Use of unicompartmental instead of tricompartmental prostheses for unicompartmental arthrosis in the knee is a cost-effective alternative: 15,437 primary tricompartmental prostheses were compared with 10,624 primary medial or lateral unicompartmental prostheses

Robertsson O, Borgquist L, Knutson K, Lewold S, Lidgren L

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
Two implants for arthrosis of the knee were considered in the study: unicompartmental knee arthroplasty (UKA) and tricompartmental knee arthroplasty (TKA).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing arthroplasty and who were operated on only for arthrosis. Patients excluded were those admitted more than one week before operation, discharged before the third postoperative day or later than 5 weeks, or who had bilateral simultaneous surgery.

Setting
The setting of the study was not clearly defined but it appears to have been secondary care. The economic study was carried out in Sweden.

Dates to which data relate
The data on effectiveness and resources used were gathered from 1985 to 1995. The price year was not clearly reported.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on a different patient sample from that used in the effectiveness analysis.

Study sample
The selection of the patient sample was conducted by matching data from the official Swedish Patient Administration System (PAS) which provided admission and discharge dates of patients, and from the national Swedish Knee Arthroplasty Register (SKAR) where information about operations and implants was recorded. The period available for
comparison was 1985-1995. An overall sample of 26,061 patients undergoing the first arthroplasty operation was generated in the study. TKA was implanted in 15,437 patients and the mean age was 72.7 years (10,702 women with mean age 73 years, 4,735 men with mean age 72 years). UKA were used in 10,624 patients and the mean age was 70.8 years (6,686 women with mean age 70.9 years, 3,938 men with mean age 70.6 years). The number of patients who had a first revision of primary implants was 568 (mean age 73.1 years, 397 women) for TKA and 752 (mean age 71.8 years, 492 women) for UKA. Power calculations were not performed.

**Study design**
This was a case-control study carried out in almost all centres performing arthroplasty in Sweden. Patient records were available until the end of 1995; therefore the maximum follow-up was 11 years.

**Analysis of effectiveness**
The primary health outcomes used in the effectiveness analysis related to primary operations and revisions. When primary operations were considered, the outcomes were preoperative and postoperative hospital stay and average length of hospital stay. In terms of revision, the outcomes were the cumulative revision risk (CRR) and the mean hospital stay for revision. The CRR was calculated using Kaplan-Meier survival statistics. Statistical analyses were not conducted to assess the comparability of groups, but they appear to have been quite similar with respect to demographics.

**Effectiveness results**
The effectiveness results were as follows:

The preoperative hospital stay was 1.3 (SD = 0.9) days for TKA and 1.4 (SD = 1) days for UKA.

The postoperative hospital stay was 12.3 (SD = 5.2) days for TKA and 10.7 (SD = 4.4) days for UKA.

In particular, linear regression analysis illustrated some relevant points: the mean hospital stay between 1985 and 1995 decreased by 0.7 days; men had a shorter hospital stay than women (0.6 days less); each additional year in patient age increased the hospital stay by 0.05 days; and finally TKA resulted in a hospital stay 2 days longer than UKA and the difference was statistically significant, (p<0.0001).

In terms of revisions, the 10-year CRR for primary arthroplasty was 11.5% for TKA and 15.8% for UKA, (p<0.001) and the cumulative risk for a UKA being revised was 1.47 times that of a TKA, (p<0.001).

Extending the sample to all patients operated on in the study period, the 10- and 15-year CRR was 12% and 17.2% for TKA and 15.2% and 19.2% for UKA, respectively, with a risk-ratio of 1.24 for the UKA.

The cumulative risk of having a re-operation for infection was 2.6 times greater in TKA than in UKA, (p<0.001).

If any revision were performed, the risk of a further revision was higher for TKA than UKA, (p=0.03).

The mean hospital stay for revision of a primary implant was 14.7 (range: 1 - 125; SD: 11.8) days for TKA and 13.1 (range: 1 - 60; SD: 6.6) days for UKA.

Revisions of TKA remained 1.5 days longer in hospital than revisions of UKA, (p=0.003).

When revised to TKA, the length of stay after primary TKA was 1.9 days longer than after primary UKA, (p=0.006).

Patients with primary UKA, when revised to UKA, stayed 1.2 fewer days then when revised to TKA, (p<0.001).

In general, infected cases with revisions stayed 7.5 days longer than uninfected ones, (p<0.001).

**Clinical conclusions**
TKA was associated with a reduced number of revisions compared with UKA, but UKA patients were found to have shorter hospital stay and fewer serious complications due to infections than UKA patients were.

**Measure of benefits used in the economic analysis**
No summary benefit measure was used; therefore a cost-consequence analysis was carried out.

**Direct costs**
Given that the time horizon of the study was 11 years, discounting would have been relevant, but was not reported. The resource/cost boundary adopted appeared to be that of the hospital. The economic analysis included only the costs of the implant and the hospital stay. The former was calculated as the weighted average cost of the 5 most common TKA implants or the 3 most common UKA implants and price information was obtained from the implant distributor for the models available in 1997. The latter was computed through the reference cost of a hospital day in Sweden in 1995, slightly reduced to exclude the costs of laboratory examinations and radiography. The authors assumed that costs of primary operation was equal for TKA and UKA, and that the only difference was due to implant cost and hospital stay. For reference, the total cost of TKA performed at the Lund University Hospital during 1993-1994 was calculated. The resources used were gathered from 1985 to 1995. The price year was not clearly reported.

**Statistical analysis of costs**
No statistical analysis of costs was reported.

**Indirect Costs**
No indirect costs were included.

**Currency**
Swedish kroner (Sek). Sek were converted into US$ at the following exchange rate: US$ 1 = Sek 7.27 at June 1995.

**Sensitivity analysis**
No sensitivity analysis was carried out.

**Estimated benefits used in the economic analysis**
See effectiveness results above.

**Cost results**
The cost results were as follows:

The mean cost was $1,267 for UKA and $2,242 for TKA.

The mean cost of hospital stay was $679 less for UKA than for TKA.

The average cost saving by using UKA rather than TKA was $1,645 per operation.

Considering the number of revisions, the authors reported that, by initially performing a UKA, the cost saved could leave about $32,722 for the payment of each of the extra revisions needed with UKA. The total billed mean cost for a TKA at the Lund University hospital was $11,100.

**Synthesis of costs and benefits**
Authors' conclusions
The authors concluded that the use of UKA implants in appropriate patients could lead to substantial cost savings compared to TKA, although the number of initial revisions was significantly higher for UKA implants, due to shorter hospital stay and fewer revisions due to infections (which were quite expensive).

CRD COMMENTARY - Selection of comparators
The reason for the selection of the techniques was clear: both were commonly used in Sweden for the management of patients undergoing arthroplasty. You should consider whether they represent used technologies in your own setting.

Validity of estimate of measure of effectiveness
The study was a population-based case-control study, which appeared appropriate for the study question. Although statistical analyses were not reported to show the comparability of groups, the sample size was quite large, thereby reducing the possibility of confounding factors or selection bias. The study population was well defined and results were likely to be applied to the general population in Sweden. Several regression analyses were conducted in order to show the impact of some variables, such as age and gender, on the measured outcomes.

Validity of estimate of measure of benefit
No summary benefit measure was used in the economic analysis and costs were not combined with benefits. It would have been interesting had a benefit measure (such as Quality Adjusted Life-Years) reflecting patient preferences for the different health states generated by the two interventions been adopted.

Validity of estimate of costs
The cost estimation was based on actual data gathered in different years, but it was not clear whether a price year was used. Furthermore, discounting appeared to be relevant but no discount rate was reported. The authors stated that operation costs were assumed to be equal, but some financial advantage of UKA over TKA was possible (shorter operating time, reduced blood loss, etc.) but not taken into account. However, this omission should not have affected the authors' conclusions. Unit costs were reported only for hospital stay. The analysis of costs appeared to be quite specific to the Swedish setting.

Other issues
Sensitivity analyses were not conducted on effectiveness and cost sides of the analysis, therefore the generalisability of the study results to other settings was quite limited. The authors made numerous comparisons of their findings with those from other studies, especially those relating to the US setting.

Implications of the study
The study results appear to suggest that the adoption of UKA rather than TKA could be more cost-effective in the management of patients undergoing arthroplasty of the knee.

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