Economic evaluation of centre haemodialysis and continuous ambulatory peritoneal dialysis in Ministry of Health hospitals, Malaysia

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 haemodialysis (HD) and continuous ambulatory peritoneal dialysis (CAPD) for patients with end-stage renal disease (ESRD) was examined.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients on renal replacement therapy requiring dialysis.

Setting
The setting was a hospital. The economic study was carried out in Malaysia.

Dates to which data relate
The effectiveness and resource use data were gathered from 1980 to 2001. The price year was 2001.

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

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

Study sample
Sample size calculations were performed in the preliminary phase of the study. These showed that 30 patients in each group were required. The calculations and assumptions made to determine the appropriate size of the sample were reported. Patients were identified randomly at all centres that commenced dialysis operations before 2001. Sixty patients who were on dialysis between 1980 and 2001, who had been on either HD or CAPD for at least 5 years and had not changed modality for the duration they were on dialysis, were included in the study. Thirty patients in each group were considered. The mean age of the patients was 45.8 (+/- 10.2) years in the HD group and 43.5 (+/- 16.2) years in the CAPD group. The proportion of female participants was 66.7% in the HD group and 33.3% in the CAPD group.
Study design
This was a retrospective cohort study involving a random selection of patients who had been identified at 55 centres (44 HD units and 11 CAPD centres). The patients were selected from a random sample of individuals identified at the participating centres. The length of follow-up was unclear. No patient appears to have been lost to follow-up. The outcome assessment was not performed blind.

Analysis of effectiveness
All of the patients included in the initial study sample were accounted for in the analysis of effectiveness. The primary outcome measure was the number of life-years saved (LYS), which was estimated using a published method. Observed survival rates for patients in HD and CAPD centres were related to expected survival rates in the general population of similar age and gender. The relative survival ratio was used to estimate the excess risk caused by end-stage renal failure when patients were on dialysis. The authors stated that the study groups were comparable at baseline with the exception of level of serum albumin, which were higher in HD patients. However, it appears that significantly more women have been included in the HD group and the duration of modality was significantly longer among HD patients.

Effectiveness results
The number of LYS in the full sample was 10.96 (standard error, SE=0.4) with HD and 5.21 (SE=0.2) with CAPD.

Among patients aged less than 40 years, the number of LYS was 17.34 (SE=0.8) with HD and 9.04 (SE=0.5) with CAPD.

Among patients aged 40 to 54 years, the number of LYS was 8.52 (SE=0.3) with HD and 4.85 (SE=0.3) with CAPD.

Among patients aged older than 55 years, the number of LYS was 5.05 (SE=0.2) with HD and 3.30 (SE=0.1) with CAPD.

In patients without diabetes, the number of LYS was 12.15 (SE=0.4) with HD and 6.46 (SE=0.3) with CAPD. In patients with diabetes, the LYS were 5.23 (SE=0.2) and 2.97 (SE=0.1), respectively.

Clinical conclusions
The effectiveness analysis showed that longer survival was obtained in patients undergoing HD than in those undergoing CAPD, for all ages and all patient characteristics.

Measure of benefits used in the economic analysis
The summary benefit measure was the number of LYS. This was derived from the clinical study.

Direct costs
An annual discount rate of 3% was used to amortise building and equipment costs. The unit costs were not presented separately from the quantities of resources used. The health services included in the economic evaluation were capital costs (land, building and equipment), human resource costs (including full- and part-time staff), overhead costs (e.g. administration, maintenance, pharmacy, security, waste and utilities) and dialysis consumable costs (including medical and office supplies). The patients’ resource use included laboratory tests during clinic visits, imaging investigations, pharmaceuticals consumed excluding erythropoietin (EPO), vascular access surgeries and referrals to non-nephrology specialist services. The cost/resource boundary of the Ministry of Health was adopted. The costs and resource use data were gathered at each participating hospital using the patients’ records. A micro-costing approach was used to identify all relevant resources. The price year was 2001. The cost efficiency (i.e. cost per unit output), was also estimated.

Statistical analysis of costs
The costs were treated deterministically.
**Indirect Costs**
The indirect costs were not included in the economic evaluation.

**Currency**
The costs were estimated using Malaysian ringits (RM). The exchange rate from RM into US dollars ($) was $1 = RM 3.80.

**Sensitivity analysis**
Univariate sensitivity analyses were performed to examine the robustness of the cost-effectiveness ratios to variations in the discount rate, overhead costs and various doses of EPO. The authors chose the alternative values.

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

**Cost results**
The mean cost with HD was RM 169 (range: 79.61 - 475.79). Cost efficiency improved with increasing volume.

The optimal point appears to be a volume of approximately 15,000 HD procedures per year at a cost of RM 103 per procedure.

The mean cost per patient month with CAPD was RM 2,084 (range: 1,400 - 3,200).

Cost efficiency tends to improve with increasing output. The optimal point appears at a cost of RM 1,764 per patient month when the service volume reached 1,245 patient-months.

Both procedures incurred similar outpatient costs (although with a different cost profile). However, hospitalisation costs were higher for CAPD patients at every phase.

The mean cost of EPO per patient per year was approximately RM 4,500 for HD and RM 2,500 for CAPD.

**Synthesis of costs and benefits**
Average cost-effectiveness ratios (ACERs; i.e. cost per LYS) were calculated to combine the costs and benefits.

The ACERs were RM 31,634.93 with CAPD and RM 33,642 with HD.

The sensitivity analysis showed that the ACERs were generally robust to variations in the key variables. The exception was the scenario of minimum overheads, when HD had a more favourable ACER. In general, changes in overhead costs had a strong impact on the ACERs. In particular, when the maximum overhead cost in the sample was used, the ACER for HD increased to RM 79,712.99 per LYS.

**Authors’ conclusions**
Both continuous ambulatory peritoneal dialysis (CAPD) and haemodialysis (HD) were cost-effective strategies for patients with end-stage renal disease (ESRD) in Malaysia.

**CRD COMMENTARY - Selection of comparators**
The rationale for the selection of the comparators was clear. The two most commonly used dialysis procedures were considered. You should decide whether they are valid comparators in your own setting.
Validity of estimate of measure of effectiveness
The effectiveness evidence came from a retrospective cohort study, which is usually associated with a weak design. However, the random selection of the patients enhanced the internal validity of the study. The patients in the two groups were not completely comparable at baseline, which could have biased the results of the analysis. Further, details of the follow-up were not reported clearly. Some strengths of the study were the justification of the sample size and the use of multiple centres. The authors stated that change of modality was not considered in the analysis, even though 10% of CAPD patients switched to HD. Moreover, the authors noted some issues related to how representative the sample of patients was.

Validity of estimate of measure of benefit
The summary benefit was appropriate as it reflected the impact of the interventions on the most relevant dimension of care, such as life expectancy. The method used to estimate the LYS was reported elsewhere (Hakama et al. 1977, see 'Other Publications of Related Interest' below for bibliographic details). However, an assessment of quality of life would have been interesting. Discounting does not appear to have been carried out, although it could have been relevant.

Validity of estimate of costs
The perspective adopted in the study was explicitly stated. As such, it appears that all the relevant categories of costs have been included. A micro-costing approach was used for the evaluation of costs, and this represented a strength of the analysis. The price year was reported, which enhances the possibility of reflating the results of the analysis. However, information on the unit costs and quantities of resources used was not reported for all items. Also, the costs were treated deterministically and only overhead costs were varied in the sensitivity analysis. The timeframe of the analysis was unclear.

Other issues
The authors made extensive comparisons of their findings with those from other studies, considering several aspects of their analysis such as costs, benefits, number of hospitalisations, patients on EPO, and so on. The issue of the generalisability of the study results to other settings was explicitly addressed. The authors noted that the costs of consumables and drugs were the most relevant categories of costs in their setting, while professional costs were a key cost determinant in developed countries. The study was based on an average cost per LYS, but an incremental analysis would have been more appropriate to compare the cost-effectiveness of the two groups. The study referred to patients with ESRD undergoing dialysis and this was reflected in the authors' conclusions.

Implications of the study
The study results supported the use of either CAPD or HD for patients with ESRD in Malaysia. The authors noted that CAPD was probably effective initially when the patient has some residual renal function but, over time, the modality could be changed to HD. It was stated that research was ongoing in terms of the cost-utility of EPO in dialysis patients.

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