The case for daily dialysis: its impact on costs and quality of life
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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 short daily or nocturnal haemodialysis for patients with end-stage renal disease (ESRD). Short daily dialysis is performed five to seven times per week in 1.5- to 2-hour sessions, either at the hospital or in the patient's own home. Nocturnal dialysis is carried out for 6 to 10 hours while the patient is asleep, five to seven times weekly. The comparator was thrice-weekly conventional in-centre dialysis.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with ESRD who were in need of haemodialysis.

Setting
Daily dialysis was performed at dialysis centres or in the patients' homes. Conventional dialysis was performed at dialysis centres. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data were derived from studies carried out between 1997 and 1999. The resource use and cost data were derived from sources published between 1996 and 1998. The price year was 1998.

Source of effectiveness data
The effectiveness data were derived from a review of prior studies.

Modelling
A decision analytic model was used to estimate the costs of four different modalities of dialysis. The four different modalities were in-centre short daily, at-home short daily, at-home nocturnal, and conventional. The choice of modality affects the probabilities associated with the use of erythropoietin (EPO), the use of blood pressure medication, and the number of days in hospital.

Outcomes assessed in the review
The outcomes assessed were the quality of life, weekly EPO dosage requirement, the number of antihypertensive medications, and the number of hospital days.
Study designs and other criteria for inclusion in the review
Reports from international daily dialysis programmes were reviewed. In addition, discussions were conducted with the principal investigators in the largest programmes in North America. Two studies employed a pre-intervention post-intervention comparison. The authors report that 60 studies published since 1969 were reviewed.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Sixty reports, 7 published studies, and 5 sets of unpublished data obtained directly from the investigators, were included in the review.

Methods of combining primary studies
For each model parameter, a weighted average was calculated from the findings of the relevant studies. Although not specifically stated, the findings were presumably weighted by the sample size.

Investigation of differences between primary studies
The authors briefly discussed some differences between the studies. They allowed for these differences by varying the model parameters in a sensitivity analysis.

Results of the review
A range of quality of life instruments was used. These were the SF-36, the Nottingham Health Profile, the Sickness Impact Profile, and the Beck Depression Inventory and Kidney Disease Quality of Life Instrument. Studies reported an improvement of at least 40% from baseline in patient energy, vitality, role-emotional, role-physical, ambulation, household management and eating, with daily dialysis in comparison with conventional in-centre dialysis. No statistically significant reductions in quality of life were found in this review.

Compared with conventional in-centre dialysis, the weekly EPO dosage requirement was reduced by a weighted average of 41% (90% confidence interval, CI: 32 - 50) with daily dialysis. The number of antihypertensive medications was reduced by a weighted average of 46% (90% CI: 33 - 61). The number of hospital days was reduced by a weighted average of 43% (90% CI: 23 - 63).

Methods used to derive estimates of effectiveness
The authors make some assumptions to build their economic model.

Estimates of effectiveness and key assumptions
A key assumption was that all home-based patients reused dialysers and that in-centre reuse reflected current practice. The assumptions were described in detail in the article.
Measure of benefits used in the economic analysis
This was a cost-consequences study and no summary health benefit measure was used.

Direct costs
The direct costs included in the analysis were for patient dialysis and training, medications, vascular access, ambulance transportation, other physician and outpatient medical expenses, hospitalisations, skilled nursing facilities, home health care and other services. The costs were adjusted to account for those borne by patients, for example, for travel to a dialysis centre or setting-up the home dialysis system. Most of the data came from national sources (including Medicare payments for some unit costs) and date from 1996 onwards. The resource use requirements for daily dialysis were derived from two programmes in the USA. The quantities were analysed separately from the costs, and some quantities were reported in the article. The costs were reported in 1998 US dollars and were adjusted for inflation. Discounting was irrelevant since the costs were calculated on an annual basis.

Indirect Costs
The indirect costs were not included, although the authors refer to evidence that patients on daily dialysis were more likely to work.

Currency
US dollars ($).

Sensitivity analysis
Best- and worst-case sensitivity analyses and one-way threshold analyses were carried out to assess the impact of uncertainty in the cost estimates. The value used for the best-case reduction in hospitalisation was the best result of the two studies used. The worst case was no reduction in hospitalisation. For the percentage reduction in EPO dosage, the weighted CI limits were used as the best- and worst-case values.

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

Cost results
Under baseline assumptions, the estimated annual cost was $60,800 for short daily in-centre dialysis, $57,700 for nocturnal dialysis, and $57,400 for short daily at-home dialysis. These were all lower than the cost of conventional dialysis ($68,400), implying incremental annual cost-savings of $7,600 (short, daily in-centre), $10,700 (nocturnal) and $11,000 (short, daily at-home). The cost-savings with the daily dialysis modalities are driven by improved clinical outcomes, which are represented by a decrease in bed days and the use of EPO and antihypertensives. These costs were sensitive to the estimated reduction in hospital days with daily dialysis.

Synthesis of costs and benefits
Not applicable.

Authors’ conclusions
The evidence reviewed in this study suggests that patients feel better on daily dialysis, and that the total health care costs could be lower than those incurred with conventional dialysis.

CRD COMMENTARY - Selection of comparators
The comparator was chosen to reflect current practice and should be relevant to many health care systems.
Validity of estimate of measure of effectiveness
While the authors appear to have performed an extensive review, they do not state that a systematic review of the literature was undertaken. In addition, few methodological details were provided. As acknowledged in the article, some of the studies used had weaknesses in their designs and small sample sizes. Moreover, the authors presented only the statistically significant results for the quality of life data, but all results for the clinical effects. The reason for this selectivity is unclear.

The clinical effects from all the studies are quoted as percentage reductions in the use of drugs and hospital days, but the article does not state the initial levels. It is possible that the initial levels were different across the studies since the authors suggest that there may have been differences in the patient groups. This would bias the percentage reduction results. Moreover, it is unclear how the model generated different cost estimates for the three different daily dialysis modalities.

Validity of estimate of measure of benefit
This was a cost-consequences study where no summary health benefit measure was used. The authors summarised data on the clinical outcomes (the use of EPO, antihypertensives and hospitalisations), but these are not linked to any improvements in health outcomes, for example, increased survival due to an improvement in cardiovascular functioning.

Validity of estimate of costs
The authors stated that they adopted a societal perspective, but they excluded the indirect costs from the analysis. All relevant direct costs were included, and the resource use and price data were obtained from well-recognised national sources. The authors aimed to include the patients' costs and state that "patient obligations are 18% of total costs". The justification for the 18% figure is not provided. The sensitivity analyses carried out revealed a wide degree of uncertainty. The threshold analysis was useful as it showed that a small reduction in hospital bed days with daily dialysis would result in it being cost-saving.

Other issues
The authors state that these findings may not be generalisable to the general dialysis population, since the patients were selected for the daily dialysis programmes because of their poor performance on conventional treatment. The study was not a randomised controlled trial. Thus, the characteristics of the patient samples may differ and the results may be biased.

In short, this study presents reasons for optimism for some patients. However, no firm clinical or cost-effectiveness conclusions can be drawn without further research. This is reflected in the authors' conclusions.

Implications of the study
The authors present a strong case for a longer-term randomised trial to confirm the short-term clinical benefits and cost implications of daily dialysis, and to evaluate the long-term impact of improved cardiovascular functioning. The authors also suggest numerous policy changes to encourage the diffusion of daily dialysis treatment. Most of these suggestions relate to the American health care system.

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