Cost-effectiveness of magnetic resonance guided focused ultrasound for the treatment of uterine fibroids

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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 magnetic resonance guided focused ultrasound for treating uterine fibroids. The authors concluded that ultrasound, hysterectomy, and uterine artery embolisation were all within the currently accepted limit for cost-effectiveness. The methods were good and adequately reported, as were the results, but more details should have been reported on how the effectiveness data were identified. The authors' conclusions appear to be appropriate for the available data.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of magnetic resonance guided focused ultrasound compared with other treatments available in the USA for uterine fibroids.

Interventions
This study compared magnetic resonance guided focused ultrasound with four other treatments for uterine fibroids. The other treatments were pharmacotherapy, hysterectomy, uterine artery embolisation, and abdominal myomectomy.

Location/setting
USA/in-patient secondary care.

Methods
Analytical approach:
A Markov model was used to estimate the long-term outcomes and costs for pre-menopausal women receiving treatment for symptomatic uterine fibroids. The time horizon was the lifetime of the patient. All women underwent standard diagnostic procedures and women potentially receiving uterine artery embolisation and abdominal myomectomy received further imaging to assess their eligibility. Treatment failure resulted in second-line treatment with one of the more invasive strategies. The third-line strategy was hysterectomy. The authors reported that a societal perspective was used.

Effectiveness data:
The clinical and effectiveness data were from a wide range of sources including the authors’ assumptions, unpublished data, and data from published trials and observational studies. The treatment effectiveness, which was symptom relief and recurrence, was the main parameter in the model and was derived from Technology Assessment Reports, published studies, and unpublished clinical trial data. All the reviewed studies had different follow-up times and so all re-treatment rates were standardised to six-month risks.

Monetary benefit and utility valuations:
The utility values for women with symptomatic fibroids and symptom relief were from a clinical trial. The utility decrements for women having a hysterectomy were from a published study and the life-long utility decrements due to hysterectomy were assumed by the authors.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary measure of benefit. As benefits could be generated over the lifetime of the patient, future QALYs were discounted at an annual rate of 3%.

Cost data:
The direct costs were those of: screening tests before the procedure; procedures and procedure-related complications, including in-patient and out-patient treatment; medications; and monitoring after the procedure. Procedure costs were from a retrospective study of insured women. Some resource use items, such as visits to the doctor for routine screening, were assumed by the authors. Drug acquisition costs were estimated based on their average wholesale prices and a review of the economic burden of uterine fibroids. Lost productivity costs were the number of working days lost multiplied by the daily wage. The number of working days lost due to the procedure and recovery was derived from published studies and trials. The daily wage was from the US Bureau of Labor Statistics and was the median weekly earnings for women aged 35 to 54 years. The price year was 2005. As costs could be incurred over the lifetime of the patient, future costs were discounted at an annual rate of 3%. All costs were reported in US dollars ($).

Analysis of uncertainty:
A series of one-way sensitivity analyses was undertaken by varying the key model parameters over possible ranges. A reference case analysis was performed, in which productivity costs were omitted. Due to a lack of data on the efficacy of treatments, alternative analyses were conducted, in which the model parameters were varied with less conservative estimates than those used in the main analysis.

Results
The average QALYs gained per patient were 16.699 for pharmacotherapy, 17.183 for hysterectomy, 17.305 for myomectomy, 17.364 for magnetic resonance guided focused ultrasound, and 17.394 for uterine artery embolisation. The average cost per patient was $9,207 for pharmacotherapy, $19,799 for hysterectomy, $35,057 for myomectomy, $27,285 for ultrasound, and $28,892 for uterine artery embolisation.

The costs and benefits were combined in an incremental cost-utility ratio (ICUR); the additional cost per QALY gained. Compared with pharmacotherapy, hysterectomy was associated with an ICUR of $21,800. Compared with hysterectomy, ultrasound was associated with an ICUR of $41,400. Compared with ultrasound, uterine artery embolisation was associated with an ICUR of $54,200. Myomectomy was dominated by both ultrasound and uterine artery embolisation, which means it was more costly and less effective.

When productivity losses were omitted from the analysis, the results and ICURs were very similar to those of the main analysis. The sensitivity analysis showed that the ICURs were most sensitive to changes in ultrasound recurrence rates, ultrasound procedure costs, and assumptions about the quality of life following hysterectomy.

Authors’ conclusions
The authors concluded that magnetic resonance guided focused ultrasound, hysterectomy, and uterine artery embolisation were all within the currently accepted limit for cost-effectiveness. Due to the lack of current data, they also stated that long-term studies of the rates of recurrence and re-treatment were required.

CRD commentary
Interventions:
The interventions were reported clearly and in detail. They appear to have represented all the valid options in the authors’ setting.

Effectiveness/benefits:
The clinical and effectiveness data were reported in detail. For each parameter the authors adequately reported the sources and the value used. They used published and unpublished evidence and expert opinion, which was mainly their own assumptions based on the literature, due to a lack of published and unpublished evidence. The authors did not report how the published evidence was identified, nor the methods used in a review, which means it is not clear if all the available evidence was used.

Costs:
The perspective was explicitly reported and it would appear that all the cost categories and costs, relevant to the societal perspective, were included. Following US guidelines on how to undertake economic evaluations, the authors produced two analyses; one including both the direct medical costs and productivity losses and the other including only the direct medical costs. The sources from which the cost and resource use data were derived were adequately reported. The authors also reported the time horizon, the discount rate, and the price year.

Analysis and results:
All the clinical, effectiveness, and cost information was synthesised using a Markov model. Full details of the model, including a diagram, were provided. The uncertainty in the model's results was tested in a series of one-way sensitivity analyses and by using less conservative estimates for some key model parameters. The authors reported that a probabilistic sensitivity analysis, the current gold standard for evaluating model uncertainty, was not performed as it would have reinforced their conclusion that the most cost-effective choice of treatment could have been any of the three interventions, but they should have performed this analysis to confirm their hypothesis. The limitations of the analysis were reported in full and the main limitation was the lack of data for some of the key model parameters.

Concluding remarks:
The methods were good and, along with the results, they were adequately reported, but more details should have been given on how the effectiveness data were identified. There was a lack of data available and the authors' conclusions appear to be appropriate.

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