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.

CRD summary
The objective was to evaluate the cost-effectiveness of CyberKnife (Accuray, Inc) stereotactic radiosurgery compared with external beam radiation therapy in the treatment of metastatic spinal malignancies. The authors concluded that CyberKnife was a superior alternative to radiotherapy. There was a lack of clinical evidence and the validity of the authors' conclusions relies on the adequacy of the sensitivity analyses.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of CyberKnife (Accuray, Inc) stereotactic radiosurgery compared with external beam radiation therapy in the treatment of metastatic spinal malignancies.

Interventions
Stereotactic radiosurgery, using CyberKnife, was compared with external beam radiotherapy, for metastatic spinal malignancies.

Location/setting
USA/in-patient secondary care.

Methods
Analytical approach:
A decision tree was used for the occurrence of spinal instability and a Markov model was used for the ongoing likelihood of pain relief and survival. The time horizon was one year and the authors reported that the perspective was that of the health care payer.

Effectiveness data:
Extensive literature searches in PubMed and the Cochrane Library were conducted to identify studies that reported the outcomes for adult patients who underwent non-chemotherapeutic interventions for histologically confirmed metastatic spinal malignancies. They identified 15 eligible studies and, where data were available from more than one study, a weighted mean was used. The main effectiveness estimates were the probabilities of the two interventions controlling pain and these were from the identified studies.

Monetary benefit and utility valuations:
The utilities were from published studies and related to the health states of metastatic spinal tumour; pain; no pain; fatigue, cognitive dysfunction, and depression; fractures; radionecrosis; paraplegia; and spinal cord compression.

Measure of benefit:
Quality-adjusted life-years (QALYs) gained were the measure of benefit.

Cost data:
The direct costs were those relating to treatment; medical care; diagnostic tests; laboratory tests; doctor consultations; and palliative care. Most of the costs were derived from Medicaid and Medicare schedules. The palliative care costs were from the literature and were defined as non-hospice palliative care. All costs were adjusted to 2006 prices and reported in US dollars ($).
Analysis of uncertainty:
A series of one- and two-way sensitivity analyses was performed by varying: the probability of achieving overall pain relief; the duration of pain relief; and the costs of external beam radiotherapy. A Monte-Carlo simulation was also performed and the results were presented as a cost-effectiveness acceptability curve.

Results
The average number of QALYs gained over one year was 0.29 with CyberKnife and 0.20 with radiotherapy. The mean cost per patient was $11,812 with CyberKnife and $13,745 with radiotherapy. CyberKnife was dominant over radiotherapy as it was more effective and less costly.

The sensitivity analysis showed that CyberKnife remained cost-effective for the ranges of parameter values tested. For CyberKnife to be cost-effective at a threshold of $50,000 per QALY gained, the probability of overall pain relief had to be at least 0.67. The Monte-Carlo simulation showed that CyberKnife was cost-effective, compared with external beam radiotherapy, at all the tested willingness-to-pay thresholds.

Authors' conclusions
The authors concluded that CyberKnife was a superior alternative to external beam radiotherapy in patients with metastatic spinal tumours.

CRD commentary
Interventions:
The interventions were reported clearly and in detail. The justification for using external beam radiation therapy as the comparator was that it was the usual practice in the authors' setting.

Effectiveness/benefits:
The authors systematically searched the literature to identify the best available evidence in PubMed and the Cochrane Library. They found no reliable randomised controlled trial data, so they performed extensive sensitivity analyses to assess if the results were robust to changes in the model parameters. The sources of the utility data were reported, but the methods used to derive them were not.

Costs:
The perspective was explicitly reported and all the cost categories relevant to this health care payer perspective appear to have been included. The authors adequately reported the sources from which the costs were derived. The price year, time horizon, and currency used were all explicitly reported, but the methods used to inflate the costs to 2006 prices were not. The costs were incurred over one year and discounting was not relevant and was not performed.

Analysis and results:
All the identified costs and benefits were combined using a Markov model. Appropriate details of the model and a diagram were provided. The uncertainty was assessed using one- and two-way sensitivity analyses and Monte-Carlo simulation. The authors reported that the main limitation of their study was the lack of primary outcome data from randomised controlled trials.

Concluding remarks:
There was a lack of clinical evidence and the validity of the authors' conclusions relies on the adequacy of the sensitivity analyses.

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Not stated.

Bibliographic details