Partial-breast irradiation versus whole-breast irradiation for early-stage breast cancer: a cost-effectiveness analysis

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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.

CRD summary
This study examined the cost-effectiveness of partial-breast compared with whole-breast irradiation for post-menopausal women with oestrogen-receptor positive, early-stage breast cancer. The authors concluded that external beam partial irradiation was cost-effective compared with whole-breast irradiation, while MammoSite was unlikely to be cost-effective. The methods appear to have been valid, but the data sources were not clearly described. The sensitivity analyses showed that these conclusions were robust.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to examine the cost-effectiveness of partial- versus whole-breast radiation therapy for post-menopausal women with oestrogen-receptor positive, early-stage breast cancer, who were receiving tamoxifen without chemotherapy.

Interventions
The two strategies were partial- and whole-breast irradiation. Two partial irradiation options were considered: external beam and MammoSite.

Location/setting
USA/out-patient.

Methods
Analytical approach:
The analysis was based on a Markov model that simulated the management of disease over 15 years. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical evidence was derived from published studies, but the method used to identify them was not reported. Partial irradiation efficacy and the patterns of recurrence were from a single-arm, phase I and II trial. No information on the design and other characteristics of the other sources was given. The primary endpoints were the rates of recurrence with partial-breast irradiation.

Monetary benefit and utility valuations:
The utility values were derived from a published study (that used the standard gamble method) and authors’ opinions, based on other studies.

Measure of benefit:
Quality-adjusted life-years (QALYs) and life-years (LYs) were the summary benefit measures and were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of partial- or whole-breast irradiation, treatment of local recurrence, and
treatment of metastases. These data were derived from two published reports, but their methods were not described. All costs were in US dollars ($) and the price year was 2004. A 3% annual discount rate was applied.

Analysis of uncertainty:
One- and two-way sensitivity analyses were carried out on most of the inputs to the model, using published ranges of values. Three probabilistic analyses were carried out, using Monte Carlo simulation. The first used a distribution for partial-breast irradiation hazard risk; the second used a distribution for this hazard risk and one for recurrence patterns; and the third also varied the utility for partial-breast irradiation when well.

Results
The expected costs and benefits of each strategy were not reported. The incremental analysis showed that whole-breast irradiation dominated MammoSite partial irradiation, as it was more effective and less expensive. The incremental cost per QALY gained with whole- over external beam partial-breast irradiation was $630,000, and per LY gained it was $1,600,000.

The sensitivity analysis showed that partial irradiation (external beam) was generally cost-effective at a threshold of $50,000 per QALY for various hazard risks for the recurrence of a tumour in the remaining breast. External beam partial irradiation was the preferred strategy, in most scenarios of the deterministic and probabilistic analyses, while MammoSite partial irradiation was not cost-effective, in any scenario (due to its high cost).

Authors’ conclusions
The authors concluded that external beam partial-breast irradiation was cost-effective compared with whole-breast irradiation, while MammoSite was unlikely to be cost-effective.

CRD commentary
Interventions:
The selected comparators appear to have been appropriate as they were the available treatments for these patients. Further description of these interventions would have been useful.

Effectiveness/benefits:
The authors did not provide any information on the approach used to identify the data sources, but more details were published in another report. They reported, in the discussion, that some data were from a Phase I and II trial and that no better evidence was available. With this information, it is not possible to judge the validity of the clinical estimates, but the sensitivity analysis showed that the findings were robust to variations in the key clinical inputs. Both the benefit measures were appropriately selected as they captured the impact of the interventions on patients’ survival and quality of life, which are relevant aspects of health for these patients. They are also comparable with the benefits of other health care interventions. Some key details on the derivation of the utility values were given.

Costs:
The cost categories were reported, but were not broken down into individual items. The costs were from published sources, but these were not described. This limits the transparency of the economic analysis. The price year and the use of discounting were appropriately reported. Variations in the cost estimates were tested in the sensitivity analysis.

Analysis and results:
The incremental approach was appropriate for identifying the most cost-effective strategy. The base-case results were only partially reported as incremental cost-effectiveness ratios, without the costs and benefits. The uncertainty was satisfactorily investigated and the findings of most of the sensitivity analyses were clearly reported and discussed. The model results were validated using an online prediction tool. The authors stated that the main limitation of their analysis was the low quality of the clinical sources, but they stated that no better information was available. An ongoing phase III clinical trial could confirm these results.

Concluding remarks:
The methods appear to have been valid, but the data sources were not clearly described. The sensitivity analyses showed that the conclusions were robust.
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