Simultaneous bilateral versus unilateral total knee arthroplasty: outcomes analysis

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
Simultaneous bilateral versus unilateral total knee arthroplasty.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients, aged between 36 and 88, undergoing simultaneous bilateral total knee arthroplasty and patients undergoing unilateral total knee arthroplasty.

Setting
Hospital. The economic study was carried out in Philadelphia, United States.

Dates to which data relate
No information was given regarding the years during which the data were collected for the effectiveness analysis, resources or prices used.

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

Link between effectiveness and cost data
The costing was undertaken on the same patient sample as that used in the effectiveness study although it was not stated whether it was undertaken prospectively or retrospectively.

Study sample
Whilst power calculations were not reported, 100 patients were included in the intervention group. The sample size of the comparator group was 100.

Study design
The study was a prospective non-randomized trial with concurrent controls. The duration of follow up was until 6 months after discharge. During this time one patient died in the simultaneous bilateral group.
Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. The primary health outcomes used in the analysis were mortality, postoperative confusion, cardiopulmonary complications, blood transfusion and rehabilitation time. The two groups were comparable in terms of age, gender, body weight index and comorbidity rating.

Effectiveness results
Postoperative confusion was approximately four times greater in the simultaneous bilateral total knee arthropalsties group (29% versus 7%, p=0.001), which was thought to represent an increased incidence of fat embolism. Cardiopulmonary complications were approximately three times greater after simultaneous bilateral total knee arthroplasties (14% versus 5%, p=0.030), and most commonly involved arrhythmias. There was an approximately 17 times greater need for banked blood in the simultaneous bilateral total knee arthroplasties group (17% versus 1%, p=0.001). Although the length of hospitalization was similar (6.4 days simultaneous bilateral total knee arthroplasties versus 6 days unilateral total knee arthroplasties), 89% of the patients in the simultaneous bilateral total knee arthroplasties group required a rehabilitation stay versus 45% of the patients in the unilateral total knee arthroplasty group.

Clinical conclusions
Simultaneous total knee arthroplasty was found to have a statistically significant higher incidence of cardiopulmonary complications and confusion, and higher need for banked blood and rehabilitation.

Measure of benefits used in the economic analysis
No single measure of benefit was produced within the economic evaluation. As such the authors conducted a cost-consequences study.

Direct costs
Quantities and costs were not reported separately. Discounting was not required given the duration of the cost analysis. The cost boundary adopted was the hospital. The total hospital charges were calculated, including rehabilitation facility charges and any cost for readmission in the first 6 months postoperatively. The dates of the price data were not reported.

Statistical analysis of costs
Not performed.

Currency
US dollars ($).

Sensitivity analysis
Not performed.

Estimated benefits used in the economic analysis
See effectiveness results reported earlier.

Cost results
The total average hospital charges for simultaneous bilateral total knee arthroplasty were $53,168 (range: $23,301 - $74,278) and those for unilateral total knee arthroplasty were $32,598 (range: $15,516 - $54,063). Total charges for rehabilitation facilities were $6,895 (range: $1,431 - $11,911) for the simultaneous bilateral total knee arthroplasty,
from which 89 out of 100 patients required rehabilitation. Rehabilitation charges for the unilateral total knee arthroplasty were $8,496 (range: $5,544 - $10,606), from which 45 patients out of 100 required rehabilitation facilities.

Total charges (hospital + rehabilitation) were $60,063 for the simultaneous bilateral total knee arthroplasty and $41,094 for unilateral total knee arthroplasty.

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

Authors' conclusions
The apparent relative cost savings implicit by undertaking simultaneous bilateral total knee arthroplasties are partially offset by the two-fold increased need for a rehabilitation facility. The study failed to identify the percentage of unilateral total knee arthroplasty and simultaneous bilateral total knee arthroplasties that required either home or outpatient physical therapy and the subsequent cost for these services. The authors recognized that in order to determine the true safety and efficacy, relative risk, and total cost analysis of simultaneous bilateral total knee arthroplasties, further critical evaluation is required.

CRD COMMENTARY - Selection of comparators
It was not clear why the comparator used was chosen. The authors recognize this weakness in the study as they stated that the control group (unilateral total knee arthroplasty) would have been more appropriately represented if they had staged bilateral total knee arthroplasty.

Validity of estimate of measure of benefit
Although the estimate of measure of effectiveness used in the study is likely to be internally valid, the authors did not develop a unitary benefit measure for the economic analysis.

Validity of estimate of costs
The resource quantities were not reported separately from prices and adequate details of methods of quantity/cost estimation were not given. Some important cost items were omitted such as home care costs and outpatient costs. The use of charges in the cost analysis introduces difficulties in terms of generalisability to other settings and does not reflect true opportunity cost.

Other issues
Given the uncertainties in the data, the authors' conclusions are likely to be justified. Appropriate comparisons were made with other studies, but the issue of generalisability to other settings or countries was not addressed.

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Confusion /etiology; Cost Savings; Costs and Cost Analysis; Disease Transmission, Infectious; Embolism, Fat /etiology; Female; Hospital Charges; Hospitalization; Humans; Incidence; Length of Stay; Lung Diseases /etiology; Male; Middle Aged; Outcome Assessment (Health Care); Postoperative Complications; Prospective Studies; Risk Factors; Safety; Stress, Physiological /etiology

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