

Systematic review of the effectiveness and cost-effectiveness, and economic evaluation, of home versus hospital or satellite unit haemodialysis for people with end-stage renal failure

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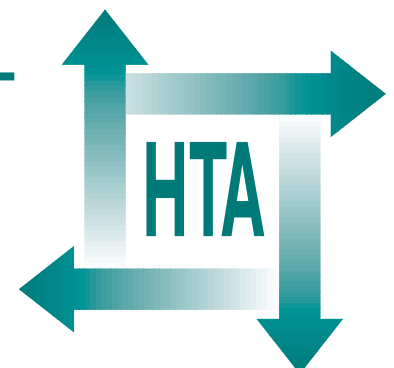


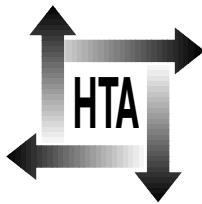
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Executive summary

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Executive summary

Background

End-stage renal failure is the irreversible loss of kidney function. When loss of kidney function reaches the point at which the kidneys fail to support life, then renal replacement therapy (RRT) is required. Several types of RRT are available. Renal transplantation is generally seen as the most cost-effective approach for patients who are suitable, with the other modalities of RRT being haemodialysis and peritoneal dialysis. Because transplantation is limited by the supply of donor kidneys, many people need lifelong dialysis. Home haemodialysis offers the opportunity to tailor the haemodialysis regimen more closely to individual requirements. Hospital haemodialysis is provided in a specialist unit in a large district general hospital or teaching hospital, while satellite haemodialysis units tend to be based in smaller district general hospitals.

Objectives

This review aims to assess the effectiveness and cost-effectiveness of home haemodialysis, compared with haemodialysis carried out in a hospital or satellite unit, for people with end-stage renal failure.

Methods

The primary outcomes considered were quality of life, hospitalisation rate, employment/school status, technique failure and access failure; other outcomes were measures of anaemia, use of erythropoietin, biochemical indices of renal disease, dialysis adequacy, blood pressure, adverse events and mortality. Electronic searches were conducted to identify published and unpublished studies. Two reviewers independently extracted data and assessed study quality. A Markov model comparing home with hospital and satellite haemodialysis was constructed. The model was used to estimate costs and quality-adjusted life-years (QALYs) for a 5-year period for patients starting RRT on home, satellite or hospital haemodialysis.

Results

Number and quality of studies

A total of 27 studies met the inclusion criteria on effectiveness: four systematic reviews, one randomised crossover trial and 22 comparative observational studies. The methodological quality of the systematic reviews was assessed using a 10-item checklist designed for this purpose. Out of an overall score from 1 (extensive flaws) to 7 (minimal flaws), one review scored 5 (minor flaws), one review scored 4, and two reviews scored 3 (major flaws). The quality of the primary studies was assessed using a checklist designed to assess the quality of both randomised and non-randomised studies, and contained 27 items. The overall mean score for the quality of all primary studies was 12 (out of a possible 27).

Direction of evidence

Despite major concerns about patient selection effects, the general direction of evidence from the included studies suggests that home haemodialysis is more effective than hospital haemodialysis, and also modestly more effective than satellite haemodialysis.

Summary of benefits

People dialysed at home generally experienced a better quality of life. There was a suggestion, however, that their partners tended to be less satisfied, both with the home setting for haemodialysis and with the increased dependency placed on them. Compared with hospital haemodialysis, patients on home haemodialysis were hospitalised less, tended to live longer, were more likely to be in full-time work and experienced fewer adverse events during haemodialysis. The one study giving details of technique survival (the time that a person remains on a particular form of RRT) suggested that patients dialysed in satellite units achieved a longer median technique survival time than those on home haemodialysis. For some outcomes, a number of studies reported statistically significant differences in favour of home haemodialysis; for other outcomes, differences were more modest but generally still favoured home haemodialysis. ▶

People undergoing home haemodialysis, however, are a highly selected group; they tend to be younger and have fewer co-morbidities than those being dialysed in hospital or satellite units. Because of these differences and the opportunities for longer and more frequent haemodialysis sessions in the home than would normally be available in hospital or satellite units, it is difficult to provide an accurate estimate of the relative effectiveness of home haemodialysis.

Costs

The evidence is overwhelmingly in favour of lower total costs for home haemodialysis compared with hospital haemodialysis. Despite the initial high costs of home haemodialysis, due to set-up and training costs, the payback period for these higher costs (relative to hospital haemodialysis) is approximately 14 months. Satellite units may vary considerably in cost, depending on the staffing intensity and the ability to maximise use of the haemodialysis machines. For low-risk adults (the base case analysis), home haemodialysis is less costly per session than satellite haemodialysis, which in turn is less costly than hospital haemodialysis. The principal reason for this is the lower staffing requirements of home and satellite haemodialysis.

Cost/QALY

The review identified six studies with strong designs, although potentially still subject to patient selection bias. The outcome measure used in most studies was survival. One study with QALYs as an outcome measure found that costs were lower and QALYs higher for home haemodialysis compared with hospital haemodialysis. Overall, the studies supported home over hospital haemodialysis. Home haemodialysis may also have advantages over satellite haemodialysis, though some researchers noted benefits of satellite haemodialysis that are hard to quantify, such as patient and family preferences for having treatment outside of the home.

The results of the economic model generally reflected those from the literature, for younger, fitter patients without serious co-morbidities who received haemodialysis for 4–5 hours 3 times per week. The main difference between the results of the model and the literature was that, over a 5-year period, the model indicated that home haemodialysis did not dominate, that is, home haemodialysis was more effective but more costly than satellite haemodialysis, although the additional cost per QALY was modest, at approximately £2200.

Sensitivity analyses

Sensitivity analysis was conducted on the cost of home haemodialysis (cost of the machine and length of the training period), the staffing requirements for satellite haemodialysis (to reflect the different ways in which such units could be organised), the level of benefits each modality of haemodialysis might provide, travel costs and the cost of allowances. The two factors that most influenced the estimates of cost per QALY were travel costs and the cost of providing allowances for the carers of patients on home haemodialysis. For patients facing the lowest travel costs (i.e. living closest to the haemodialysis unit) and receiving the highest level of allowance (i.e. the most disabled), the incremental cost per QALY of home haemodialysis, compared with hospital haemodialysis, was approximately £12,000. When compared with satellite haemodialysis, the incremental cost per QALY of home haemodialysis was £45,000–50,000.

Limitations of the calculations

In general, the data used in the model were limited and came from non-randomised studies. It is important to note that a new generation of home haemodialysis machines is under development but could not be analysed in this review. These new machines may lower the rate of complications in the home or diminish the need for carer involvement, thereby reducing the need for family participation (which is often seen as a factor lessening the attractiveness of home haemodialysis compared with satellite haemodialysis).

Conclusions

Home haemodialysis has tended to be used on a highly selected group of relatively young patients with low co-morbidity. This review shows that it is generally more effective than hospital haemodialysis on a range of outcomes, and modestly more effective than satellite haemodialysis. It is unclear to what extent these findings are influenced by selection bias. The evidence is in favour of lower total annual costs for home haemodialysis compared with hospital haemodialysis, with treatment costs of satellite haemodialysis lower than hospital haemodialysis but higher than home haemodialysis.

Generalisability of the findings

Most of the included studies were observational studies, which are particularly vulnerable to unknown confounding factors that could bias the

results. Overall, the number of people on home or satellite haemodialysis was much less than those on hospital haemodialysis. Within studies, socio-demographic characteristics and co-morbidities were generally not evenly balanced between the participant groups, although some studies attempted to adjust for this by employing Cox proportional hazards regression models. Finally, in many of the studies, the haemodialysis intervention was poorly described in terms of the equipment used, and the duration and frequency of haemodialysis. For these reasons, any suggestion of generalisability must be at best tentative.

Implications

Expanding home and satellite haemodialysis services may provide a method of coping with increasing numbers of people requiring RRT, with less additional resources required than would otherwise be needed to expand hospital haemodialysis services. While the expansion of home haemodialysis may improve the well-being and financial security of patients, it may add considerably to the stress on carers and families. The net effect on a family's income is uncertain because it depends upon what, if any, paid employment would be given up by the carer.

The expansion of home haemodialysis programmes may be difficult to achieve without recruiting and training additional nurses. Under-supported programmes may not realise the same level of benefits as those programmes identified from the literature.

Recommendations for research

Further prospective comparative studies are needed on the effectiveness and cost-effectiveness of home versus satellite unit haemodialysis. Further qualitative research is also needed on the acceptability to patients and their carers/families of home haemodialysis as a form of treatment.

Publication

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