Predictors of cost of liver transplantation in children: a single center study

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 a transition to home programme for children who underwent liver transplantation. The transition to home programme consisted of early discharge based on defined clinical criteria and a family education programme.

Type of intervention
Other: home care.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised children who underwent OLT. The inclusion criterion was children who survived for 3 months after transplantation.

Setting
The setting was community care and a children's hospital. The economic analysis was carried out in Cincinnati (OH), USA.

Dates to which data relate
The effectiveness and resources data were collected between March 1994 and April 1999. The unit costs/charges were adjusted to the date of the procedures.

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

Link between effectiveness and cost data
The costing was generally carried out prospectively on the same sample of patients as that used in the effectiveness study. The exception was home care, the costs of which were estimated from a sub-group of 15 children who received all of their home care services through the authors' institution.

Study sample
No power calculations to determine the sample size were reported. Eight-three children were included in the study. The intervention group comprised 47 children who underwent OLT between September 1996 and April 1999. The control group comprised 36 children who underwent OLT between March 1994 and August 1996.
Study design
This was a comparative study with historical controls that was conducted in a single centre. The duration of follow-up was 3 months.

Analysis of effectiveness
The analysis of the clinical study was conducted on the basis of treatment completers only. The primary health outcomes used in the analysis were graft survival, incidence of hepatic artery thrombosis, re-transplantation within 30 days after transplantation and allograft rejection. The children in the intervention group were younger (3.8 +/- 4.8 years) than those in the control group (6.9 +/- 6.3 years), (p=0.01). There was a lower proportion of girls in the intervention group, 43.4% versus 64.9%, (p=0.0002). The two groups did not receive the same primary immunosuppression. Children in the control group received OKT3, cyclosporine, azathioprine and corticosteroids, while those in the intervention group received tacrolimus plus corticosteroids. The authors did not adjust for confounding factors in the clinical outcomes.

Effectiveness results
Allograft rejections were lower in the intervention group (28%) than in the control group (47%), (p=0.06).

A greater proportion of patients in the intervention group had hepatic artery thrombosis, 8.5% versus 2.8%, (p=0.28). However, the difference was not statistically significant.

There were no statistical differences in the graft survival between the intervention (86%) and control (78%) groups, (p=0.23). There was also no statistical difference in the re-transplantation incidence, 2.1% (intervention) versus 0% (control), (p=0.41).

Clinical conclusions
The transition to home programme in children who underwent OLT did not compromise either the safety or clinical outcomes.

Measure of benefits used in the economic analysis
The authors did not develop a summary benefit measure. A cost-consequences analysis was performed.

Direct costs
The direct costs were for organ retrieval, surgery and hospitalisation for OLT. The total cost of hospitalisation included the inpatient costs and the costs of the transition to home programme (outpatient visits, outpatient pharmacy, outpatient laboratory and home care). The surgical costs and organ retrieval costs were identified by specific charge codes. The costs of outpatient physician visits were determined from current protocol terminology codes. The costs for home care were estimated from a sub-group of 15 children who received all of their home care services through the authors’ institution. All of the costs were adjusted for inflation. The duration of follow-up was 3 months. The transition to home period was defined as the 7 days after discharge from the hospital following the OLT admission. Discounting was unnecessary. The costs and the quantities were not reported separately. The price year was not stated.

Statistical analysis of costs
Statistical analyses of the costs were performed using Fisher’s exact test or Student’s t-test. The authors presented mean values and standard deviations. Multivariate analyses were carried out to identify potential predictive factors of the costs and length of hospitalisation.

Indirect Costs
No indirect costs were included in the analysis.
Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness results' section.

Cost results
The mean length of hospital stay was 29% lower in the intervention group (24.8 days; 95% confidence interval, CI: 18.5 - 31.1) than in the control group (35 days, 95% CI: 28.2 - 41.8). The difference was statistically significant, (p=0.0006).

The cost of organ retrieval was not statistically different between the intervention ($21,971) and control ($21,574) groups, (p=0.40).

The mean surgical costs were 34% lower in the intervention group ($14,703, 95% CI: 12,461 - 16,944) than in the control group ($22,403, 95% CI: 18,859 - 25,947). The difference was statistically significant, (p=0.0006).

The mean total costs of hospitalisation were 36% lower in the intervention group ($106,874, 95% CI: 87,161 - 126,587) than in the control group ($167,433, 95% CI: 141,340 - 193,525). The difference was statistically significant, (p=0.0001).

The total costs were lower and length of stay was shorter for patients who received whole organs, participated in the transition to home programme, were white, had early allograft rejection, or had a higher z-score. Patients who had hepatic artery thrombosis, or were older at the time of OLT, had higher costs and longer length of stay.

Synthesis of costs and benefits
Not applicable.

Authors’ conclusions
The transition to home programme decreased the length of stay and cost after orthotopic liver transplantation (OLT), without compromising the clinical outcomes. Organ type, height, z-score, race, hepatic artery thrombosis, early allograft rejection, and participation in the transition to home programme were significant predictors of the post-transplant length of stay and total costs.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator, no transition to home intervention, was clear.

Validity of estimate of measure of effectiveness
The study design (comparative study with historical control) was not particularly appropriate for the study question. It introduces the potential for bias and confounding, as other temporal factors may have had an influence on the results. A randomised controlled trial would have increased the validity of the results. The patients were not shown to be comparable at analysis. The main clinical outcome, patient survival, was considered as an inclusion criterion. Confounding factors were not adjusted for in the analysis of the clinical outcomes. The study sample size was small, suggesting a lack of power calculations. These factors may limit the internal validity of the findings.
Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The economic study was therefore a cost-consequences analysis.

Validity of estimate of costs
The perspective adopted was unclear, but it is likely to have been that of the hospital. The authors included the inpatient and outpatient costs from hospital discharge until 3 months after discharge, and justified this short follow-up period. However, immunosuppression may have affected the outcome measures during the year after transplantation. Charges were used to proxy prices, which may limit the generalisability of the results. The costs and the quantities were not reported separately. However, a statistical analysis of the costs was performed. Discounting was unnecessary since the costs were incurred in less than one year.

Other issues
The generalisability of the results was not specifically addressed. Adequate comparisons were made with studies dealing with the same topic. The study enrolled children who underwent OLT and this was reflected in the authors’ conclusions. The authors highlighted limitations of their study, which have been addressed already. The authors do not appear to have reported their results selectively. This study focused more on the predictors of cost than on the clinical outcomes. This may be a strong limitation of the study.

Implications of the study
Within the context of the caveats highlighted, an early discharge programme based on defined criteria can be used to decrease the length of stay and cost after OLT, without compromising the clinical outcome.

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