

Commentary

The Costs of Cancer Therapy

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(COMMENTARY ON: Walker Q.J., Salkeld G., Hall J. *et al.* The management of oesophageal carcinoma: surgery or radiotherapy? Cost considerations. *Eur J Cancer Clin Oncol* 1989, **25**, 1657-1662.)

ECONOMIC FACTORS in health care are becoming more important as demands on health care systems increase, often beyond the ability of these systems to satisfy them. The basis for this increased demand is multifactorial and the relative importance of contributing factors varies from centre to centre. Some of the most important factors include recent advances in health care which have resulted in the treatment of many conditions that were previously untreated, the increasing health consciousness of the general population that has resulted in increased demands for treatment of minor illnesses, as well as the aging of the population.

When demands for resources exceed supply, decisions must be made regarding the allocation of these resources. These decisions can be made after formal examination of all available alternative uses of resources or they can be made on a less formal, *ad hoc* basis. When the *ad hoc* approach is taken in a privately funded system, this usually results in the provision of services to those most able to pay for them, while in publicly funded systems resources are usually allocated on a first come, first served basis. Regardless of the approach, unless these decisions are made explicitly, resources may be allocated to services that are of marginal benefit or extremely costly rather than to highly effective and less costly services, a situation that may not result in the most efficient use of resources.

Economic evaluations contribute to the formal decision making process in several ways [1]. First, they encourage the identification of relevant alternative programmes to which new programmes should be compared. These alternatives may include treatment programmes (including palliative care), diagnostic and screening programmes as well as preventive and public health programmes. Second, they identify the cost implications of new programmes from different viewpoints, for example, third party payers, government departments or individual patients, so that costly programmes will not appear to be financially attractive simply because costs are shifted from one source to another. Finally, they provide an estimate of the magnitude of the costs associated with the adoption of a new programme from each viewpoint that is examined.

There are several types of economic evaluation [1] and the terminology used to describe them is sometimes confusing. The simplest type of evaluation is a cost analysis. In this type of evaluation, the costs of two (or more) programmes are compared without consideration of the health benefits of the programmes. Other types of economic evaluations relate costs to health benefits; these evaluations measure costs in the same way, but differ in the manner in which benefits are evaluated. A cost-benefit analysis attempts to value health benefits in monetary terms. Because this requires that a human life be valued in dollar terms, this type of evaluation is rarely used in health care evaluations. Cost-effectiveness evaluations measure the outcomes of programmes in natural units, such as years of life gained or the number of new cases of a disease diagnosed. These units are readily understood by

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the medical community and, when the same units are used in different evaluations, comparisons across evaluations are facilitated. Cost-utility evaluations require that health outcomes be measured in units of time (for example, years of life gained) and this time is then adjusted for quality. In the final type of evaluation, cost minimization analysis, the health outcomes of the programmes being compared are shown to be identical (for example, inpatient versus outpatient minor surgical procedures) and the costs compared.

Many of the published economic evaluations of cancer treatment have consisted of cost analyses only or have significant methodologic limitations which weaken their results. However, some general observations regarding the results of the more rigorous evaluations are possible. Two recent cost minimization analyses have reported the use of radiation therapy to be less costly, and equally effective, compared to radical surgery for early stage cancer of the prostate [2] and larynx [3]. Thus, there is support for the use of radiation therapy in situations where it is of proven medical benefit. Similar results have been obtained in two economic evaluations of chemotherapy for malignant disease reported by our group. Chemotherapy which was shown to improve survival in patients with extensive small cell lung cancer was shown to be associated with acceptable costs in one study [4] while the use of palliative chemotherapy to prolong survival in unresectable non-small cell lung cancer was shown to reduce costs to the health care system in another [5]. The latter studies have also demonstrated that the costs of chemotherapeutic drugs account for only a small portion of the total costs of caring for cancer patients and that reduction in hospitalization rates have a significant cost-saving effect.

Walker *et al.* have recently published a study of cost considerations in the management of oesophageal carcinoma using radiotherapy or surgery in this journal [6]. They assume the therapeutic results of each approach are equivalent, therefore their study is a cost-minimization analysis. Their assumption is based on the results of a retrospective analysis of the survival of the patients on whom costing was performed [7]. Because this is a non-randomized comparison of the two treatment approaches and patients in the comparison groups differed with respect to important prognostic variables such as tumour histology and size of the primary tumour, the conclusion that the two approaches are truly equivalent must be accepted with caution. Unfortunately, more reliable information is not available in the literature. If the two treatment approaches are not equivalent, differences in costs are of potentially less importance and they should be related to differences in survival; this might alter the major conclusions of the economic evaluation.

With respect to costing, the authors are to be commended for identifying actual patterns of resource use in their patients and for attempting to calculate unit costs. It is likely that costs were underestimated somewhat due to the exclusion of overhead costs and of costs relating to terminal care. Exclusion of overhead costs may have influenced surgical ward costs to a greater extent than intensive care unit costs because of the very low cost of the former relative to the latter reported by the authors. Exclusion of terminal care costs would be of particular importance if patients receiving the least costly therapy, radiation, had significantly higher terminal care costs, a scenario that might reverse the conclusions of the evaluation. Future economic evaluations of cancer care must attempt to include all potentially important costs.

Some of the patterns of resource utilization identified by Walker *et al.* differ considerably from those that exist in our centre. For example, at the Mount Sinai Hospital in Toronto the average length of hospital stay for surgical resection of carcinoma of the oesophagus was 18.4 days, with an average of less than 1 day in intensive care even though complication rates were comparable (unpublished data). This is less than half that identified by Walker *et al.* In addition, the operating room time required is approximately 25% less than that reported by Walker *et al.* Thus, the patterns of resource utilization identified in Toronto would result in significantly lower surgical costs than those identified by Walker *et al.*

The impact of variability in estimates of either resource utilization or costs on the results of the economic evaluation could have been examined in sensitivity analyses. These analyses provide an assessment of the range of economic outcomes that are possible given the degree of uncertainty that exists in the cost and utilization estimates. If the major conclusions of the evaluation are unchanged at the extremes of these sensitivity analyses, the results are considered robust to the degree of uncertainty examined and the conclusions are strengthened. Future economic evaluations should attempt to include such analyses when there is uncertainty regarding any of the estimates of costs or utilization included in the analysis. This is particularly important when costs are determined retrospectively.

Sensitivity analyses also allow an estimation of the effects of different patterns of resource utilization or different cost structures found in different health care systems on the results of the economic evaluation. For example, the high costs of radiation therapy that exist in the United States might make surgery more attractive economically in that setting. Fewer days in hospital for patients undergoing surgery would also make surgery more attractive. Conversely, the admission of radiotherapy patients for concurrent administration of chemotherapy

might make radiotherapy less attractive economically. Sensitivity analyses would provide estimates of the economic effects of these different practices.

Despite these methodologic limitations, the investigators have taken a more rigorous approach to costing than has been the case in many previous reports and they have satisfied some of the currently accepted methodologic guidelines for economic evaluations described by Drummond *et al.* [1]. It is probable that none of the methodologic shortcomings described above resulted in an incorrect conclusion that the use of radical surgery for oesophageal carcinoma is more costly than radical radiation therapy. Only a properly conducted randomized trial will resolve the uncertainty that exists regarding the relative therapeutic efficacy of surgery and radiotherapy in this disease.

More economic evaluations of the care of patients with malignant disease are needed to ensure that the health care dollars that are currently directed towards cancer care are spent in the most advantageous way. These economic evaluations will provide information that can be used in conjunction with other information when policy decisions are made regarding the allocation of resources to the care of patients with cancer. Clearly, such decisions

should not be based solely on economic factors. Treatment efficacy should be a primary consideration in such decisions and other factors, including the effects of treatment on quality of life as well as societal and patient preferences, should be taken into consideration. Economic evaluations will not substitute for properly conducted randomized trials of therapeutic efficacy or for formal assessments of the effect of different treatments on quality of life.

The information that is currently available regarding the cost of cancer therapy in relation to its benefits is clearly reassuring. The cost-effectiveness of efficacious therapy has been shown to be comparable to that of commonly used therapies for non-malignant disease. Even therapy given with palliative intent may be cost effective, as evidenced in a recent report by our group which showed that palliative chemotherapy for advanced non-small cell lung cancer was associated with both reduced costs and prolonged survival when compared to a policy of best supportive care [5]. Future economic evaluations of cancer therapy will provide additional information on the costs in relation to benefits of cancer care and will facilitate decisions regarding allocation of resources for the care of cancer patients.

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