Cost minimisation and cost effectiveness in anaesthesia for total hip replacement surgery, in Belgium: a study comparing three general anaesthesia techniques

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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.

Health technology
The use of general anaesthesia in total hip replacement surgery was studied. Three techniques (propofol, desflurane and sevoflurane) were compared.

Type of intervention
Treatment and anaesthesia.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised those patients undergoing total hip replacement surgery. No further details were given, and no exclusion or inclusion criteria were specified.

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

Dates to which data relate
There was no information on when the trial was undertaken. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was carried out prospectively on the same sample of patients as that used in the effectiveness analysis.

Study sample
The study randomised 60 patients to receive one of the three anaesthesia techniques. There were 20 patients in each group. The authors did not report any power calculations, or their method of sample selection.

Study design
The study was a randomised trial, although the method of randomisation was not reported. The study appears to have been conducted in a single centre. The authors stated that, owing to methodological problems, only 18 patients in group 2 and 19 in group 3 were retained. The follow-up period was not explicitly stated. The three groups were found
to be similar in terms of their age, weight and body mass index, although they differed in gender.

**Analysis of effectiveness**
The basis of the analysis of effectiveness was treatment completers only. The primary health outcomes used to measure effectiveness included nausea and vomiting, pain scores, analgesics and duration of hospital stay.

**Effectiveness results**
The only information on effectiveness given in the paper was for the duration of hospital stay.

The duration of hospital stay was 10.3 (+/- 3.8) days in group 1, 10.0 (+/- 3.99) days in group 2 and 12.3 (+/- 4.7) days in group 3, (p=0.265).

**Clinical conclusions**
The authors stated that there were no other differences between the groups. In effect, the three alternatives were considered to be of equal clinical effectiveness.

**Measure of benefits used in the economic analysis**
No summary measure of benefit was used. A cost-minimisation analysis was performed on the basis of equal clinical effectiveness.

**Direct costs**
Discounting was not required because of the short time horizon. The quantities (mean anaesthesia consumption) and the prices were reported separately. The estimation of anaesthesia cost was undertaken in two ways. In one it was directly estimated from actual resource use (consumption of anaesthesia), whereas in the other it was estimated from detailed patient invoices. The total cost of each intervention was estimated from patient invoices. The source of the unit cost data was not stated. The price year was not reported.

**Statistical analysis of costs**
The mean measured and invoiced costs across the three groups were compared using Mann-Whitney, Kruskal-Wallis or unpaired t-tests where appropriate. The authors also calculated an "invoicing coefficient": the invoiced mean cost versus the measured mean cost, expressed as a percentage.

**Indirect Costs**
The analysis of invoiced cost included "own cost to patient", but no further details were provided.

**Currency**
Euros (EUR).

**Sensitivity analysis**
No sensitivity analysis was conducted.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.
Cost results
For the mean cost of anaesthesia:

the mean difference between groups 1 and 3 was EUR 25.16 (95% confidence interval, CI: 20.36 to 29.95; p<0.0001);

the mean difference between groups 1 and 2 was EUR 0.20 (95% CI: -1.66 to 1.26; p=0.782); and

the mean difference between groups 2 and 3 was EUR 24.96 (95% CI: 19.91 to 30.00; p<0.0001).

The mean invoiced cost of the intervention was EUR 5,234.75 in group 1, EUR 5,654.13 in group 2 and EUR 5,394.49 in group 3.

The total cost for analgesics was EUR 25.88 in group 1, EUR 26.54 in group 2 and EUR 24.52 in group 3.

Synthesis of costs and benefits
The costs and benefits were not combined.

Authors’ conclusions
The authors found no difference in cost of anaesthesia for desflurane and sevoflurane. They also stated that there was no significant difference between any of the groups in terms of outcome. Therefore, there was no difference between the groups in terms of cost-effectiveness. In terms of cost-minimisation, inhaled anaesthetics are cheaper than intravenous methods of administration.

CRD COMMENTARY - Selection of comparators
No explicit justification was given for the comparators used, but it would appear that desflurane and sevoflurane are two common inhaled anaesthetics which can be combined with propofol. You should decide if these are widely used health technologies in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a randomised trial. This was appropriate for the study question, although details of the randomisation process were not given. The study sample appears to have been representative of the study population, but only limited details were given. The patient groups were found to be similar at baseline, although there were differences in the proportion of males and females across the groups. There was limited analysis of effectiveness, and there appears to have been some confusion between measures of health outcome and resource use and cost.

Validity of estimate of measure of benefit
According to the authors they undertook a cost-effectiveness analysis. However, they did not present any summary measures of health benefit, although they did state that outcomes were similar across the groups. The analysis was therefore categorised as a cost-minimisation analysis.

Validity of estimate of costs
The perspective of the analysis was not stated. Since patient costs appear to have been included, it is possible the perspective might have been societal. All relevant anaesthesia costs were included, and the authors also considered the total invoice cost. Although some costs common to all groups were excluded from the analysis, this was unlikely to have affected the authors’ conclusions. The costs and the quantities for the anaesthesia techniques were reported separately. The authors undertook some statistical analysis of the cost of anaesthesia, but not of the quantities. The authors considered both the measured and invoiced costs and undertook some primary analysis of the difference between these two costs. No sensitivity analysis was performed. The source of the cost data was not given, and nor was the price year, which would limit the possibility of re-working the analysis in other settings or time periods.
Other issues
The authors compared their findings with other studies that had found similar results, but the issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively. There appears to have been some confusion as to the difference between a cost-minimisation analysis and a cost-effectiveness analysis, in that the authors stated that they undertook a cost-effectiveness analysis (in addition to a cost-minimisation analysis). However, they did not produce a summary measure of benefit and the reporting of health-related outcomes was minimal, although these were identified by the authors.

Implications of the study
Cost-minimisation should be achieved by the use of inhaled anaesthetics. However, since the cost of anaesthesia makes only a small contribution to the total cost of total hip replacement surgery, in order to save money it will be necessary to consider variables other than anaesthesia.

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