The cost-effectiveness of immediate treatment, percutaneous biopsy and active surveillance for the diagnosis of the small solid renal mass: evidence from a Markov model

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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 study assessed the cost-effectiveness of adding percutaneous biopsy or active surveillance to the diagnosis of a 2cm or less, incidentally detected solid renal mass (kidney tumours). The authors concluded that biopsy should be increasingly used in solid renal mass diagnostic assessment. The analysis was based on a conventional cost-effectiveness framework, but data sources were not fully reported, so the quality of the evidence was not clear; this might affect the validity of the authors’ conclusions.

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

Study objective
The study assessed the cost-effectiveness of adding percutaneous biopsy or active surveillance to the diagnosis of a 2cm or less, incidentally detected, solid renal mass.

Interventions
The three diagnostic strategies were assessed in otherwise healthy patients: percutaneous image-guided biopsy; active surveillance using of computerised tomography (CT) to monitor the observed solid renal mass; and definitive (immediate) treatment involving surgical resection or ablation. Patients with positive biopsy (including false-positive) were treated with surgical resection or ablation.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a Markov model with a lifetime horizon in a hypothetical cohort of 60-year-old men. The authors stated that the analysis was carried out from the perspective of the third-party payer.

Effectiveness data:
Clinical inputs came from published sources and from primary data collected at the authors’ clinical practice. No information on data sources was provided, except for some data obtained from the SEER (Surveillance, Epidemiology and End Results) database. The accuracy of biopsy and CT scans was a key input; it was taken from the literature and from primary data. Risk of death came from American life tables. Some assumptions were also made.

Monetary benefit and utility valuations:
Utility values were from early stage breast and colorectal cancer studies and experts’ opinions.

Measure of benefit:
Life-years (LYs) and quality-adjusted life-years (QALYs) were used as the summary benefit measure. A 3% annual discount rate was applied.

Cost data:
The costs included diagnosis, treatment, and surveillance. Most costs came from published sources. Costs were in US $
and were discounted at an annual rate of 3%. The price year was 2009.

Analysis of uncertainty:
Uncertainty was investigated by extensive one-way sensitivity analyses. The most influential inputs were further tested in two-way sensitivity analyses.

Results
With active surveillance projected life-years were 18.210, QALYs were 10.965, and lifetime costs were $33,015.84.

With biopsy projected life-years were 18.501, QALYs were 11.453, and lifetime costs were $49,500.35.

With immediate treatment (surgery) projected life-years were 18.527, QALYs were 11.078, and lifetime costs were $51,356.92.

The incremental cost per life-year gained was $56,643.89 for biopsy over active surveillance, and $70,149.37 for immediate treatment over biopsy. In the cost-utility analysis, the incremental cost per QALY gained with biopsy over active surveillance was $33,840.10, while immediate treatment was dominated by biopsy, which was more effective and less expensive.

The sensitivity analysis showed that when life-years were used as the benefit measure, immediate treatment provided the greatest benefits in almost all scenarios. Biopsy became dominant when 54% or less of solid renal masses were malignant, biopsy sensitivity was 94.3% or more, 35% or more of observed solid renal masses were treated, or mortality due to a benign solid renal mass was 1.6% or more. At a cost-effectiveness threshold of $50,000, biopsy was preferred over active surveillance when treatment costs were low, or where there was an intermediate likelihood of consequences of missed treatment.

In the cost-utility framework, biopsy was the most cost-effective strategy in most scenarios. Active surveillance was preferred only when specific assumptions on utility valuations were changed.

Authors’ conclusions
The authors concluded that biopsy should be increasingly used in solid renal mass diagnostic assessment, although further clinical research was needed to better understand the natural history of the observed solid renal mass, the accuracy of biopsy, and the utilities related to a potential renal cell carcinoma diagnosis.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear as the available options of the management of this specific patient population were considered.

Effectiveness/benefits:
A selective approach appeared to have been used to identify relevant sources of evidence as no information on a review of the literature was reported. No information on the methods or other characteristics of the data sources was reported, except for a well-known large database. Therefore it was not possible to judge the quality of these data. The authors acknowledged that high uncertainty existed around some estimates. Assumptions were required; these were generally biased in favour of immediate treatment. Clinical inputs were extensively varied in the sensitivity analyses to discover their impact on model outcomes. Both life-years and QALYs were appropriate benefit measures as they captured the impact of the disease on life expectancy and quality of life, which were relevant measures health status for this patient population. Utility weights were obtained from surveys conducted among patients with other cancer types and supported by experts’ opinions.

Costs:
Although the cost categories included in the analysis appeared to reflect the third-party perspective (as stated by the authors), little information was provided on the sources for unit costs and resource use; a clear breakdown of cost items was not provided. It was difficult to objectively assess the relevance of the data used to populate the economic side of the model, although it was likely that US published studies were selected. Some costs were varied in the sensitivity
analysis. Other details such as the price year and the discount rate were given.

**Analysis and results:**
A schematic representation of the model was provided. A deterministic approach was used to investigate uncertainty and to identify the most influential inputs. Some limitations of the analysis were acknowledged by the authors; these were mainly on the uncertainty in most clinical inputs. The results were clearly presented. Projected costs and benefits were synthesised using an incremental approach and commonly quoted cost-effectiveness thresholds. The transferability of results was not explicitly addressed; these findings appeared to be specific to the USA.

**Concluding remarks:**
The analysis was based on a conventional cost-effectiveness framework, but data sources were not fully reported, so the quality of the evidence was not clear; this might affect the validity of the authors' conclusions.

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