Radiofrequency ablation versus nephron-sparing surgery for small unilateral renal cell carcinoma: 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
The objective was to evaluate the cost-effectiveness of percutaneous radiofrequency ablation versus nephron-sparing surgery, in 65-year-old male patients with unilateral small (4cm or less) renal cell carcinoma. The authors concluded that ablation was cost-effective, at a societal willingness to pay of $75,000 per QALY, and that further research on the long-term effectiveness and rate of complications was needed. The methods were well reported and the authors’ conclusions are appropriate, given the limitations of the analysis and evidence.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of percutaneous radiofrequency ablation (RFA) versus nephron-sparing surgery (NSS) in 65 year old male patients with unilateral small (4cm or less) renal cell carcinoma (RCC).

Interventions
Percutaneous RFA was compared with NSS.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A four state Markov model, with a lifetime time horizon, was used, with a simple decision tree, to capture the progression of the disease after surgery and the data for this were obtained from various sources. The authors stated that a quasi-societal perspective was taken, where the costs of disease management were included, regardless of who incurred them, but the cost of the patient's time was excluded.

Effectiveness data:
Published studies, including a meta-analysis, were used to estimate the rate of incomplete RFA and the probabilities of local recurrence and of direct progression to metastatic disease for NSS (Gervais, et al. 2005, Manikandan, et al. 2004, see 'Other Publications of Related Interest' below for bibliographic details). Due to a lack of comparative studies, it was assumed that the probability of local recurrence for RFA was 10% higher than for NSS and the probability of direct progression to metastatic disease for RFA was the same as for NSS. These assumptions were tested in the sensitivity analysis.

Monetary benefit and utility valuations:
Due to a lack of studies providing data for the RCC utilities in the post-operative, local recurrence, and metastatic phases, published utilities for colon cancer were used. These were then scaled overtime to reflect the underlying age-specific quality of life, based on a large community-based study. The utilities for the first month after treatment were based on a published study of RFA and surgical treatments for colorectal cancer metastases in the liver.

Measure of benefit:
The measure of benefit was the quality-adjusted life-year (QALY) gained and these were discounted at an annual rate
of 3%.

Cost data:
The direct costs included RFA and NSS costs, treatment and ongoing costs for local recurrence, ongoing costs for metastatic disease, and the ongoing cost of surveillance for recurrence using computed tomography (CT). RFA and NSS treatment costs, and the adjustment for complications, were based on published studies (Lotan, et al. 2005, Shekarriz. 2002, see 'Other Publications of Related Interest' below for bibliographic details). Due to a lack of studies on RCC costs in the post-operative, local recurrence and metastatic phases, published costs for colon cancer were used. All costs were converted into 2006 US dollars ($) using the medical care component of the Consumer Price Index, and were discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way sensitivity analysis was used to explore the parameter uncertainty and the results were described. The probability of local recurrence after RFA was varied to determine the threshold level below which RFA would be preferred over NSS, at a societal willingness to pay of $75,000 per QALY, and this was presented in a graph.

Results
The expected QALYs per patient were 9.682 for RFA and 9.689 for NSS. The lifetime costs were $51,952 for RFA and $59,941 for NSS. The incremental cost-effectiveness ratio (ICER) of NSS relative to RFA was $1,152,529 per QALY.

At a societal willingness to pay of $75,000 per QALY, RFA was the preferred strategy as long as: the probability of local recurrence after RFA was less than 48% more than that for NSS (baseline estimate was 10%); the costs of RFA were less than $23,818 (baseline estimate was $17,589); and the costs of NSS were more than $23,172 (baseline estimate was $30,672). If the one-month post-NSS utility was less than 0.6 (baseline estimate was 0.7) then RFA resulted in more QALYs and less costs than NSS.

These results were stable to changes in: the one-month post-RFA utility; the rate of repeat RFA; the utilities for all long-term health states; the probability of metastatic disease; the probability of RCC-related death; and the CT costs. RFA remained the preferred strategy for both men and women across the age range considered (45 to 75 years).

Authors' conclusions
The authors concluded that RFA was cost-effective, at a societal willingness to pay of $75,000 per QALY, and that further research on the long-term effectiveness and rate of complications was needed.

CRD commentary
Interventions:
RFA was well described and appropriately compared with NSS. NSS appears to have been the current practice in the authors' setting.

Effectiveness/benefits:
: Published studies were used to obtain the clinical evidence. One of these was a meta-analysis which could potentially be a good source of data. However, as no systematic review of the literature was reported, it is unclear whether the best available evidence was used. The authors used their best judgement for the difference in the rate of local recurrence, between the interventions, for the base-case. This was appropriate given the lack of direct comparative data and was explored appropriately in the sensitivity analysis. The level of reporting of the assumptions was appropriate. For the utilities, the authors used colorectal cancer as a proxy for RCC in the absence of available data. The baseline estimates and sources were provided, but further details regarding the methods used in the source studies were not reported and so it is not clear from the paper whether adjusting QALYs for age was appropriate.

Costs:
The costs were relevant to the perspective. A breakdown of the unit costs and their sources were provided, but it is unclear whether the source of the other costs was the most appropriate and thus generalisable to other settings. The details of the adjustments to the cost data were reported.
Analysis and results:
Overall, the analytical approach was satisfactorily reported and the model structure was reported in full, with a diagram. The use of an incremental analysis was appropriate to determine the cost-effectiveness of RFA compared with NSS. The impact of uncertainty was explored through one-way sensitivity analyses which were appropriately reported, but probabilistic sensitivity analysis might have been more appropriate, given the range of uncertainty in multiple parameters. Overall, the results of both the base case and the sensitivity analyses were satisfactorily reported and extensively discussed. The authors also pointed out the possible limitations of their model.

Concluding remarks:
The methods were well reported and the authors’ conclusions are appropriate, given the limitations of the analysis and the evidence.

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