Cost-effectiveness analysis of nephron sparing options for the management of small renal masses

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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 estimated the cost-effectiveness of commonly available nephron sparing options for healthy patients, with incidentally found unilateral small renal masses. The authors concluded that immediate laparoscopic partial nephrectomy was the best strategy for these patients, who were under 74 years old. The results were described and the methods were adequate, but those used to derive the cost and effectiveness data were not well described. This makes it difficult to assess the authors' conclusions.

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

Study objective
The objective was to estimate the cost-effectiveness of commonly available nephron sparing options for healthy patients, with incidentally found unilateral small renal masses.

Interventions
Nine nephron sparing interventions were assessed. These were open partial nephrectomy; laparoscopic partial nephrectomy; laparoscopic ablation; percutaneous ablation; initial surveillance, with a possible delayed open partial nephrectomy; initial surveillance, with a possible delayed laparoscopic partial nephrectomy; initial surveillance, with a possible delayed laparoscopic ablation; initial surveillance, with a possible delayed percutaneous ablation; and non-surgical management (observation).

Location/setting
USA/in-patient secondary care.

Methods
Analytical approach:
A decision-analytic model combined published evidence to evaluate the nine nephron sparing strategies. The time horizon was the lifetime of the patient. The authors reported that a societal perspective was adopted.

Effectiveness data:
The effectiveness data were from retrospective studies. Preference was given to population-based studies, multinational studies, and meta-analyses. The authors made several assumptions, based on published literature. The main effectiveness estimates were the probabilities of recurrent or residual disease and metastatic disease.

Monetary benefit and utility valuations:
Age-specific quality of life estimates from the Medical Expenditure Panel Survey were used. This survey used the Short Form (SF)-12 in the general population and scores were converted into European Quality of life (EQ-5D) estimates.

Measure of benefit:
The measures of benefit were quality-adjusted life-years (QALYs) and life-years gained; these were discounted at an annual rate of 3%.
Cost data:
The health care costs were those of the intervention, complications, and follow-up, and the indirect costs of recovery at home. These were from Medicare and Medicaid fee schedules or from published US studies. All costs were reported in 2008 US dollars ($) and were discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way and multi-way sensitivity analyses were undertaken to assess the robustness of the model results. Alternative scenarios were considered, with different patient and tumour characteristics.

Results
The average cost per patient was $82,213 for observation, $95,950 for surveillance with percutaneous ablation, $103,629 for percutaneous ablation, $104,950 for surveillance with laparoscopic ablation, $106,614 for surveillance with laparoscopic partial nephrectomy, $108,935 for surveillance with open partial nephrectomy, $114,515 for laparoscopic partial nephrectomy, $117,234 for open partial nephrectomy, and $117,380 for laparoscopic ablation.

The average QALYs gained were 8.91 for observation, 9.32 for surveillance with percutaneous ablation, 9.39 for percutaneous ablation, 9.36 surveillance with laparoscopic ablation, 9.59 for surveillance with laparoscopic partial nephrectomy, 9.57 for surveillance with open partial nephrectomy, 9.82 for laparoscopic partial nephrectomy, 9.80 for open partial nephrectomy, and 9.44 for laparoscopic ablation.

Compared with observation, surveillance with percutaneous ablation was associated with an additional cost per QALY gained of $33,604. The best strategy was laparoscopic partial nephrectomy, which was associated with an additional cost per QALY gained of $36,645.

The sensitivity analyses showed that the results were most sensitive to changes in the patient's age at diagnosis, health status, and tumour size, but laparoscopic partial nephrectomy was still the best strategy across a range of probabilities for complications, post-operative quality of life, and recurrence.

The alternative scenarios found that laparoscopic partial nephrectomy was the best strategy for patients younger than 74 years, but this varied by tumour size (two to three centimetres in the base case). If the tumour was less than two centimetres, it was the best strategy up to the age of 65 years. If the tumour was three to four centimetres, it was the best strategy up to just over 75 years.

Authors’ conclusions
The authors concluded that immediate laparoscopic partial nephrectomy was the best nephron sparing option for healthy patients under 74 years old, with a small renal mass.

CRD commentary
Interventions:
The interventions were described and appear to have been appropriate comparators.

Effectiveness/benefits:
It was unclear if a systematic review was undertaken to identify the best available evidence. The effectiveness parameters were mainly from retrospective studies, which the authors acknowledged are open to bias and this increases the uncertainty in the results. The benefit measures appear to have been appropriate as both the morbidity and mortality of these patients was included. The measures were appropriately discounted.

Costs:
The authors reported that a societal perspective was adopted. They stated that the indirect costs of recovery (home care) were included, but it was unclear if productivity losses were analysed. It appears that all the other relevant cost categories were included. The unit costs were reported and the price year, time horizon, discount rate, and currency were all stated.

Analysis and results:
All the available evidence was appropriately synthesised using a Markov model. The details of the model were given, with a diagram. The results were clearly presented and appropriately combined in an incremental analysis. One-way sensitivity analyses were conducted to establish which parameters had the greatest impact on the results. This type of analysis goes some way towards evaluating uncertainty, but a probabilistic sensitivity analysis would have more thoroughly evaluated the overall model uncertainty. The authors reported the main limitations of their study.

Concluding remarks:
The results were described and the methods were adequate, but those used to derive the cost and effectiveness data were not well described and no probabilistic sensitivity analysis was undertaken. This makes it difficult to assess the authors’ conclusions.

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