Costs of early adjuvant radiation therapy after radical prostatectomy: a decision 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 evaluated the cost-effectiveness of the addition of radiotherapy, after radical prostatectomy, for selected patients with prostate cancer, with adverse pathologic features. The authors concluded that radiotherapy appeared to be cost-effective, compared with observation. They acknowledged that observation was no longer the most appropriate comparator, and the radiation technology assessed was half the cost of the most common technology. The reporting was basic, and these limitations restrict the generalisability of the results, and hinder any validity judgments.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study evaluated the cost-effectiveness of the addition of radiotherapy, after radical prostatectomy, for selected patients with prostate cancer, with adverse pathologic features.

Interventions
The addition of three dimensional conformal radiation therapy, was compared with observation and salvage radiation therapy, if necessary.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A decision tree was developed to compare radiotherapy versus observation, over 10 years. The authors stated that the perspective was that of the payer.

Effectiveness data:
The effectiveness of radiotherapy was from a prospective randomised trial, of radiotherapy versus observation, conducted by the Southwest Oncology Group (SWOG). The primary effectiveness measure was the probability of treatment success, defined as the absence of prostate-specific antigen failure (0.4 nanograms per mL or more). Other outcomes were the use of androgen deprivation therapy, and adverse events.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The main outcome was treatment success. Benefits were discounted at a rate of 3%.

Cost data:
The costs were radiotherapy and adverse events, including rectal bleeding, bladder neck contracture, androgen deprivation therapy, and fractures. Most of the costs were from 2010 Medicare reimbursement rates; the costs of androgen deprivation therapy and fractures were from a published study. All costs were in US $. Future costs were discounted at a rate of 3%, applied to bleeding and contracture at two years, and fracture and androgen deprivation therapy at five years. The costs of radiotherapy were not discounted as they were incurred in the first year.
Analysis of uncertainty:
For one-way sensitivity analyses, each cost and probability in the model was increased and decreased by two standard deviations. Probabilistic sensitivity analysis was performed, using 1,000 Monte Carlo simulations. The results were shown on a cost-effectiveness plane.

Results
The prostate-specific antigen success rate with radiotherapy (0.43) was higher than with observation (0.22). The mean incremental cost per patient, with radiotherapy versus observation was $6,023.

The mean incremental cost-effectiveness ratio was $26,983 per additional success, over 10 years.

One-way sensitivity analysis showed that results were most sensitive to the probability of radiotherapy success, the radiotherapy costs, and the androgen deprivation therapy costs. The probabilistic model had similar average results to the deterministic model.

Authors’ conclusions
The authors concluded that the addition of radiotherapy appeared to be cost-effective, compared with observation.

CRD commentary
Interventions:
The interventions were not described in detail; it was not clear how often patients received treatment, nor what the treatment entailed. The authors stated that the most appropriate comparator, for their setting, was early salvage radiation therapy, but further research on this was necessary, and the SWOG trial did not evaluate early salvage therapy, so this intervention was not considered.

Effectiveness/benefits:
The effectiveness data were sufficiently described. The authors acknowledged that measures of effectiveness other than prostate-specific antigen success might have been appropriate, such as overall survival, or health-related quality of life, but there were few data available on these. The justification for this decision was provided, with the acknowledgment that the results might not be widely comparable to those of other studies. It was unclear whether discounting was applied to the benefits in the first year, which would have been inappropriate.

Costs:
The costs appear to have been from appropriate sources and they were clearly reported. As the authors acknowledged, the costs of hospital visits and additional care for patients were not included, which could have favoured observation. Discounting was applied based on the expected time of an event, but events could occur based on a probability, within the model, so discounting should have been applied to all costs that occurred after one year. The decision tree structure might have been inadequate to accurately capture the specific time points and their related costs. The authors acknowledged that the cost of radiotherapy might be significantly higher than estimated, as the technology that was most commonly used (intensity-modulated radiotherapy) cost twice as much as the three dimensional conformal radiotherapy used in the SWOG trial.

Analysis and results:
The authors used standard deviations that were 10% of the mean, for parameters without available standard deviations, but the parameters with unavailable variances were not identified, and it was not clear whether a standard deviation of 10% of the mean represented the variance in practice. It is unclear whether the uncertainty was accurately captured in the probabilistic sensitivity analysis. The primary results of the study were appropriately presented, and the incremental analysis was valid. The results of the one-way sensitivity analyses were not presented in sufficient detail.

Concluding remarks:
The reporting was basic, and the limitations that were acknowledged by the authors greatly restrict the generalisability of the results and hinder any validity judgments.

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