

## Economic evaluation of integrated care: an introduction

*Hindrik Vondeling, Department of Health Economics, Institute for Public Health, University of Southern Denmark, Odense, Denmark*

*Correspondence to: Hindrik Vondeling, Institute for Public Health, University of Southern Denmark, Winslowparken 19, 3<sup>rd</sup> floor, Odense, Denmark. Tel: +45 65 50 30 85, Fax: +45 65 91 82 96, E-mail: [hvo@sam.sdu.dk](mailto:hvo@sam.sdu.dk)*

---

### Abstract

**Background:** Integrated care has emerged in a variety of forms in industrialised countries during the past decade. It is generally assumed that these new arrangements result in increased effectiveness and quality of care, while being cost-effective or even cost-saving at the same time. However, systematic evaluation, including an evaluation of the relative costs and benefits of these arrangements, has largely been lacking.

**Objectives:** To stimulate fruitful dialogue and debate about the need for economic evaluation in integrated care, and to outline possibilities for undertaking economic appraisal studies in this relatively new field.

**Theory:** Key concepts, including e.g. scarcity and opportunity costs, are introduced, followed by a brief overview of the most common methods used in economic evaluation of health care programmes. Then a number of issues that seem particularly relevant for economic evaluation of integrated care arrangements are addressed in more detail, illustrated with examples from the literature.

**Conclusion and discussion:** There is a need for well-designed economic evaluation studies of integrated care arrangements, in particular in order to support decision making on the long-term financing of these programmes. Although relatively few studies have been done to date, the field is challenging from a methodological point of view, offering analysts a wealth of opportunities. Guidance to realise these opportunities is provided by the general principles for economic evaluation, which can be tailored to the requirements of this particular field.

### Keywords

**economic evaluation, cost-effectiveness analysis, cost-minimisation analysis, cost-utility analysis, cost-benefit analysis, integrated care, allocation of resources, decision making**

---

### Introduction

Integrated care is a relatively new field, which scope and definition is intensively debated. In a contribution to this debate, Spreeuwenberg and Kodner [1] noticed that some authors are inclined to define integration predominantly as a hierarchical or 'top-down' process driven by generalised organisational exigencies for perfection and optimisation, whereas other authors promote a patient-centred or 'bottom-up' view in which the characteristics and needs of specific patient groups, and their fit with existing systems of care and cure more or less determine the what, how and where of integration. Representing the latter group of authors, Spreeuwenberg and Kodner propose to define the term 'integrated' as a coherent set of methods and models on the funding, and the administrative-, organisational-, service delivery- and clinical levels designed to create connectivity, alignment and collaboration within and between the cure and care sectors. While limiting the focus to patients with

complex, long term problems cutting across multiple services, the results of such multi-pronged efforts to promote integration for the benefit of these patients would be called 'integrated care'. In a similar vein, but more comprehensive, Hardy et al. [2] state that integrated care refers to a coherent and co-ordinated set of services, which are planned, managed and delivered to individual service users across a range of organisations and by a range of co-operating professionals and informal carers. In their view, integrated care covers the full spectrum of health and health care-related social care, while it is also inextricably linked to other services that enable people to be properly cared for in their own homes and in their own communities. The essence of integrated care would be to provide individuals with care services they are in need of, when and where they need them. Integrated care would appear seamless to the service recipients and would be devoid of overlap or gaps to service commissioners and providers. At the same time, these authors acknowledge that, in practice, integrated care appears in a variety of forms: 'trans-

mural care', 'shared care', 'disease management', 'integral care', 'comprehensive care', 'continuing care', 'intermediate care' and so on, partly reflecting different countries of origin and differences in scope and approach. For example, transmural care encompasses many different forms of care directed towards bridging the gap between generalised and specialised care for both acute and chronic patients, with origins in the Dutch health care system [3]. According to Rosendal [4] the concept of integrated care is more comprehensive than the concept of transmural care since transmural care generally does not include the whole care process of patients but instead tends to focus on one or two crucial transition-steps between different types of health care providers. Also, in Rosendal's view, transmural care is similar to 'shared care' and 'hospital at home care' in the UK, and (rather) different from 'disease management' and 'managed care', which both originate from the US. The author states that the latter two approaches more closely match the comprehensive definition of integrated care presented earlier. Integrating these views, it is perhaps fair to state that in the past decade a large variety of new care arrangements has emerged which, despite clear differences, are more and more frequently referred to as (alternative forms of) integrated care. Integrated care thus may become rather an umbrella term, uniting a field, than an exact definition for all its variations in practice. For reasons of clarity and understanding, in this article integrated care is referred to as a comprehensive concept, while distinguishing between different arrangements on a more detailed level where appropriate.

Integrated care arrangements have emerged for a variety of reasons. In the UK, for example, the development of shared care relates to the policy of shifting the balance from secondary to primary care [5] whereas in the Netherlands, transmural care was conceptualised in particular as a means to integrate primary health services and hospital services [6]. In these and other countries, the ageing of the population and the concomitant increase of citizens suffering from non-communicable disease in general and chronic disease in particular, are regarded as major drivers of the development of integrated care [7]. Related to this, the importance of integrated care arrangements is expected to increase, exemplified by the establishment of this journal, the (forthcoming) creation of a Society for Integrated Care and a concomitant increase in research activities in the field, perhaps in particular in the EU [7].

It is generally assumed that integrated care results in increased effectiveness and quality of care, while being cost-effective or even cost-saving at the same

time [1–3, 6]. Although many authors agree that integrated care holds a great promise, they warn against expectations that may be unrealistic, while supporting an evaluative approach [1, 3–5]. For example, in a PhD thesis on economic evaluation of end-stage renal disease treatment in The Netherlands, the author states that: 'in the context of an efficient use of resources for research, economic evaluation of health care programmes should be oriented increasingly to interventions at the level of the organisation of care or the organisation of the health care system in general, rather than to the plethora of interventions at the micro level of care and prevention' (translation HV) [8]. Analysts in the field agree, indicating that in the Dutch context the effectiveness and efficiency of transmural care has hardly been addressed [3]. Likewise, in the UK the concern has been expressed that 'we know too little about the relative cost-effectiveness of providing care in different settings and by professionals with different types of training' [5]. In addition, a recent review of the development of integrated care in 6 EU countries indicates that, despite many initiatives, most of these programmes may not yet have achieved their full potential [7]. The combination of these findings indicate a need for evaluation in general and economic evaluation in particular as, due to the relative immaturity of the field, many integrated care programmes are short-lived after initial funding by temporary subsidies and grants at either local or national levels runs out. A positive decision on long-term financing or reimbursement of services can be facilitated by a timely and high-quality economic evaluation demonstrating 'value for money' of the programme in question. Likewise, an economic evaluation combined with a budget impact analysis could support decision making on permanent reallocation of some share of e.g. existing hospital and/or home care budgets on behalf of an integrated care arrangement, thus contributing to its long-term survival. In this context this paper intends to stimulate research efforts in this field by providing a brief overview of economic evaluation methods and by discussing a number of issues that seem particularly relevant for economic evaluation of integrated care. In doing so, it has been taken into account that there are quite many different forms of integrated care. As a consequence, concepts are illustrated on the basis of studies evaluating both transmural care-, hospital at home care-, and managed care programmes. The choice of issues has been determined on the basis of general requirements for any economic evaluation, as formulated in the excellent textbook by Drummond and colleagues [9], geared towards integrated care as a result of a plenary discussion following a presentation of a draft version of this paper at the WHO/IJIC International Conference on New Research and Developments in Inte-

grated Care, held in Barcelona, Spain, 21–22 February 2003.

## **Scarcity and economic evaluation**

Rapid technological change, the ageing of the population, and increased expectations of the public constitute the three major pressures on health services in most industrialised nations, challenging the financial sustainability of health care systems and widely held values of equal access to high quality care. In other words, resources—people, time, facilities and knowledge—are scarce. Choices must and will be made concerning the deployment of resources, in this case to develop and implement integrated care arrangements. In fact, the real costs of committing resources to a particular use is not the number of euros, dollars or other currency appearing on the programme budget, but rather the health outcome achievable in some other programme which have been forgone by committing the resources in question to the first programme. It is this ‘opportunity cost’ which can be estimated and compared with programme benefits by means of economic analysis [9].

Two features characterise economic analysis, which is also called economic appraisal. Firstly, it deals with both the inputs and outputs, or costs and consequences, of activities. Secondly, economic analysis concerns itself with choices. The two characteristics of economic evaluation have led to its definition as the comparative analysis of alternative courses of action in terms of both their costs and consequences [9]. Economic evaluation of integrated care thus involves a comparison of its costs and consequences to one or a combination of its most appropriate comparators, e.g. care provided in the ‘usual’ setting.

There are a number of forms of economic evaluation [9, 10]. The simplest form of analysis considers only costs. This approach is justified where it can be assumed, or has been shown, that the alternative programmes or therapies being compared produce identical outputs. The economic evaluation is then essentially a search for the least cost alternative. An example of such a study, termed a cost-minimisation study, is the one by Shepperd et al. (1998), who conducted an economic evaluation alongside a randomised clinical trial with 3 months follow-up, comparing hospital at home care with inpatient hospital care for a wide variety of patients, e.g. recovering from hip or knee replacement. The results of the study were reported in two consecutive articles, the first focusing on health outcomes and the second on the efficiency of the competing care programmes [11, 12]. The latter study was reduced to a cost-minimisation analysis, as

the analysis of the clinical study demonstrated that there were no major differences in patient’s reported health outcomes between the two arrangements. To date, this form of analysis may have been used most frequently in evaluation of integrated care.

The other forms of economic evaluation differ mainly in the method of measuring the outputs. In a cost-effectiveness analysis, outputs are expressed in the most convenient natural units or health effects, such as ‘number of cases successfully treated’ or ‘years of life gained’. Analyses like these presuppose that the costs of care are related to a single, common effect, which may differ in magnitude between the alternative programmes. When instead it is deemed more appropriate to present an array of output measures, the associated analysis is termed a cost-consequence analysis.

This is often related to the fact that much modern medicine is concerned not only with improving quantity, but also quality of life. To assess quality of life, an impressive number of instruments has been developed, usually distinguishing between disease-specific and generic questionnaires. The latter questionnaires allow comparisons of the quality of life between different patients groups, and between patient groups and the general population. For similar reasons as those underlying the development of quality of life questionnaires, there has also been a growth of interest in cost-utility analysis, where the life-years gained from treatment are adjusted by a series of utility weights reflecting the relative values individuals place on different states of health. In creating these adjustments, health economists are basically attempting to ascertain how much better the quality of life in one health situation or ‘state’ is compared with another. An example is dialysis at home with help from a spouse or a friend versus dialysis in the hospital (see [8]). The output measure most frequently used is known as the quality-adjusted life year (QALY), which is particularly useful for comparing the efficiency of alternative programmes with differences in both mortality and quality of life. A less frequently used outcome measure is the Healthy Years Equivalent (HYE) [9]. Finally, in a cost-benefit analysis, the outputs of a programme are, just as the costs, expressed in money terms, usually the currency of the country of study, in order to make them commensurate with the costs of the intervention. An example of a study using an analytical technique that is often applied in cost-benefit analysis to assess the value of outcomes, is provided by a study by Barner et al. (2001), assessing asthma patients’ Willingness to pay (WTP) for and give time to an asthma self-management programme [13]. In other cases, a WTP approach is applied to both patients and informal

**Table 1.** Types of economic evaluation

Type of evaluation	Cost measurement	Outcome measurement	Outcome valuation
Cost-minimisation	Any currency	Assumed equivalent or demonstrated equivalent	No valuation
Cost-effectiveness	Any currency	Single major outcome common to alternatives being evaluated, but achieved to different degrees	No valuation Common units e.g. number of lives saved
Cost-utility	Any currency	Single or multiple effects, common or unique to the alternatives and achieved to different degrees	Valuation, with results expressed in e.g. Quality-Adjusted Life Years (QALYs)
Cost-benefit	Any currency	Any effects produced by the alternatives	Valuation, with results expressed in currency units

(Source: modified after [16]).

caregivers. Yet another example, but now exclusively geared towards informal caregivers, is the study by Chiu et al. (1999), assessing the willingness of families caring for victims of stroke to pay for in-home respite care [14]. In contrast with the previous analytic techniques, where results are expressed as a ratio, the results of cost-benefit analyses are expressed as a net benefit (or cost) [15]. The different types of economic evaluation are summarised in Table 1.

Of the different types of economic evaluation, cost-benefit and cost-utility analysis enable decision-makers to assess broader choices, since they address the issue of outcome valuation. Cost-benefit analyses can also shed light on whether the programmes concerned are 'worth while' when compared to other programmes within and outside the health care sector. In principle, this is highly relevant in case of integrated care arrangements, some of which incorporate a combination of health and non-health services. Cost-minimisation and cost-effectiveness analysis tacitly assumes that the treatment objective is worth meeting, and generally address more restrictive questions [9]. In general, the choice of analytic methods should fit the decision making process to be supported.

## Selected issues in economic evaluation of integrated care arrangements

### A comparison of two or more alternatives that need to be described comprehensively

To be categorised as a full economic evaluation, a study needs to examine both costs and effects of the alternative programmes to be compared. Most likely a comparison will involve 'usual care', or, more specifically, 'care in the usual setting' as comparator, which may be e.g. regular hospital care, nursing home care,

or care provided in hospices [17, 18]. In some cases, it may be difficult to choose the most relevant comparator(s). In the Netherlands, for example, seven categories of transmural care have been distinguished, of which some are aimed at a single patient group, e.g. diabetes patients [3]. After making the correct choice of comparator, the alternatives need to be described comprehensively. This allows the reader the opportunity to assess whether the results can be transferred to a local setting. For example, in the trial by Richards et al. (1998), patients randomised to hospital at home care received early discharge with home based rehabilitative care between 08.30 and 11 pm provided by a team of two nurses, a physiotherapist, an occupational therapist and three support workers [19]. The services provided were those for health care, with minimal essential domestic tasks performed, with a case load of 12 patients at any one time or less, with discharge (of hospital at home care) when patients could be managed by routinely available community services [19, 20].

### Viewpoint for the analysis and decision-making context

Health economists recommend to state a viewpoint for the analysis and to place the study in a decision-making context. Possible viewpoints include those of the provider institution, the individual clinician or professional organisation, the patient, the purchaser of health care (or third party payer) or society as a whole. A broad societal viewpoint is recommended by most analysts. This is because data can usually be disaggregated and the analysis carried out from a number of viewpoints. Also, the additional costs of adopting a broader perspective at the outset of the study is probably less than the cost of attempting to gather additional information later [9, 21]. As noticed earlier, this is relevant in case of integrated care. For example, in the economic evaluation carried out

**Table 2.** Types of costs in an economic evaluation, depending on the perspective of the analysis

Perspectives			Types of costs	Examples
1	2	3		
			Hospital costs	Inpatient and/or outpatient medical staff time, nursing staff time, other staff time, diagnostic tests, procedures, drugs, anaesthesia, materials, and overhead costs, e.g. electricity, heating, and administration costs
			Primary care costs	General practitioner time, practice nurse time, visits to physiotherapists, etc., prescription drugs (excluding co-payments), supplies (e.g. dressings), overheads
			Costs of integrated care arrangements, not yet covered by the previous categories	Professional home care, costs of training and employing e.g. liaison or transfer nurses or otherwise specialised hospital or home nurses, training programmes for GPs and other personnel, costs of diagnostic tests and/or test facilities, including overheads, consultation of medical specialists and GPs, costs of special arrangements, e.g. rehabilitation wards, development and supply of educational programmes for specific patient groups, etc.
			Costs borne by the patient, family and friends	Travel expenses by the patient and/or accompanying family and friends, travel time, out-of-pocket expenses, including co-payments, e.g. for medication, purchase of items for hospital stay, adaptation of the home, other expenses associated with informal caring, including e.g. lost housework time and lost leisure time
			Costs in other sectors, e.g. costs of production losses	Days at work, both paid and unpaid, with reduced productivity due to illness, days off work due to illness, (partial) disability, and production losses related to premature death of the patient. Days off paid and unpaid work of informal caregivers.

(1=societal perspective, 2=health care perspective, 3=hospital perspective).

(Source: modified after [10, 18]).

alongside a clinical trial by Richards et al. [19, 20], it was attempted to include the viewpoints of both the NHS, social services, and patients. The viewpoints fitted with the aim of the study, evaluating the effectiveness and acceptability of an early discharge, hospital at home scheme and acute hospital care for medically stable elderly patients. It can be added that the relatively important role of informal care in a number of integrated care programmes supports the choice of a broad societal perspective. An example is provided by an arrangement in Denmark, where an informal caregiver is allowed to stay home from paid work to care for a terminally ill family member.

## Assessment of effectiveness

The quality of an economic evaluation is to a large extent determined by the quality of the evidence of effectiveness of health care programmes. The availability (and if available, the quality) of evidence of effectiveness is almost always a problem, and this goes as well for the field of integrated care. Of the different designs that can be used to generate evidence on effectiveness, the randomised controlled clinical trial is generally acknowledged as providing the highest quality evidence. However, in an assessment of research done in the UK it was stated that few randomised controlled clinical trials of hospital at

home services have been done, and that most of these have been small, with little attempt at economic evaluation [22]. So when considering economic evaluation of integrated care programmes, perhaps three issues related to the quality of evidence on effectiveness need to be addressed:

1. For which programmes does reliable evidence of effectiveness exist, and does this provide an adequate basis for economic evaluation?
2. For which programmes are clinical trials being planned and is there any scope for undertaking economic analysis alongside these trials? (see e.g. [23], for more information on this issue)
3. For which major applications of integrated care is there yet no reliable evidence of effectiveness and what efforts should be made to assemble such evidence?

With regard to these latter points, a meta-analysis of interventions used in disease management programmes for patients with chronic illnesses is illustrative [24]. In this particular study, six interventions were distinguished: provider education (materials or instruction given to healthcare providers regarding appropriate care for patients with the condition targeted by the programme); provider feedback (information to health care providers regarding the specific care or results of care received or experienced by their patients);

provider reminders (prompts given to providers to perform specific patient care tasks); patient education (materials and instructions issued to patients providing information on their condition and how it could be managed); patient reminders (prompts given to patients to perform specific tasks related to care for their condition); and patient financial incentives (payments (direct monetary payments, discounts or services) made to patients for achieving specific treatment related goals). It was concluded that, although these different interventions were associated with improvements in provider adherence to guidelines and patient disease control, the studies did not directly compare different interventions and that, therefore, less is known about which interventions produce the greatest relative improvements in care. It was therefore recommended to organise additional studies to determine the effects and costs of individual intervention strategies.

Ideally, an economic evaluation may be contemplated in direct association with the results from an overview of clinical studies. Typically, the economic analyst would take the respective point estimate of effect from the overview as a base case value and use the confidence interval as the relevant range for sensitivity analysis [21]. With increased research efforts, this option may become realistic in the field of integrated care in a few years time. Finally, an ad hoc synthesis of effectiveness data from several sources, including expert opinion, is regarded as justifiable when no well-controlled clinical studies have been performed [21]. Given the relative lack of evidence on the effectiveness of integrated care, this is a relevant approach when contemplating new economic appraisal studies.

## Assessment of costs

To start with, the range of costs to be included in a given evaluation will be closely related to the viewpoint or the perspective of the analysis. Three categories of costs can be identified, health care costs, costs borne by the patients and their relatives, and costs in other sectors, such as costs in the social sector or costs associated with production losses, e.g. due to absence of work. Table 2 provides examples of each of these types of costs and their relation to the choice of perspective for an analysis. In general, the identification of relevant categories of resource use is followed by measurement of the quantities of the resources used and their valuation in money terms.

The health care resources consumed consist of the costs of organising and operating the programme. The identification of these costs often amounts to the listing of the ingredients of the programme—both variable

costs such as the time of health professionals or supplies, and fixed or overhead costs such as light heat, rent or capital costs [9]. This means that when, for example, evaluating a rehabilitation programme of stroke patients in a hospital at home setting with attendance at a day centre compared to the standard alternative intervention (rehabilitation in a long stay hospital) it is necessary to take into account both the time of the various professionals involved, the time of secretaries and administrators who help run the service, the cost of food and drugs of stroke patients and a fraction of the capital cost of building the day centre and maintaining a transport service to it [25]. But also when comparing transmural care with outpatient care, overhead costs may be important to consider. For example, in a study in The Netherlands comparing the effects and costs of initiation of insulin therapy in type 2 diabetes patients in a transmural care setting and a secondary outpatient care setting, representing usual care, it was calculated that overhead costs contribute 24 and 7%, respectively, of total health care costs in the first year after treatment initiation [26]. There may be considerable differences between countries in this respect. Coast et al. (2000) report that in the UK typically between 25 and 35% of total hospital costs relate to overhead costs, 30% to 40% relate to specialty level costs (for example medical staffing), whilst the direct costs of ward staffing make up only 30–40% of an inpatient bed day [18].

Common benefits of quite a few integrated care arrangements that may result in savings compared to usual care are a reduction of hospital stay or, perhaps less commonly, avoiding hospitalisation altogether [17]. How should this be valued? Clearly, it is not satisfactory to take the daily cost of hospitalisation as an estimate of these savings, since the vacated beds will either be filled by other patients, or, if they remain empty, still incur a cost [15]. Therefore, the impact of integrated care programmes on the use of other resources needs to be assessed in the local setting, in the knowledge of managerial actions taken to re-deploy resources. Other authors have pointed to the fact that the possibility to redeploy resources may be dependent on the size of the integrated care programme. A hypothetical example to illustrate this issue, in economists' terms relating to economies of scale of integrated care programmes, is provided by Coast et al. (2000) [18]. A small programme, taking 5 patients per week from the hospital, may lead to a release of resources for consumables; at 10 patients per week some staff time may be released, and at 20 patients per week it would be possible to close a small ward. It is clear that, according to these authors, a threshold volume must be reached in order to achieve substitution. Following this type of reasoning,

the problem may be particularly acute where shared or integrated care programmes are drawing patients from more than one hospital. In this case such a programme needs to be of sufficient size to achieve these threshold volumes in each hospital. In other words, in considering to perform an economic evaluation the sheer size of the integrated care programme and its structuring may determine its potential cost-effectiveness, at least from a health care sector perspective.

Costs borne by the patient and his or her relatives usually include the costs of travel time, waiting time, and the costs of e.g. over-the-counter medication. A more complex issue is the valuation of resources invested by informal caregivers, who usually are more heavily burdened by integrated care programmes than by conventional care schemes, either by having to learn medical techniques or care for relatively sick relatives at home [1]. A comprehensive introduction and a practical approach to these issues is provided by Van Busschbach and colleagues (1998), in a study providing an outline for a cost-effectiveness analysis of a drug for patients with Alzheimer's disease [27]. The authors suggest a shadow-price method to value resource use of informal caregivers. Firstly, all caregiving and supporting activities that an informal caregiver might perform should be listed with those activities that could be performed by formal caregivers or other professional aids. The next step is to assign an hourly wage rate to each specific activity. Some activities (e.g. making a bed) will be valued at a lower hourly rate than others (specific caregiving). In this way, a uniform valuation of the activities by all caregivers can be established.

There is debate about whether the costs of production losses should be included in an economic evaluation. Some analysts argue that it introduces inequalities between those interventions that are aimed at individuals who could potentially return to productive activity and those that are not. Other analysts state that inclusion of these costs follows straightforward from a societal perspective of analysis. It is therefore, recommended, when included in a study, to report these costs separately, allowing readers the opportunity to interpret study findings with and without taking these costs into account [21]. In case of integrated care arrangements, inclusion of the costs of production losses may not be of paramount importance when evaluating arrangements for elderly patients, most of whom may be retired. The same consideration holds for arrangements aimed at children, who are not yet part of the workforce. However, in evaluating arrangements primarily aimed at working-age populations, inclusion of costs of production losses may be highly

appropriate. Two different methods are available for this purpose, with the human-capital method using lost earnings until retirement as a proxy for lost production, while the friction-cost method uses lost earnings until the time of replacement of the patient as a measure of lost production. Which of these methods is most appropriate is still debated in the health economics literature.

### **Adjustment for differential timing of costs and consequences in the analysis**

A bird in the hand is worth two in the bush. In health as well as in money terms, we value a benefit today more highly than we value a promise of the same benefit in 5 years' time [25]. Therefore, when the costs or benefits of an intervention will occur at least after 1 year in the future, a technique called discounting is used to tackle time preferences [21]. In evaluation of integrated care, discounting of costs and health effects is an important issue, as many of these arrangements are aimed at patients with a chronic condition. More formally, when discounting, the value of the costs and consequences that occur in 10 years are reduced, as they are multiplied with the factor  $1/(1+r)^t$ , where  $r$  is the chosen discount rate. For example, a cost of 5000 € that has to be paid after 3 years, will with a discount rate of 5% have a present value of 4319 €, Likewise, the present value of a health benefit of 250 QALY's gained after 5 years, will with a 5% discount rate be the same as the gain of 196 QALY's today [18]. The exact choice of discount rate is the government recommended rate, usually between 3 and 6%, and a common rate found in the literature is 5% per year. It is also helpful to provide the undiscounted data to allow the reader to recalculate the results using any discount rate [21].

### **Dealing with uncertainty in the estimates of costs and consequences**

Without proper consideration of uncertainty the reader may be unable to judge whether conclusions are meaningful and robust. In economic evaluations of integrated care arrangements it seems essential to include e.g. uncertainties surrounding the reduction in the length of stay in the sensitivity analysis, as it usually is (one of) the most important source(s) of potential cost-savings.

For example, Shepperd (1998), showed that for patients recovering from a hysterectomy, total health service costs were significantly higher for those allocated to hospital at home care compared to hospital care [12]. When subjected to a sensitivity analysis, it

was demonstrated that a one day reduction in the length of hospital stay of hospital at home care eliminated the cost difference between these settings, while a two day reduction altered the results so that hospital at home care became significantly less costly than hospital care. In other words, the results of this study were highly sensitive to uncertainties with regard to the length of stay, at least for the particular group of patients, which was reflected in the discussion of the findings. In another study, with a 3 month follow up, it was concluded that, from the combined viewpoint of the NHS and social services, the cost of hospital at home care were less than that of hospital care for medically stable elderly patients [20]. The conclusion was only sensitive to uncertainty when assuming hospital costs to be less than 50% of those used in the initial analysis, indicating that the findings were relatively robust. These examples demonstrate the crucial role of performing a sensitivity analysis as part of an economic evaluation.

### Generalisability of the findings

Of all other issues that may need to be addressed when undertaking and reporting an economic evaluation, the generalisability of the findings may be one of the most important. As noted earlier, it is essential, when considering the generalisability of a study, that the programmes and interventions have been comprehensively described. However, authors of studies evaluating new care structures have been criticised for not doing so, e.g. Sowden et al. (1995) [28], stated that 'shared care is used as a 'black box' which has a different content in different studies (...). The authors continue: 'Until we have clearer definitions of the key features of a programme of shared care, evaluations will be of limited use, not least because those aspects of shared care that might be important in influencing process and outcome will remain unclear'. From a health economics perspective, it can be added that one of the essential features of a programme that need to be reported is related to its size (see earlier), as this co-determines its potential cost-effectiveness.

### Conclusion and discussion

Economic evaluation of integrated care arrangements is a challenging and interesting area of research, offering many opportunities. Guidance to realise these opportunities is provided by the general principles for economic evaluation, which can be tailored to suit the evaluation of different forms of integrated care. However, few evaluations have been reported to date. Reasons may be the complexity of the intervention,

the fact that evaluation of integrated care arrangements may require detailed data collection across the health care system, the necessity (at least in some arrangements) to take into account other sectors than the health sector as well, the inclusion of a substantial percentage of patients with co-morbidity, and the situation that integrated care programmes may cover multiple patient groups. Therefore, on the one hand economic analysis in this field may be more complicated than in case of single technologies or interventions, but on the other hand the results of these studies may support decision making processes that affect the organisation of the health care system and the care processes in multiple patient groups at the same time.

A major issue in evaluating integrated care is the choice of design of the study, as this co-determines the quality of the evidence of on effectiveness, which impacts on any subsequent analysis of the cost-effectiveness of the arrangement. Although this article has provided a number of examples of studies designed as randomised controlled trials, several authors have pointed at inherent difficulties associated with this design in evaluating specific integrated care arrangements, suggesting comparative cohort studies and audit-type approaches instead, comparing 'usual-care' settings with integrated care settings [4, 29]. Also in this situation, integration of an economic evaluation may be useful. An example of a comparative cohort-study is provided by Polder et al. (2002) evaluating costs and effects of a conventional discharge policy after hip fracture versus an early discharge policy in which patients were rehabilitated in a specialised nursing home [30]. In explaining the design of the study, the authors state that randomisation of patients was not considered feasible since the change from conventional discharge to early discharge arrangements required such organisational adjustments that both service models could not be offered simultaneously. Despite the methodological disadvantages of such studies, the findings may still be useful to support reimbursement decision making in a situation where, according to Van der Linden et al. (2001) [29], most of the current transmurals projects are experiencing difficulties in obtaining permanent funding after the conclusion of the experimental phase. A general issue of concern, however, is the demand-generation effect of integrated care programmes. Since a considerable proportion of such programmes enable the patient to be treated at home while reducing the length of hospital stay, many categories of patients will prefer this option, and it can therefore be expected that the limits will be pushed of indications that are deemed eligible for care in such settings, which may lead to inefficiencies. It is there-



fore recommended to explore the cost-effectiveness of broadening the indications of selected integrated care programmes as part of the sensitivity analysis of an appraisal.

This article has introduced and discussed some of the issues that need to be addressed when contemplating an economic evaluation of integrated care arrangements. From a societal perspective, assessment of potential savings due to reduced length of hospital stay in integrated care arrangements and issues of cost shifting, e.g. from the hospital to other health care institutions, and from health services to both social services and the patient and their relatives, deserve special attention. For readers who wish to be informed in more detail, the textbook by Drummond and colleagues is recommended [9]. Finally, to guar-

antee the highest possible level of economic evaluation in this field, a skilled health economist should be consulted in the early phase of the design of the study. Ideally, the health economist would be part of the research team from start to finish of the project.

## Acknowledgements

I would like to thank Ingvar Karlberg and two anonymous reviewers for constructive comments on an earlier version of this paper. I also would like to thank the participants in the plenary session at the WHO/IJIC International Conference on New Research and Developments in Integrated Care (Barcelona, February 21–22, 2003), where this paper was discussed, for a stimulating debate on economic issues of integrated care programmes.

## References

1. Kodner DL, Spreeuwenberg C. Integrated care: meaning, logic, applications and implications: a discussion paper. *International Journal of Integrated Care* [serial online] 2002 Nov 14; 2. Available from: URL: [www.ijic.org](http://www.ijic.org).
2. Hardy B, Van Raak A, Mur-Veeman I, Steenbergen M, Paulus A. Introduction. In: van Raak A, Mur-Veeman I, Hardy B, Steenbergen M, Paulus A, editors. *Integrated care in Europe. Description and comparison of integrated care in six EU countries*. The Netherlands: Elsevier Gezondheidszorg, Maarssen; 2003. p. 9–13.
3. Van der Linden BA, Rosendal H. The birth of transmural care in the 1990s. In: Van Rooij E, Droyan Kodner L, Rijsemus T, Schrijvers G, editors. *Health and health care in the Netherlands. A critical self-assessment of Dutch experts in medical and health sciences*. The Netherlands: Elsevier Gezondheidszorg, Maarssen; 2002. p.191–7.
4. Rosendal H. *Comparative cohort studies in transmural care. Three cases of structurally embedded practice in the Netherlands*. The Netherlands: Ridderprint Offset Drukkerij BV, Ridderkerk; 2002 (PhD thesis).
5. Coulter A. Shifting the balance from secondary to primary care. Needs investment and cultural change [editorial]. *British Medical Journal* 1995;311:1447–8.
6. Committee for the Modernization of Curative Care. *Shared care, better care*. The Netherlands: Zoetermeer; 1994. (in Dutch).
7. Van Raak A, Mur-Veeman I, Hardy B, Steenbergen M, Paulus A, editors. *Integrated care in Europe. Description and comparison of integrated care in six EU countries*. The Netherlands: Elsevier Gezondheidszorg, Maarssen; 2003.
8. De Wit A. *Economic evaluation of end-stage renal disease treatment*. The Netherlands: PrintPartners Ipskamp, Enschede; 2002 (PhD thesis).
9. Drummond MF, O'Brien B, Stoddart GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. 2nd ed. New York, Toronto: Oxford University Press, Oxford; 1997.
10. Poulsen PB. The economy. In: Kristensen FB, Hørder M, Poulsen PB, editors. *Health technology Assessment Handbook*. 1st ed. Denmark: Danish Institute for Health Technology Assessment, Copenhagen; 2001. p. 96–122.
11. Shepperd S, Harwood D, Jenkinson C, Gray A, Vessey M, Morgan P. Randomised controlled trial comparing hospital at home care with inpatient hospital care. I: three months follow-up of health outcomes. *British Medical Journal* 1998;316:1786–91.
12. Shepperd S, Harwood D, Gray A, Vessey M, Morgan P. Randomised controlled trial comparing hospital at home care with inpatient hospital care. II: cost minimisation analysis. *British Medical Journal* 1998;(316):1791–6.
13. Barner JC, Mason HL, Murray M. Assessment of asthma patients' willingness to pay for and give time to an asthma self-management program. *Clinical Therapeutics* 1999;5(21):878–94.
14. Chiu L, Tang KY, Shyu WC, Chang TP. The willingness of families caring for victims of stroke to pay for in-home respite care – results of a pilot study in Taiwan. *Health Policy* 1999;46:239–54.
15. Drummond MF. Economic evaluation of laser applications. In: Banta HD, Schou I. *Lasers in health care. Effectiveness, cost-effectiveness and policy implications*. Denmark: Academic Publishing, Frederiksberg; 1991. p. 72–81.
16. Brooks R. The economic framework of day surgery: a plea for appropriate appraisal. *Ambulatory Surgery* 1998;(6):201–6.
17. Hensher M, Fulop N, Coast J, Jefferys E. The hospital of the future. Better out than in? Alternatives to acute hospital care. *British Medical Journal* 1999;319:1127–30.
18. Coast J, Hensher M, Mulligan JA, Shepperd S, Jones J. Conceptual and practical difficulties with the economic evaluation of health services developments. *Journal of Health Services Research and Policy* 2000;1(5):42–8.

19. Richards SH, Coast J, Gunnell DJ, Peters TJ, Pounsford J, Darlow MA. Randomised controlled trial comparing effectiveness and acceptability of an early discharge, hospital at home scheme with acute hospital care. *British Medical Journal* 1998;316:1796–801.
20. Coast J, Richards SH, Peters TJ, Gunnell DJ, Darlow MA, Pounsford J. Hospital at home or acute hospital care? A cost-minimisation analysis. *British Medical Journal* 1998;316:1802–6.
21. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic submissions to the BMJ. *British Medical Journal* 1996;313:275–83.
22. Iliffe S. Hospital at home: from red to amber? Data that will assure advocates – but without satisfying the sceptics [editorial]. *British Medical Journal* 1998;316:1761–2.
23. Coyle D, Davies L, Drummond MF. Trials and tribulations. Emerging issues in designing economic evaluations alongside clinical trials. *International Journal of Technology Assessment in Health Care* 1998(14)1:135–44.
24. Weingarten SR, Henning JM, Badamgrav E, Knight K, Hasselblad V, Gano A, et al. Interventions used in disease management programmes for patients with chronic illness – which ones work? Meta-analysis of published reports. *British Medical Journal* 2002;325:925–33.
25. Greenhalgh T. Chapter 10. Papers that tell you what things cost (economic analysis). In: Greenhalgh T. *How to read a paper. The basics of evidence based medicine* 2nd ed. London, United Kingdom: BMJ Books; 2002. p. 151–65.
26. Hutubessy RCW, Vondeling H, De Sonnaville JJJ, Colly LP, Smit JLJ, Heine RJ. Insulin therapy in patients with type 2 diabetes mellitus. Shared care versus secondary outpatient care in The Netherlands. *Disease Management and Health Outcomes* 2001;6(9):337–44.
27. Van Busschbach J, Brouwer WBF, Van der Donk A, Passchier J, Rutten FFH. An outline for a cost-effectiveness analysis of a drug for patients with Alzheimer's disease. *Pharmacoeconomics* 1998;1Pt1(13):21–34.
28. Sowden AJ, Sheldon TA, Alberti G. Shared care in diabetes. Better evaluation is needed [editorial]. *British Medical Journal* 1995;310:142–3.
29. Van der Linden BA, Spreeuwenberg C, Schrijvers AJP. Integration of care in The Netherlands: the development of transmural care since 1994. *Health Policy* 2001;(55):111–20.
30. Polder JJ, Van Balen R, Steyerberg EW, Cools HJ, Habbema JDF. A cost-minimisation study of alternative discharge policies after hip fracture repair. *Health Economics* 2003;12:87–100.