Cost effectiveness of treatment for benign prostatic hyperplasia: an economic model for comparison of medical, minimally invasive, and surgical therapy


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.

Health technology
Three therapies for benign prostatic hyperplasia (BPH) were compared. The three therapies were medical therapy (alpha-blocker, AB), minimally invasive therapy (microwave thermotherapy, MT) and surgery (transurethral resection of the prostate, TURP).

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of 65-year-old men with moderate to severe symptoms of BPH. The quality of life and utility estimates were obtained from men with BPH symptoms.

Setting
The setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness evidence for MT was obtained from a multi-centre study reported in 1998. No dates were indicated for the effectiveness data on AB or TURP. The costs were inflated to 1999 prices.

Source of effectiveness data
The effectiveness data for MT were obtained from a single study. For AB and TURP, the data were obtained from the medical literature and the opinion of a clinical panel.

Modelling
A decision-analytic Markov model was used. This employed 25 health states, 3 treatments, 5 short-term clinical events and 17 possible long-term outcomes, analysed at one-month intervals. The objective was to assess whether the analytical method could be applied to evaluate the cost-effectiveness of any BPH strategy. The 25 health states are described elsewhere (see Other Publications of Related Interest).

Outcomes assessed in the review
The quality of life outcomes assessed in the review were:
minimal, moderate or significant remission;
symptom worsening;
mortality;
myocardial infarction;
haemorrhage (transfusion);
haemorrhage (surgical repair);
TURP syndrome;
deep vein thrombosis;
dizziness;
urethral stricture;
asthenia;
urinary retention;
bladder decompensation;
ejaculatory dysfunction;
erectile dysfunction;
temporary incontinence;
epididymitis;
severe urinary tract infection (UTI);
transient dysuria.

Study designs and other criteria for inclusion in the review
No specific criteria for inclusion in the review were indicated.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
None reported.

Methods used to judge relevance and validity, and for extracting data
None reported.

Number of primary studies included
For MT a single study was included. For AB and TURP, there was a general statement that the event probabilities were
obtained from the medical literature and a clinical panel.

**Methods of combining primary studies**
None specified.

**Investigation of differences between primary studies**
None reported.

**Results of the review**
No specific results of the outcomes were reported. Instead, for each outcome, it was indicated whether it was relevant for one of the three treatments:

- minimal, moderate or significant remission (AB, MT, TURP);
- symptom worsening (AB, MT, TURP);
- mortality (AB, MT, TURP);
- myocardial infarction (TURP);
- haemorrhage (transfusion) (TURP);
- haemorrhage (surgical repair) (TURP);
- TURP syndrome (TURP);
- deep vein thrombosis (TURP);
- dizziness (AB);
- urethral stricture (MT, TURP);
- asthenia (AB);
- urinary retention (MT, TURP);
- bladder decompensation (TURP);
- ejaculatory dysfunction (AB, MT, TURP);
- erectile dysfunction (AB, TURP);
- temporary incontinence (MT, TURP);
- epididymitis (MT, TURP);
- severe UTI (TURP);
- transient dysuria (TURP).

The authors did not provide full details of their results. However, they stated that, in the non-risk averse group, the utility values were 99.1 for significant remission, 97.1 for moderate remission, 94.4 for no remission, and 87.3 for worsening of BPH symptoms without an adverse event.
Methods used to derive estimates of effectiveness
The estimates of event probabilities for AB and TURP were derived using a clinical panel, in conjunction with medical literature.

Estimates of effectiveness and key assumptions
The model used estimates of the 5-year treatment success (durability profile) for the three treatments.

The base assumptions of durability profiles were 85% for TURP, 65% for MT and 50% for AB.

The 5-year durability profile for MT was derived from a single multi-centre study that followed patients for 3 years only, using the Kaplan-Meier method.

Measure of benefits used in the economic analysis
The outcome measure used was the quality-adjusted life-months (QALMs). The health states were valued using the standard gamble method. The utility values of each health state were obtained from 13 men with lower urinary tract symptoms. The 13 respondents were grouped into risk averse and non-risk averse, and the average utility values were derived for each group. Five attributes were used to describe the health states. These were event description, pain, duration of hospitalisation, required treatment and risk of death.

Direct costs
The costs were discounted at a rate of 3% per annum. The quantities were not presented or analysed separately from the costs. The costs were derived from Medicare fee-for-service payment rates and estimated, discounted listed drug prices. The direct costs included the initial TURP procedural costs without complications, initial thermotherapy procedural costs without complications, and the monthly costs of medical therapy. The costs were inflated to 1999 prices using the medical component of the Consumer Price Index.

Statistical analysis of costs
The costs were not treated statistically.

Indirect Costs
The indirect costs of lost productivity, and the intangible costs of pain and suffering related to BPH morbidity, were characterised in the health state descriptions and were incorporated into the utility values.

Currency
US dollars ($).

Sensitivity analysis
A one-way sensitivity analysis was performed. The parameters varied were the success rates for the three treatments, costs of the treatments and the discount rate.

Estimated benefits used in the economic analysis
The benefits were estimated in terms of the QALMs over 5 years. The side effects of the treatments were incorporated into the utility values obtained from descriptions of the health states. For a hypothetical cohort of 10,000 non-risk averse patients, the utility scores were 53.29 QALM for medical therapy, 53.52 QALM for thermotherapy and 51.81 QALM for TURP. These were based on a 5-year treatment success outcome, and in the base-case, a durability profile of 85% for TURP, 65% for thermotherapy and 50% for medical therapy.
The non-risk averse group preferred MT, while the risk averse group preferred medical therapy.

**Cost results**
The total intervention costs were $6,294 for AB, $7,035 for MT and $7,334 for TURP.

**Synthesis of costs and benefits**
The costs and the benefits were combined through incremental cost per quality-adjusted life-year (QALY) calculations. These were reported for risk averse and non-risk averse patients.

For non-risk averse patients, the incremental cost/QALY for MT over AB was $38,664, and MT dominated TURP.

For risk averse patients, the incremental cost/QALY for MT over AB was $40,416, and MT dominated TURP.

No statistical testing of the results was reported.

The results were sensitive to assumptions about the 5-year durability rates assumed for each treatment. When the durability rate of MT was increased from 65 to 75%, MT became dominant over both AB and TURP for both the risk averse and non-risk averse groups. When the durability rate of MT was decreased from 65 to 50%, AB became dominant for the non-risk averse group.

**Authors’ conclusions**
The results suggested that, in both risk averse and non-risk averse populations, minimally invasive therapy (microwave thermotherapy, MT) is a reasonable cost-effective alternative to surgery (transurethral resection of the prostate, TURP) and medical therapy (alpha-blocker, AB) for moderately to severely symptomatic benign prostatic hyperplasia (BPH).

**CRD COMMENTARY - Selection of comparators**
It was stated that TURP has long been the standard with which all therapies for BPH are compared. The AB and MT therapies compared in the study were felt to be the most popular current classes of therapeutic alternatives to TURP.

**Validity of estimate of measure of effectiveness**
No systematic review of the literature was reported. The authors used data for MT effectiveness from one study. For AB and TURP, there was no indication of the number of studies consulted. It was stated that some of the effectiveness data were obtained from a clinical panel, but no information was given on the make-up or working methods of this panel. No weighting scheme was used to consider the impact of differences in the primary data sources when estimating effectiveness. The event probabilities were derived from the literature, but these were not reported in the present study. In general, details of the data used in the Markov model were lacking, although they were reported in another study. The above factors make it difficult to assess the validity of the effectiveness estimates objectively.

The overall estimate of the benefit was modelled with a Markov model. This was appropriate for those treatments that involved repetitive events such as retreatment.

**Validity of estimate of measure of benefit**
The benefits were estimated in terms of the QALMs. These were derived using utility values estimated from a small sample (13) of patients suffering from BPH. The authors stated that this small sample size was not a problem, as the standard errors of the mean utility values were relatively small and the results were robust to changes in utility values. However, there was no evidence to support these claims. A good feature of the analysis was the grouping of the patients into risk averse and non-risk averse. This provides useful information on the way in which the chosen therapy alters according to attitude to risk.
Validity of estimate of costs
The authors reported that the costs were estimated from a societal perspective. However, the indirect costs were not explicitly accounted for, but were incorporated into the utility estimates via the descriptions of the health states. All relevant costs that varied between the treatments were included in the analysis. The costs were not reported separately from the quantities. The cost parameters were derived using Medicare fee-for-service payment rates and estimated, discounted listed drug prices. These were valid sources for the study population (over 65-year-old men with BPH symptoms).

Other issues
The authors did not compare their results with those from other studies. The issue of generalisability of the cost results to other settings was discussed, but only in terms of the cost differences in federal capitated and private insurance plans. Although the analysis considered both risk averse and non-risk averse patients, the authors concluded that the results are externally valid for risk averse patients.

The results were sensitive to key assumptions about the 5-year durability rates for each treatment. The validity of these assumptions was not strongly established.

The authors claimed that the study demonstrated that the model parameters appear appropriate for evaluating MT against AB and TURP. However, the results themselves do not provide a basis for making this judgement. In addition, the methods of deriving the parameters (see above) do not preclude the possibility of selectivity.

Implications of the study
The authors concluded that the model parameters appear to be appropriate for evaluating the cost-effectiveness of minimally invasive therapy relative to AB and TURP, and can serve to evaluate the cost-effectiveness of developing therapies for BPH.

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