A cost-utility analysis of hysterectomy, endometrial resection and ablation and medical therapy for menorrhagia
You J H, Sahota D S, MoYuen P

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
The study examined four treatments for women with menorrhagia. The treatments were hysterectomy, endometrial resection and ablation (ER/A), a levonorgestrel-releasing intra-uterine system (LNG-IUS) and oral medical therapy.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of women with menorrhagia. The patients included were women of reproductive years (aged 40 years or younger) with regular heavy menstrual periods. The exclusion criteria were postmenopausal bleeding, irregular menses and inter-menstrual bleeding, and the presence of pathological or iatrogenic causes of heavy menstrual bleeding.

Setting
The setting was secondary care and a hospital. The economic study was carried out in Hong Kong, China.

Dates to which data relate
The effectiveness data and some resource use data were derived from studies published between 1991 and 2005. No dates for most resource use data were reported. The price year was not reported.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of published studies and some authors' opinions.

Modelling
A Markov model was constructed to assess the costs and benefits of the four treatments for women with menorrhagia. The time horizon of the model was 5 years and the cycle length was one year. In the hysterectomy arm, patients might experience surgical complications such as sepsis, need for blood transfusion, vault haematoma, perforation, gastrointestinal (GI) obstruction/ileus and laparotomy. Women could need no extra surgery or need extra surgery because of surgical complications. Both clinical outcomes would result in the resolution of menorrhagia. In the ER/A arm, there were two possible clinical outcomes. One was the abatement or subsidence of menorrhagia symptoms (no need for extra surgery), while the other was salvage hysterectomy for heavy menstrual bleeding because of treatment failure. Similarly, in the medical arms (LNG-IUS and oral medical therapy), menorrhagia could be resolved after initiation of the medical treatment. The two possible clinical outcomes were no need for extra surgery and salvage
hysterectomy for heavy menstrual bleeding. The structure of the model was represented graphically.

Outcomes assessed in the review
The outcomes estimated from the literature were:

the probabilities of surgical complications for hysterectomy,

odds ratio (ORs) of surgical complications in ER/A versus hysterectomy,

the yearly probability of additional surgery for menorrhagia,

the duration of convalescence post-surgery,

the duration of hospitalisation, and

the utility values.

Study designs and other criteria for inclusion in the review
The primary studies were identified from two published meta-analyses, the inclusion criteria for which were studies on first- or second-generation techniques (e.g. trans-cervical resection of endometrium, endometrial ablation by electrocautery, laser or balloon therapy) for ER/A and studies on abdominal, vaginal, laparoscopic or laparoscopically-assisted vaginal routes for hysterectomy. Medical regimens included were LNG-IUS and oral medical therapy (non-steroidal anti-inflammatory agents, tranexamic acid, oral contraceptive pills, progestogens and danazol). Yearly rates of additional surgeries were obtained from 10 clinical trials, while the rate of surgical complications was obtained from 4 clinical trials. The utility values were derived from a study based on interviews with patients.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
The use of clinical trials should have ensured a high internal validity of the primary studies.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Fourteen primary studies provided the clinical data and utility values.

Methods of combining primary studies
The primary estimates were combined by meta-analysis.

Investigation of differences between primary studies
Not reported.

Results of the review
The probabilities of surgical complications in hysterectomy were as follows:
blood transfusion, 0.06 (range: 0.03 to 0.08);
GI obstruction/ileus, 0.02 (range: 0.016 to 0.025);
laparotomy, 0.031 (range: 0.025 to 0.037);
perforation, 0 (range: 0 to 0.01);
sepsis, 0.27 (range: 0.25 to 0.29); and
vault haematoma, 0.091 (range: 0.053 to 0.129).

The ORs of surgical complications in ER/A versus hysterectomy were as follows:

blood transfusion, 0.22 (range: 0.08 to 0.57);
GI obstruction/ileus, 0.47 (range: 0.05 to 4.58);
laparotomy, 0.33 (range: 0.05 to 2.41);
perforation, 6.85 (range: 0.14 to 346);
sepsis, 0.16 (range: 0.1 to 0.24); and
vault haematoma, 0.14 (range: 0.06 to 0.34).

The yearly probability of additional surgery for menorrhagia was 0.003 (range: 0 to 0.018) with hysterectomy, 0.13 (range: 0.024 to 0.23) with ER/A, 0.15 (range: 0.10 to 0.19) with LNG-IUS, and 0.26 (range: 0.21 to 0.30) with oral medical therapy.

The duration of convalescence post-surgery was 1 month (range: 0.6 to 2.6) with hysterectomy and 0.6 months (range: 0.4 to 0.7) with ER/A.

The duration of hospitalisation was 5.3 days (range: 2.1 to 11) with hysterectomy and 1.7 days (range: 1.0 to 2.2) with ER/A.

The utility value was 0.55 (range: 0.5 to 0.8) for menorrhagia and 0.95 (range: 0.65 to 0.95) for resolved menorrhagia.

Methods used to derive estimates of effectiveness
The authors made some assumptions that were used in the decision model.

Estimates of effectiveness and key assumptions
The duration between the beginning of each cycle and additional surgery if needed was 6 months.

The utility value associated with convalescence post-surgical intervention was 0.65 (range: 0.55 to 0.95).

Measure of benefits used in the economic analysis
The summary benefit measure used was the total number of quality-adjusted life-years (QALYs) associated with the four treatments. QALYs were calculated by combining utility values for specific conditions with the time spent in those conditions. Both types of data were derived from the literature. No discount rate appears to have been applied to the health benefits.

Direct costs
The analysis of the costs was carried out from the perspective of a health service provider. It included the costs associated with the primary treatment options, treatment of surgical complications, and additional hysterectomy in case of primary treatment failure. The unit costs and the quantities of resources used were not presented separately. The costs were mainly presented as macro-categories. The source of resource consumption was unclear, while the costs came from charges for the health care services of public hospitals and clinics posted in the Hong Kong Gazette. Details of how the costs were calculated from charges were reported. Discounting was relevant, as 5-year costs were estimated, and an annual rate of 3% was applied. The price year was not reported.

**Statistical analysis of costs**
The costs were treated deterministically in the base-case.

**Indirect Costs**
The indirect costs were not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
A univariate sensitivity analysis was carried out to examine the robustness of the model results to variations in all inputs and to identify potentially influential factors. In particular, the probabilities of surgical complications, duration of hospitalisation and convalescence period for abdominal, vaginal and laparoscopic hysterectomy were examined over a broad range of values. Published ranges and confidence intervals were used. A probabilistic sensitivity analysis was also performed to evaluate the impact of uncertainty in all variables simultaneously using Monte Carlo simulation, in which the costs and QALYs were assigned triangular distributions.

**Estimated benefits used in the economic analysis**
The total QALYs were 4.625 with LNG-IUS, 4.575 with oral medical treatment, 4.624 with ER/A and 4.725 with hysterectomy.

**Cost results**
The total costs per patient were $4,528 with LNG-IUS, $5,508 with oral medical treatment, $6,185 with ER/A and $6,878 with hysterectomy.

**Synthesis of costs and benefits**
Average and incremental cost-utility ratios were calculated to combine the costs and benefits of the alternative treatments.

The average cost per QALY gained was $979 with LNG-IUS, $1,204 with oral medical treatment, $1,338 with ER/A and $1,456 with hysterectomy.

The incremental analysis showed that oral medical treatment and ER/A were both dominated by LNG-IUS, which was more effective and less expensive. The incremental cost per QALY gained with hysterectomy over LNG-IUS was $23,500.

The deterministic sensitivity analysis showed that hysterectomy remained the most cost-effective strategy in most scenarios. However, when the probability of need for extra surgery in the ER/A group was lower than 0.055, the ER/A group dominated both the oral medical treatment and the LNG-IUS groups, and the incremental cost per QALY gained with hysterectomy exceeded the threshold of $50,000.
The probabilistic sensitivity analysis suggested that hysterectomy was more costly than LNG-IUS, oral medical treatment and ER/A in, respectively 100%, 100% and 85% of the simulations. Hysterectomy gained a higher number of QALYs than LNG-IUS, oral medical treatment and ER/A in, respectively, 99%, 99% and 98% of the simulations. When comparing non-surgical interventions, LNG-IUS was less costly and it gained a higher number of QALYs than oral medical treatment in 100% and 99% of the simulations.

Authors' conclusions
Hysterectomy was the most cost-effective treatment for women with menorrhagia in Hong Kong. The levonorgestrel-releasing intra-uterine system (LNG-IUS) was the most efficient alternative when non-surgical intervention was the patient's preference.

CRD COMMENTARY - Selection of comparators
The authors justified the choice of the comparators, which were appropriate as they represented the available treatments for menorrhagia. The advantages and disadvantages of each comparator were highlighted. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
Clinical data used in the decision model were derived from published studies, identified from two published meta-analyses of clinical trials. The validity of the primary sources was ensured by the inclusion of clinical trials, which usually have a robust design. However, other aspects of the primary studies, such as the number of patients and length of follow-up, were not reported. Some of the inclusion criteria used for the two meta-analyses were reported. The authors made some assumptions when there was a lack of published estimates with which to populate the decision model. The issue of uncertainty surrounding some estimates was investigated satisfactorily in the sensitivity analysis.

Validity of estimate of measure of benefit
QALYs were the most appropriate benefit measure because they capture the impact of the interventions on both quality of life and survival, which are relevant dimensions of health for women with menorrhagia. The authors stated that the analysis focused on patients' preferences, and that data on quality of life were derived from a study that used interviews with patients. QALYs have the advantage of being comparable with the benefits of other health care interventions.

Validity of estimate of costs
The cost categories included were consistent with the perspective adopted in the analysis. The approach used to calculate the costs from national tariffs was described. However, limited information on the unit costs and quantities of resources used was provided, thus limiting the possibility of replicating the analysis in other countries. Statistical analyses of the costs were carried out only in the sensitivity analysis, where probabilistic distributions were assigned to all economic estimates. The sources used to derive data on resource consumption were not explicitly stated. The price year was not reported, which will make reflation exercises in other time periods difficult.

Other issues
The authors stated that their findings corroborate the results obtained in other published economic evaluations of interventions for the treatment of menorrhagia. The issue of the generalisability of the study results to other settings was not explicitly addressed but the authors performed extensive sensitivity analyses, which enhanced the external validity of the analysis. Nevertheless, the authors pointed out that practice patterns and treatment pathways may vary in different countries. In addition, they noted a limitation of the analysis in that clinical data derived from overseas studies were used. They also acknowledged the fact that the impact of using a longer time horizon was unclear.

Implications of the study
The current study supported the use of hysterectomy for the treatment of menorrhagia.
Source of funding
Supported by the Centre for Pharmacoeconomics Research, School of Pharmacy, Chinese University of Hong Kong.

Bibliographic details

PubMedID
16585125

DOI
10.1093/humrep/del088

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Cost-Benefit Analysis; Endometrium /surgery; Female; Humans; Hysterectomy /economics; Intrauterine Devices, Medicated /economics; Levonorgestrel /administration & dosage; Markov Chains; Menorrhagia /economics /surgery /therapy; Quality-Adjusted Life Years

AccessionNumber
22006001469

Date bibliographic record published
31/12/2006

Date abstract record published
31/12/2006