

# HERU Briefing Paper

HEALTH ECONOMICS RESEARCH UNIT

Briefing paper for the NHS

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## THE EFFICIENCY OF METAL ON METAL HIP RESURFACING ARTHROPLASTY

### Background

It is difficult to measure the true prevalence of hip disease severe enough to require surgery but it has been estimated that it may be around 15.2 people per 1000. The conventional surgical method used to treat advanced hip disease in the UK is total hip replacement (THR). While THR is often successful perhaps as much as 20% of all THRs performed are revisions.

Revision rates for THR vary between patient groups. For example, long-term results of THR in younger patients with a variety of underlying conditions indicate that 25 – 30% may require revision by 15 years, compared with less than five percent at ten years for older patients, and less than ten percent at ten years for all patients. Specific subgroups of young active patients, such as those with osteoarthritis, may experience a revision rate of 50%.

1. Metal on Metal hip resurfacing arthroplasty may offer a promising approach to treating hip disease.

2. There is a lack of long term follow up data, particularly from controlled sources.

3. Further randomised controlled trials with long follow up are needed.

### Key Messages

The outcomes for patients following revision THR are believed to be poorer than those following a primary THR. It is therefore desirable to reduce or delay the need for revision for as long as possible.

Younger patients, or those with a more active lifestyle, who may experience relatively high rates of early THR implant failure may have their symptoms managed for a period medically (watchful waiting ('WW')) before a surgical approach is adopted. Metal on metal hip resurfacing arthroplasty (MOM), developed from earlier polyethylene prostheses, has been proposed as an alternative to either THR or 'WW' as it may alleviate symptoms and perhaps allow a more successful revision should one be required in the future.

This briefing paper is based on work performed in collaboration with the Health Services Research Unit (HSRU) at the University of Aberdeen



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# Methods

The evaluation used Markov model techniques. The figure below shows the Markov model for THR. Similar models were also produced for MOM and WW. A Markov model comprises a set of predefined health states between which a patient can move over successive time periods (cycles). Each cycle in this model lasts for one year. A patient can be in only one of the health states during one cycle. At the end of any one cycle a patient can either remain in the same health state for the next cycle or move to another health state. This is indicated by the arrows in the figure below. Transition probabilities determine whether a patient moves from one health state to another (eg for someone in the 'successful revision' state each year there is a probability of needing a revision THR (hence moving to the 'revision' state)).

Each model estimated costs and outcomes for a hypothetical cohort of patients over a 20 year follow-up period. These were discounted (i.e. costs and outcomes that occur in the future will be given less weight than costs and outcomes that occur now) using currently recommended discount rates of 6% and 1.5%. The Markov model combined information on the costs and effectiveness (probabilities and quality of life) of each intervention, to estimate the incremental cost per quality adjusted life year (QALY) of MOM compared with THR and WW.

Two main sub-groups were considered: patients aged 45 years at entry to the model; and those aged 65.

Sensitivity analysis was used to explore the robustness of the results to variations in the baseline estimates of cost, revision rates and quality of life.

## Costs

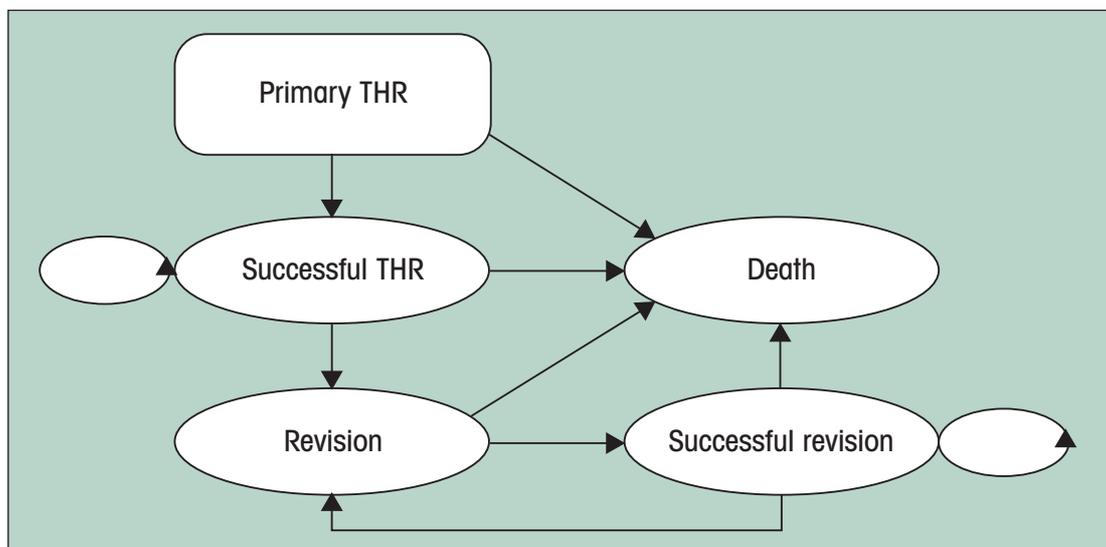
All costs were estimated from an NHS perspective. Procedure costs included operation costs (prosthesis cost, theatre time, staff time), consumables such as drugs and x-rays, and theatre overheads. Hospital ward costs were based on published information for cost per day, the average length of stay, and ward overheads. Follow-up costs included the cost of any relevant GP visits, physiotherapy, and any relevant prescriptions. All costs were estimated at year 2000 prices.

## Probabilities and quality of life

Each Markov model included probabilities for mortality rates, complication rates and revision rates. The latter were defined as the annual risk that the initial procedure required to be revised to a second procedure. Probabilities were estimated using data from a systematic review conducted as part of this work.

Quality of life scores were based on assumptions about levels of pain associated with each treatment alternative, combined with published quality of life data for osteoarthritis of the hip both pre and post operatively.

## Markov Model for an individual receiving THR as their initial procedure



# Results

Very few relevant studies were identified; none provided long-term follow up data for MOM. Available data suggested annual equivalent revision rates of 1.36%, 1.15%, and 8.33% for THR, MOM and WW, respectively. Estimated total procedure costs for THR and MOM were £4195 and £5515, respectively, with an annual cost per patient of watchful waiting treatment estimated at £642. Estimates of cost, QALYs for each intervention as well as the incremental cost per QALY ratios are presented in the table.

For younger persons, THR dominated MOM throughout a 20 year follow-up period - THR was less costly and had a slightly lower risk of revision. In the first years of follow up, costs for MOM were higher than those for watchful waiting. However, after about 14.5 years, MOM dominated watchful waiting, largely due to the lower quality of life for watchful waiting patients.

Sensitivity analysis revealed that MOM would become cost-effective if the risk of revision following THR

increased or the revision rate of MOM decreased. When the annual rate of revision for MOM was between 80% and 90% of the revision rates of THR, MOM ceased to be dominated by THR. Estimates of annual revision rates for MOM based on unpublished data and for rates of revision for THR in younger people suggest that it is possible that MOM may give an acceptable incremental cost per QALY. However, long term follow-up of MOM is still lacking.

MOM was no longer dominant when the annual cost of 'watchful waiting' fell below approximately £620 per patient per annum. This may be possible if care provided during 'watchful waiting' was less intense, or if there were fewer side effects associated with medical therapy. The cost for a THR prosthesis used in the base case analysis was that of the most commonly used prosthesis, a Charnley device. More expensive prostheses are often used in younger patients. However, even with THR prosthesis costs at 300% higher than the baseline prosthesis cost, THR continued to dominate MOM.

## Costs, QALYs and Incremental cost per QALY for MOM vs. WW or THR

	Younger persons	More active elderly		Younger persons	More active elderly
<b>Total Costs</b>					
MOM	£6297	£6180	THR	£1357	£1362
WW followed by THR	£6476		<b>QALYs gained by MOM vs:</b>		
THR	£4940	£4818	WW followed by THR	3.73	
<b>QALYs</b>			THR	-0.02	-0.02
MOM	16.20	12.31	<b>Incremental Cost Per</b>		
WW followed by THR	12.46		<b>QALY for MOM vs:</b>		
THR	16.22	12.33	WW followed by THR	MOM dominates	n/a
<b>Extra Cost for MOM vs:</b>			THR	THR dominates	THR dominates
WW followed by THR	-£179				

# Implications/Conclusions

The use of MOM in the UK is still relatively rare. However, there has been increasing interest from younger people with hip disease who are not currently considered eligible for THR and amongst surgeons who strive for better ways to treat the patients whom they see. However, only very limited evidence is currently available on MOM and although the procedure does appear promising, the lack of robust comparisons with the other treatment options and of long term data make it virtually impossible to

draw robust conclusions about its relative effectiveness. Given the early promise shown by MOM there is a need for more rigorous research. Although such research would be challenging, a prospective, preferably randomised, comparison of MOM with a policy of delayed selective surgery is needed. These studies should preferably be large-scale, long-term, and use standard outcome measures, both pre- and post-operatively.

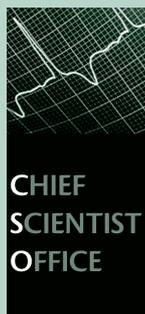
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## For further details about this study see:

Vale L, Wyness L, McCormack K, McKenzie L, Brazzelli M, Stearns S. Systematic review of the effectiveness and cost-effectiveness of metal on metal hip resurfacing arthroplasty for treatment of hip disease. Health Technology Assessment. 2002; Vol. 6: No. 15.

The executive summary and full text of the report can be downloaded from the NHS R&D HTA Programme Website: <http://www.hta.nhsweb.nhs.uk/>

This briefing paper describes work conducted by the Economic Evaluation Programme of Health Economics Research Unit (HERU) for the NHS Research and Development Health Technology Assessment Programme, on behalf of the National Institute of Clinical Excellence. Further information about this topic may be obtained by contacting Luke Vale at HERU, University of Aberdeen, Foresterhill, Aberdeen AB25 2ZD (Tel: 01224 551127); Fax: (01224 662994); Email [l.vale@abdn.ac.uk](mailto:l.vale@abdn.ac.uk).



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