

## Evaluating rehabilitation using cost–consequences analysis: an example in Parkinson's disease

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**Objective:** To use cost–consequences analysis to evaluate rehabilitation, and to discuss some practical limitations.

**Design:** Case study of a cost–consequences analysis.

**Setting:** Day hospital.

**Subjects:** People with Parkinson's disease without major cognitive loss, and their carers.

**Intervention:** A programme of multidisciplinary rehabilitation, delivered for one day per week over six weeks, and including 2 h of individual therapy (physical, occupational, speech and language, specialist nurse) and group activities on each occasion.

**Main measures:** Costs: direct and overhead costs of treatment; participant travel. Consequences: patient outcomes (mobility, speech and language, disability, psychological well-being, health-related quality of life); carer outcomes (psychological well-being, health-related quality of life, strain); social service utilization; satisfaction.

**Results:** In this example the main costs were facility's overheads and hospital-provided transport. The consequences of the intervention were improved immediate outcomes for patients that diminished over four months, discovery of unmet social services need, high satisfaction. No benefits for carers were observed.

**Conclusion:** A cost–consequences analysis provides a clear descriptive summary for decision-makers that is easier to interpret than cost–effectiveness, cost–utility and cost–benefit analysis. It is a useful technique in rehabilitation research where multiple outcomes and several perspectives (health service, patient, carer) are relevant. However limitations remain: it is difficult to capture all consequences because of data deficiencies and long-term effects; evaluations of individual interventions are partial and do not guarantee economic rationality; local studies may not be generalizable; fixed protocols impede the evaluation of alternative service configurations.

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## Introduction

In recent years the need to provide an economic dimension to clinical trials, health technology assessments and studies appraising service delivery changes has been emphasized. This is part of the drive for cost-effective, evidence-based practice that seeks to ensure that limited health care resources are used to maximum benefit.<sup>1,2</sup> Concern is growing, however, about the lack of impact on practice of some of the more technical forms of economic evaluation (including cost-effectiveness, cost-utility and cost-benefit analyses), particularly in the area of service development.<sup>3-6</sup> The use of QALYs (quality-adjusted life years), which are utility-based index measures of health benefit, presents particular interpretation problems in a policy-making context. As a result, some economists are advocating cost-consequences analysis, which combines and summarizes information about costs and outcomes (clinical and other) in the form of a balance sheet. Cost-consequences analysis can cover carers as well as patients, and offers service planners a transparent range of outcome measures for consideration in their decision-making.<sup>7</sup> This is especially apposite in the field of rehabilitation because disability affects family and friends and use of a single outcome measure focused on one domain may conceal important benefits elsewhere.

The purpose of this paper is to investigate, by means of a case study, how cost-consequences analysis can be used as an evaluative tool, and to discuss some practical limitations. Although cost-consequences analysis is a more pragmatic approach to economic appraisal, decision-makers may still encounter difficulties in drawing unambiguous implications for service delivery.

## Methods

The case study concerns a programme of multi-disciplinary rehabilitation for people with Parkinson's disease and their carers.<sup>8</sup> One hundred and eighteen patients without major cognitive loss attended a day hospital over a three-year period in groups of six (with their carers) on one day per week for six consecutive weeks. At each visit they

received: 2 h of individual therapy from a physiotherapist, occupational therapist, speech and language therapist and a specialist nurse; group relaxation and talks from experts (e.g. pharmacist, continence adviser); morning and afternoon refreshments and lunch; assessment by a social services care manager. The mean (SD) age of patients who attended was 71.5 (8.3) years, and 73 (62%) of them were male. Most of the patients ( $n = 67$ , 71%) were Hoehn and Yahr disease stage 3 or 4<sup>9</sup> and half of them ( $n = 59$ , 50%) had received their Parkinson's diagnosis at least five years earlier.<sup>10</sup>

The costs of providing rehabilitation were estimated from a detailed list of resources and supplies compiled from the programme protocol, by direct observation, and from weekly staff and patient timetables. Each item was costed in British pounds, for the accounting period April 1999 to March 2000, using financial data supplied by local hospital managers and derived by total cost apportionment methods.<sup>11</sup> Staff costs (therapists and expert speakers) were verified from independent sources.<sup>12</sup> The daily cost of the facilities included estate costs and capital charges, and all overheads such as heating, lighting, cleaning, laundry, domestic services and portering.

Participants' travel details were recorded at each visit, and distances to the day unit were computed from home postcodes. The contracts manager of the ambulance service provided the economic costs for those using hospital transport, based on extra-contractual rates for low-dependency patients. The travel costs of people using their own cars were calculated using the mileage allowance paid by the ambulance service to volunteer hospital car drivers.

Measurement of the consequences has been described in detail elsewhere.<sup>10,13</sup> A range of outcomes was assessed at two points: immediately after treatment ended by means of a pre-post study (mobility and speech of patients, psychological well-being and health-related quality of life (HRQoL) of patients and carers, social services need, carer strain, perceptions of programme, willingness-to-pay),<sup>10</sup> and four months later by means of a randomized controlled trial (mobility and disability of patients, psychological well-being and HRQoL of patients and carers, carer strain, other service utilization).<sup>13</sup> Most

**Table 1** Cost-consequences balance sheet for a day hospital programme of multidisciplinary rehabilitation for people with Parkinson's disease and their carers

Costs	1999-2000		Participants	
	Health service	Participants	Total £	Per patient
£	Total £	(%)	Total £	Per patient
a) Treatment (1 x 6 week programme for 6 people with PD and their carers)				
Human resources	2 160	(34%)	0	0
Consumables	144	(2%)	0	0
Space and overheads	4 110	(64%)	0	0
Total	6 414	(100%)	0	0
b) Transport				
Hospital provided for 41 people (35%)	18 655		0	0
Private car for 73 people (62%)	0		3 358	46
Taxi for 4 people (3%)	0		NA	NA
Consequences	Baseline-immediately post treatment		Baseline-4 months post treatment	
	Mean (SD)		Mean (SD)	
a) Patient outcomes				
Mobility (s)				
10-min walk with turn	14.7(7.2)	Improved P = 0.02	Treated: 20.1(8.7)	19.4(6.9)
stand-walk-sit-test at 4 months <sup>14</sup>			Control: 21.5(8.0)	23.2(10.3)
Speech and language			Improved P = 0.09	
Frenchay	6.2(4.9)	Improved P < 0.001	No significant change	
dysarthria summary: 0 (no problem) - 45 (max) <sup>15</sup>			No significant change	
Brown PD disability scale <sup>16</sup>			No significant change	
Anxiety <sup>17</sup>			No significant change	
Depression: 0 (no problem) - 21 (max) <sup>17</sup>			No significant change	
HRQoL: generic <sup>18</sup> , range 0-100			No significant change	
HRQoL: PD specific <sup>19</sup>			No significant change	
b) Carer outcomes				
Anxiety <sup>17</sup>			No significant change	
Depression <sup>17</sup>			No significant change	
HRQoL: generic <sup>18</sup>			No significant change	
Carer Strain <sup>20</sup>			No significant change	
c) Social Services (local criteria)				
High/medium unmet need				
Carer in danger of being unable to cope	N = 29 (31%), N = 35 (38%)			
d) Receipt of home care services				
Local authority services	N = 7 (10%)			
Private/voluntary services				
e) Perceptions of the programme				
Would like programme repeated at least once per year	People with PD: N = 104 (94%)		N = 17 (20%) - N = 26 (30%)	
	Carers: N = 65 (92%)		Not significant	
			N = 41(48%) - N = 28 (33%)	
			Not significant	

PD, Parkinson's disease; HRQoL, health-related quality of life; NA, not applicable.

assessments were undertaken by an independent researcher using validated instruments.

## Results

The cost-consequences balance sheet is shown in Table 1. The largest elements of cost were associated with the use of facilities (treatment rooms and communal space) in the day hospital and transport for people unable to provide their own. Participants travelled a mean (SD) of 9.4 (7.6) miles (15.1 (12.2) km) to attend the day hospital.

Patients experienced benefits across a range of indicators at the end of the treatment programme, but only small mobility gains were observed four months later. Carers were not found to experience any health-related benefits. The study revealed that over 30% of patients had unmet needs for social services (according to local criteria), and some increases in local authority provision and reduced use of the private and voluntary services were observed at four-month follow-up. High levels of satisfaction with the programme were reported.

## Discussion

This analysis shows that the main costs associated with a multidisciplinary rehabilitation programme given over six weeks in a day hospital to people with Parkinson's disease arise from facilities, overheads and the staff time involved, and that the benefits are short term and mainly concerned with patient mobility. The study cannot conclude that the programme either is or is not worth funding because that judgement depends upon the value attached to the mobility gains by the patients, their carers and those who fund the service. The main study had some weaknesses, discussed elsewhere.<sup>10,13</sup> The economic analysis adopted the perspectives of the health service and of participants. Societal (productivity) effects were not included because 90% of participants were over 60 years of age, and only one was in paid employment.

A cost-consequences balance sheet was used to evaluate the rehabilitation programme because this approach can provide a clear descriptive summary

for decision-makers about the costs of delivering an intervention and its varied effects from which value-for-money judgements may be made. In this regard it offers advantages over more technical forms of economic analysis. Cost-effectiveness analysis, which involves the calculation of cost per unit of therapeutic gain, requires the identification of a primary outcome measure and cannot capture the full spectrum of ramifications from an intervention.<sup>21</sup> Cost-utility analysis is centred on a single preference-based valuation of health states, but may be considered to be unreliable because of assumptions involved in the estimation of QALYs.<sup>22,23</sup> Cost-benefit analysis, which assesses users' evaluations of a service in terms of their willingness to pay for it, is affected by the distribution of income, and is inappropriate in the context of the tax-funded British National Health Service, where patients receive care that is free at the point of delivery and therefore have limited understanding of health care costs.

Cost-consequences analyses have some limitations, but these usually also apply to the other forms of economic appraisal. First, it is often impractical to fully capture all consequences, especially indirect effects that may occur sometime in the future. Moreover, data-gathering problems may create uncertainties around other indicators. Such issues should be clearly explained to decision-makers in documentation that accompanies any cost-consequences balance sheet. In the example described here, it was difficult to trace system-wide utilization effects after the intervention because health and social services data are collected by disparate agencies. Hence, self-report, which may be subject to recall errors, was used instead. Although participants reported increased use of local authority home care services at four-month follow-up, this was not costed because a causal link to the intervention could not be established. It has been shown elsewhere that higher service utilization by older people may defer or avoid costly hospitalization or long-term care,<sup>24</sup> in which case rehabilitation may reduce overall expenditure. Large studies with long follow-up periods are required to confirm this,<sup>25</sup> but are difficult to orchestrate for practical and financial reasons.

Second, for rational decision-making, information is required beyond that pertaining to the intervention under investigation. Most service

### Clinical messages

- The main costs of a day hospital multi-disciplinary rehabilitation programme for people with Parkinson's disease arose from facilities, overheads and staff time.
- The main benefit was a short-term improvement in mobility.
- The cost-consequences analysis provides a clear descriptive summary for decision-makers about the costs of delivering the intervention and its varied effects from which value-for-money judgements may be made.

innovations, including the case study examined here, incur extra expenditures in order to generate outcome gains. The question that decision-makers therefore face is whether the benefits from the intervention are sufficiently large to justify the resources used.<sup>26</sup> With fixed budgets, they need to weigh improved treatment for one patient group against the effect of reduced resources for another. In order to set priorities, comprehensive information on the costs and consequences of all competing claims on resources is theoretically required. In reality, however, this is impractical. As a result, service planning is driven by subjectivity, pragmatism, politics, financial incentives and the status quo, rather than economic rationality. The use of different thresholds for accepting or rejecting new service initiatives by decision-makers in different localities has been recognized as a source of inequities.<sup>27</sup>

Third, results of local studies are often highly context specific with implications that cannot be generalized. They do not provide evidence about costs and consequences if an intervention was transported to a different hospital or region. Moreover, it is a problem of trials with fixed protocols that they do not enable changes in delivery to be investigated. In the case of the multidisciplinary rehabilitation programme discussed here, potential benefit-enhancing or cost-saving service changes became apparent as the trial progressed, but will need to be subsequently researched.

On the outcomes side there is a question whether short-term beneficial effects could be sustained if the rehabilitation is delivered over a longer period of time (say once a month for six months, rather than weekly for six weeks), or if 'booster' sessions of therapy at regular intervals after the initial treatment period are provided. On the cost side, economies might be achieved by increasing the group size or changing the location of the intervention. Other research suggests that venues such as community halls, senior centres, or general practice premises do not compromise the quality of specialist care for frail older people, compared with day hospital settings.<sup>28</sup> Treating patients in their own homes avoids the high costs of transporting infirm patients to hospital for treatment, and would enable therapists to address patients' needs in the context of their daily living arrangements, but would remove any beneficial effects generated by a supportive group environment. Formative evaluations offer some advantages over randomized controlled trial designs. They provide the flexibility that enables alternative treatment arrangements to be explored so that cost-effective service configurations can evolve in the normal cycle of delivery and audit.

Resources devoted to research have an opportunity cost in terms of direct patient care,<sup>4</sup> and should be used to provide robust and relevant evidence. Economic evaluation fulfils a useful role in providing systematic and structured information to decision-makers.<sup>1</sup> Although cost-consequences analysis may lack the technical rigour of other approaches to evaluation, it is at the same time more versatile and practical.<sup>7</sup> Provided its shortcomings are borne in mind, it offers an appropriate framework for appraising rehabilitation interventions.

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### Conflicting interests

None. Note that two reviewers independent of the Editor, who is an author, reviewed and recommended the paper.

### Contributions

The treatment programme was devised by PT and JK and co-ordinated by JK. Recruitment was undertaken by PT and JK. Outcome data analysis was undertaken by CO. The economic analysis was conducted by HG. The research was supervised by DW.

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