducted on sound lines. The guidelines are concerned with (1) study design: the study question, the selection of alternatives, and the

form of evaluation; (2) data collection: effectiveness data, benefit measurement and valuation, costing, and modelling; and (3) analysis and interpretation of results: adjustments for timing of costs and benefits, allowance for uncertainty, and presentation of results. A 35-item checklist is provided based upon this framework. So clear criteria have been ‘laid down’ for economic appraisal, which can be expected to apply in the economic analysis of day surgery activities.

3. Economic framework: provider (hospital) perspective

It is important to be clear from whose perspective the appraisal is being conducted. Evidently hospital decision-makers are required to balance their budgets while delivering good quality care, so a framework is now outlined which shows how their perspective can be handled in economic studies. The study question here could be the following: from a provider perspective, which is the most cost-effective means of undertaking surgery?

Studies in Scotland [14] have indicated six alternative ways of delivering surgery:

- designated day surgery unit with its own committed and separate facilities,
- designated day surgery ward plus dedicated theatre(s),
- designated day surgery ward plus booked theatre time in main theatre(s),
- designated day surgery ward plus mixed lists in main theatre(s),
- day surgery patients in ‘standard’ surgical wards, and
- in-patient surgical wards.

To undertake economic appraisal requires the calculation of both recurrent costs and capital costs. In the case of capital costs the alternatives could be newly build or rebuild and/or modify e.g. theatre facilities. Alternative specifications should be costed along with all the associated equipment costs. A full economic appraisal should also provide estimates of the opportunity cost of space (the value of the next best alternative use of the space/land) taken up: for example such estimates are likely to be of considerable influence on a decision to build a designated unit on a crowded city hospital site, and thus on the mode of delivery of surgery. When assessing capital expenditure in respect of day surgery projects, hospitals would be required to use the government discount rate of 6% mentioned above.

Calculations of recurrent costs of alternative programmes should be undertaken. Table 2 indicates the data categories required. Although reasonably detailed it should not be viewed as completely comprehensive. Data requirements include calculations of medical and

nursing staff time, supplies of anaesthesia, drugs and dressings, and the allocation of overheads such as administration, heating and lighting. A fully detailed design would specify the proposed valuation techniques for each item and the sources of data needed to proceed with these valuations. Detailed accounting and economic techniques are available for valuation [15–17]. No general prescription can be given on data sources since this will evidently vary with both local and national circumstances.

The study question is framed in terms of cost-effectiveness, so an appropriate outcome measure is required, in this framework the numbers of cases treated would suffice. Alternative delivery programmes are likely to differ on the costs incurred and on the numbers treated in a given time period, or on both: hence the need to compare programmes in terms of their cost-effectiveness. The study question could be made more specific and relate to one category of surgical procedure, or more commonly a ‘basket’ or group of procedures.

4. Economic framework: societal perspective

A typical study question could be: from the societal perspective, is it preferable to undertake a group of operations by day surgery or by in-patient surgery?

Table 2
Cost framework: provider viewpoint

Recurrent costs
Out-patient
Medical staff time
Nursing staff time
Other staff time
Overheads (e.g. administration, heating, lighting)
In-patient/day case bed
Medical staff time
Nursing staff time
Other staff time
Drugs
Direct supplies (dressings, sundries)
Overheads (ward/unit administration, heating, lighting)
Theatre
Medical staff time
Nursing staff time
Anaesthetist time
Drugs, anaesthesia
Direct supplies (dressings, theatre drapes)
Overheads
Hospital liaison nurse
Nurse time
Direct supplies
Travel
Overheads (administration)

Table 3
Cost framework: societal perspective

Health service recurrent costs

Out-patient, in-patient bed/day case bed, theatre, hospital liaison nurse/district nurse: as Table 2

General practice

Contacts with general practice: general practitioner time, practice nurse time
Drugs, supplies (e.g. dressings)
Overheads

Costs borne by other public sector bodies

e.g. Social work department

Costs borne by patients, family, friends

Out-of-pocket expenses: travel costs (accompanying patient to/from GP, hospital; visiting patient in hospital)
Child care costs
Costs of caring for other dependants
Purchase of items for hospital stay
Other expenses associated with informal caring

Further societal costs

Effect on national income: days off work
Disruption to other normal activity: lost housework time, lost leisure time
NB: this category applies to all involved—patients, family, friends

Psychological/emotional costs

In-patient case: pain; anxiety associated with hospitalisation and being away from family
Day case: pain; anxiety for both patient and family associated with early discharge

A social appraisal is likely to include most of the items listed in Table 2, but the framework is substantially broadened to a more comprehensive list of those affected, both institutionally and personally. Hence the inclusion in Table 3 of general practice costs, costs borne by other public sector bodies, costs borne by patients, family and friends, further societal costs in the shape of impacts on work, housework and leisure, and last but not least, the psychological and emotional costs associated with hospitalisation and surgery.

The benefits of alternative surgical procedure programmes will include reductions in some aspects of the listed costs (e.g. resource savings in hospitals, less travelling costs for patients and relatives), and improvements in patient health status, satisfaction, and quality of life.

The evaluation approach taken in the broader framework could be either CBA or CUA. In the CBA approach, all the listed costs and benefits should be valued in monetary terms as shown in the formula explained above. If the CUA approach is selected, measures of health-related quality of life would be needed to assess changes in patients' health status, satisfaction and well-being.

The comprehensive nature of this broader approach confirms the importance of the perspective taken in

evaluation. Such evaluation clearly moves well beyond the confines of hospital budgets. We can note, however, that even within this broader framework equity considerations have not been explicitly addressed.

5. Some important issues in the economic appraisal of day surgery

Evidently the conduct of economic appraisal requires that considerable care be taken in formulating appropriate study questions and designing and evaluating alternative delivery programmes for surgery. A number of issues can be raised. Almost 20 years ago Jönsson and Lindgren [18] warned of five 'fallacies' surrounding the estimation of economic gains from early discharge after surgery. Their concerns are still highly relevant so their fallacies will be interwoven with a number of key issues, many of which are adopted from an invaluable paper by Mayston [19].

(1) First and foremost, it would be wrong to presume that day surgery is the optimal type of programme. It is strongly urged that the provision of alternative forms of surgery provision be fully evaluated, including economic considerations. This cannot be stated too forcefully in the face of the enthusiasm for day surgery shown in many quarters, not least in government agency reports.

(2) It is frequently asserted that day surgery is likely to produce 'savings' (usually for hospital budgets) by comparison with in-patient surgery. Which brings us to Jönsson and Lindgren's first fallacy: a reduction of 1 day in the length of stay means a cost saving equivalent to the average cost of 1 day in hospital. There are clearly 'days' and 'days' in hospital, with variations in cost incurred on behalf of patients. The precise (potential) savings to be made will depend on how much of the cost incurred is variable, and can thus be adjusted, and how much is fixed and thus cannot be adjusted (in the short run).

(3) For cost savings to be realised at a given hospital would require either (i) the closure of in-patient beds and perfect substitution (matching) between in-patient and day cases [1], or (ii) the functions of whole wards be transferred to other specialties. Hospital administrators should be aware that by moving more patients through the system they may require bigger budgetary allocations: a result which could be justified in terms of quality health care delivery, but may not be what was sought in terms of 'efficiency' savings. Further, there is no presumption in this context that, in the words of Jönsson and Lindgren's second fallacy: a reduction in length of stay means that the waiting list can be correspondingly reduced.

(4) Day surgery involves a saving at marginal (additional) cost of relatively cheap recovery time compared

with the more expensive cost of the operation itself. Further, total theatre costs for a particular medical condition may be higher for some types of operating procedure amenable to day surgery than other types of procedure already practised in the in-patient context.

(5) Day cases may require more experienced and more expensive medical staff, such as consultants rather than junior doctors. The consequences of expanding day surgery for staffing patterns and staff training could be considerable, and indeed for some programmes such considerations may need to be incorporated into the economic evaluation framework.

(6) Day cases may require a long 'day', such as 7:30–21:00 h, to carry out the required procedures within the day, resulting in reduced potential savings in total labour costs, particularly if overtime payments are required.

(7) It should be reaffirmed that the capital expenditure implications of day surgery programmes are likely to be crucial to decisions taken concerning these programmes, and should thus be included in economic evaluations. For example, day cases may require separate dedicated recovery rooms, thus requiring additional capital expenditure; or if patient hotels are included as part of a programme, the capital expenditure implications of the construction of such facilities should be included in relevant evaluations.

(8) There may be greater risks to patients who suffer complications after day surgery, with initial cost savings lost if readmission is necessary, or such complications may require general practitioner input, imposing additional costs on general practitioners (and possibly other community services). We should thus beware of the third fallacy: length of stay can be reduced without any corresponding increase in costs in the primary care sector.

(9) Day cases may result in higher costs of transport for each day patient to be home within the day (for example private transport being recommended rather than public transport), and may impose greater external costs on the patient's relatives, particularly if they are in employment. More generally, we can refer to the fourth fallacy: length of hospital stay can be reduced without increasing the care input or the welfare loss of the patient's family and friends.

(10) Jönsson and Lindgren's fifth fallacy is: length of stay can be reduced without causing any loss in welfare to the patient. Even amongst enthusiasts there is still some unease or uncertainty about the impact of day surgery on patient welfare. For example, amidst a wealth of recommendations aimed at a considerable expansion of cataract day surgery in Scotland, the National Audit Office [5] advocates that health boards should commission surveys to measure patients' quality of life. As noted earlier, the economic appraisal approach of cost-utility analysis is designed to incorporate patient quality of life outcomes.

6. Concluding commentary

Day surgery may indeed prove to be the appropriate, recommended, mode of surgery delivery in particular decision-making circumstances. The message of this paper is that the relevant alternatives require evaluation, part of which should be economic. It is not being argued here that the economic aspects of resource use dominate or override all other factors. Decision-making in surgery provision involves a wide range of considerations. In this respect a strong case has been made recently for economic appraisal to be embedded within the framework of decision analysis which, it is argued, is the only approach which can transparently integrate the three key components of health care decisions involving the use of public funds, namely clinical evidence, preferences, and costs [20].

So resource use should be evaluated: economic appraisal can be very helpful in explicitly pointing to, and evaluating, the costs and consequences of alternative actions. How much better it is to take decisions in the presence of such information than in its absence.

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