The cost-effectiveness and cost-utility of high-dose palliative radiotherapy for advanced non-small-cell lung cancer

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The use of high-dose palliative radiotherapy (RT) for the treatment of patients with advanced non-small-cell lung cancer (NSCLC).

Type of intervention
Palliative care.

Economic study type
Cost-effectiveness and cost-utility analyses.

Study population
The study population comprised patients with advanced NSCLC.

Setting
The setting was an outpatient treatment centre. The economic study was carried out at the Vancouver Island Cancer Centre of the British Columbia Cancer Agency (Canada).

Dates to which data relate
The effectiveness evidence was gathered from two papers published in 1998 and 2000 (see Other Publications of Related Interest nos.1-2). The resource use data were mainly collected in 1994. The prices used were from the period 1997 to 1998.

Source of effectiveness data
The effectiveness data were derived from a single study conducted by the same authors as those of the present study, which was published as two papers (see Other Publications of Related Interest nos.1-2).

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
No power calculations were performed to determine the sample size. All lung cancer patients from the Victoria area (BC, Canada) who presented at the clinic between 1 February 1990 and 31 January 1992, were asked to participate in the study. Of the 241 patients invited to participate, 162 (66%) agreed, giving informed consent. Of these, 54 had advanced NSCLC and received high-dose palliative RT as the primary treatment. The average tumour size was 6.53 cm at the greatest diameter. The average age at assessment was 70.2 years. The patient distribution according to the
histology was 66.7% with squamous cell carcinoma, 18.5% with adenocarcinoma, and 14.8% with other carcinoma. The data concerning survival benefits were derived from a sample of 129 NSCLC patients who received BSC, low-dose palliative RT, high-dose palliative RT, or radical RT.

**Study design**

The study appears to have been a cohort study, carried out at a single centre. However, the numbers of patients receiving each treatment were not given. The patients included in the study completed a monthly questionnaire concerning the quality of life in their own health states. The analysts were also authorised to have access to the patients' medical records. The patients were followed until death or the end of the study period.

**Analysis of effectiveness**

The primary health outcomes assessed were the number of quality-adjusted life-days (QALDs) and the survival rates associated with high-dose palliative RT and BSC.

The QALDs were assessed using the QLQ-C30 questionnaire and through a least-squares regression model. The questionnaire was developed and tested by the European Organisation for Research and Treatment of Cancer study group on quality of life.

The survival rates were estimated using a Cox proportional hazards model with prognostic and treatment covariates. The Cox proportional hazards model was used to estimate two survival curves, one with the treatment and the other without. Statistical analyses were not conducted to show whether the groups were comparable at baseline. However, the Cox proportional hazards model and the least-squares model adjusted the survival and quality of life weights for confounding.

**Effectiveness results**

The survival rates were 187 days with BSC and 266 days with RT. RT therefore increased the median survival by 79 days (95% confidence interval, CI: 31 - 106). The method to calculate the CIs was described elsewhere (see Other Publications of Related Interest no.2).

There were 158.5 QALDs with BSC and 101.6 with RT. RT therefore resulted in a gain of 56.9 QALDs (approximate 95% CI: 23.6 - 81.1).

**Clinical conclusions**

RT was statistically significantly more effective than BSC, both in terms of survival and the quality of life.

**Measure of benefits used in the economic analysis**

The benefits measures used in the economic analysis were the survival rate and QALDs. These were derived from the analysis of the effectiveness.

**Direct costs**

Discounting was irrelevant because the costs were incurred in a timeframe of less than 2 years. The direct cost analysis included the in-clinic expenses, such as the patient's assessment, planning (diagnostic tests), treatment, follow-up visits, and nutrition visits. The costs were estimated from actual data derived from a published study conducted by the same authors. The costs were obtained following a treatment protocol commonly used at the authors' institution. The resource use data were collected in 1994. The resource quantities and the unit costs were not reported separately. The cost boundary adopted was that of the hospital. The cost estimates were collected during the period 1989 to 1990, but prices from the period 1997 to 1998 were used. Therefore, different cost items were increased by different rates (inflation adjustment), according to the expected growth rate in the economy.
The analysis also included non-clinic medical costs, and the cost of time and travel for the patients, their families, and volunteer drivers. The time and travel costs were obtained from a survey of patients in February 1991. Non-clinical medical costs were derived from the patients' bills.

**Statistical analysis of costs**
No statistical analysis of costs was reported.

**Indirect Costs**
The indirect costs were not reported. The authors described non-clinical medical costs, and time and travel costs, as "societal". However, for NHS EED these are categorised as "direct" and are therefore listed in the 'Direct Costs' section, whereas those due to lost productivity are categorised as "indirect".

**Currency**
Canadian dollars (Can$).

**Sensitivity analysis**
Two-way sensitivity analyses were conducted. Firstly, on the incremental costs and the number of life-days gained, in order to investigate the effect on the cost-effectiveness ratio. Secondly, on the incremental costs and QALDs, in order to investigate the effect on the cost-utility ratio. The benefits were set at the upper and lower limits of the 95% CI, whilst the costs ranged from 80 to 120%.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
From the perspective of the clinic, the total costs were Can$3,489 for RT and Can$1,488 for BSC. The incremental cost of RT over BSC was Can$2,001.

From the "societal" perspective, the total costs were Can$4,300 for RT and Can$1,648 for BSC. The incremental cost of RT over BSC was Can$2,652.

**Synthesis of costs and benefits**
The costs and the benefits of RT and BSC were combined using incremental cost-effectiveness and cost-utility analyses.

From a clinic perspective, the incremental cost-effectiveness ratio of RT over BSC was equal to Can$9,245 per life-year gained. The incremental cost-utility ratio of RT over BSC was Can$12,836 per QALY.

From a "societal" perspective, the incremental cost-effectiveness ratio of RT over BSC was Can$12,253 per life-year gained. The incremental cost-utility ratio of RT over BSC was Can$17,012 per QALY.

The sensitivity analyses identified the best and worst scenarios for RT. The cost-effectiveness ratio of RT over BSC ranged from Can$5,513 to Can$28,270 per life-year from the clinic perspective, and from Can$7,307 to Can$37,465 from the "societal" perspective. The cost-utility ratio of RT over BSC ranged from Can$7,205 to Can$37,134 per QALY gained from the clinic perspective, and from Can$9,550 to Can$49,213 from the "societal" perspective.

**Authors' conclusions**
High-dose palliative radiotherapy (RT) was a cost-effective strategy, in comparison with best supportive care (BSC), for
the treatment of patients with advanced non-small-cell lung cancer (NSCLC). The cost-effectiveness ratio for RT lies below the threshold of $50,000 per QALY, which is commonly used to select medical interventions in the health care system.

CRD COMMENTARY - Selection of comparators
The reason for the selection of the comparator was clear. BSC was selected because it represented the routine management of patients with advanced NSCLC. However, the authors did not justify the exclusion of alternative strategies commonly available for the treatment of these patients. You should consider whether they represent commonly used health technologies in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness (benefits) associated with the treatments was assessed using a single study, which had been conducted by the same authors as those in the present analysis and published as two papers (see Other Publications of Related Interest nos.1-2). Few details of the study were therefore reported. The authors reported that the validity of the study could have been limited by the small sample size. However, the statistical approach to controlling for confounding seems to have been adequately performed.

Validity of estimate of measure of benefit
The effectiveness measures, which acted as summary measures of benefit, were appropriate. In addition, they enabled comparisons to be made with other technologies, in terms of the efficiency.

Validity of estimate of costs
The cost analysis was consistent with the clinic perspective adopted, and it appears that all the relevant categories of costs have been included. Unfortunately, the authors stated that non-clinic direct costs reflected a societal perspective. This is misleading because it does not account for the value of time lost from other activities, such as productivity, due to illness. The unit costs and the quantities were not reported separately. In addition, the costs were quite specific to the authors’ institution, although sensitivity analyses were conducted.

Other issues
The authors made extensive and appropriate comparisons of their results with those from other published studies. The issue of the generalisability of the results to other settings was addressed, to some extent, by the sensitivity analyses.

Implications of the study
The authors stated that RT was as cost-effective as other medical treatments, such as some forms of chemotherapy, combinations of surgery and chemotherapy, and surgery for early NSCLC. However, RT alone appeared to be less cost-effective than a combination of chemotherapy and RT for a mixed group of advanced NSCLC patients. The authors recommend that more research using larger sample sizes is required. This should focus on the cost-effectiveness of specific regimens across different disease characteristics within the group of advanced NSCLC patients. The conclusions and recommendations should be judged in the light of the caveats highlighted.

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Bibliographic details
Other publications of related interest


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MeSH
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