Cost and outcome analysis of home parenteral and enteral nutrition

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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
Home parental and enteral nutrition (HPEN) in patients with intestinal failure.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Male and female patients aged over 18 years receiving either HPN or HEN or HPEN were included in the analysis.

Setting
Hospital and community. The economic study was conducted in the USA.

Dates to which data relate
The main effectiveness data were obtained from a single trial conducted between 1991 and 1996. Resource and cost data were taken from 1991-96 sources. The price year was 1996.

Source of effectiveness data
The estimates of complication rates, hospitalisation rates, utilization of resources, patient-reported side effects and the impact of therapy on lifestyle and health status were derived from a single trial.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample as that used in the effectiveness study.

Study sample
Twenty-three patients receiving HPN, 9 receiving HEN and 7 patients on HPEN were included in the analysis. Those patients receiving both HPN and HEN concurrently were included in both categories, thus resulting in 16 patients (11 female) receiving HEN and 30 patients (19 female) receiving HPN. The mean age was 53 years in the HEN group and 52 years in the HPN group. The HPN group had mainly inflammatory bowel disease and superior mesenteric artery thrombosis. The HEN group had mainly superior mesenteric artery thrombosis. Power calculations to determine the sample size were not undertaken.

Study design
Case series study. The duration of the follow-up was not stated. There was no loss to follow-up.

**Analysis of effectiveness**
The effectiveness analysis was based on intention to treat. The primary health outcomes were complication rates, hospitalization rates, utilization of resources, patient-reported side effects and the impact of therapy on lifestyle and health status. A questionnaire was used to assess the impact of therapy on lifestyle (including patient employment, financial reimbursement and side effects due to therapy) and health status. The enteral and parenteral groups were similar with respect to age, weight, height and sex distribution. The primary diseases were, however, different between the groups.

**Effectiveness results**
The annual number of metabolic complications per HPN patient varied from 0.23 in 1993 to 0.64 in 1991. The corresponding figures for HEN patients ranged from zero in 1992 and 1993, to 1.47 in 1995. The number of mechanical complications per HPN patient per year varied from 0.07 in 1991 and 1994, to 0.55 in 1996. The corresponding figure for HEN ranged from 0.17 in 1993 and 1996, to 1.2 in 1995. The number of instances of infectious complications in HPN patients varied from 0.42 in 1994 to 1.27 in 1993. The corresponding figures for HEN ranged from 0.1 in 1995 to 0.67 in 1992. The number of hospitalizations per HPN patient per year varied from 0.52 in 1992 to 1.1 in 1995. The corresponding figures for HEN ranged from zero in 1991, 1992, 1993 and 1995 to 0.5 in 1994. The number of days HPN patients were hospitalized varied from 3.34 to 12.40 days. The corresponding figures for HEN patients ranged from zero in 1991, 1992, 1993 and 1995 to 18 in 1994.

The number of clinic visits for HPN patients varied from 6.4 in 1996 to 8.23 in 1995. The corresponding figures for HEN ranged from 4.4 in 1992 to 7.58 in 1994. The number of nurse visits for HPN patients varied from 5.13 in 1992 to 12.63 in 1995. The corresponding figures for HEN ranged from 1.6 in 1991 to 6.7 in 1996. Of 39 lifestyle-related questionnaires mailed, 78% were returned (10 from HEN patients and 22 from HPN patients). The impact of HPEN therapy on lifestyle was similar between the two groups and was mainly in the areas of sleep (8 in the HEN group and 13 in the HPN group), travel (6 in the HEN group and 13 in the HPN group), exercise (5 in the HEN group and 8 in the HPN group), leisure (3 in the HEN group and 8 in the HPN group) and social life (4 in the HEN group and 9 in the HPN group).

Of 36 lifestyle-related questionnaires mailed, 62% were suitable for analysis (7 from HEN patients and 17 from HPN patients). There was no significant difference between the scores of the HPN patients and those of the HEN group, (p<0.01).

**Clinical conclusions**
Home nutrition support had a significant negative impact on patient's quality of life and lifestyle.

**Measure of benefits used in the economic analysis**
The outcome measures were the impact of therapy on lifestyle (including patient employment, financial reimbursement and side effects due to therapy) and health status. Quality of life was assessed by using the SF-36 health survey. Patient scores were computed for each of the 8 domains: physical functioning, role limitations due to physical health problems, bodily pain, social functioning, general mental health, role limitations because of emotional problems, vitality, general health perceptions.

**Direct costs**
Because actual costs were not readily available, costs were based on charges billed by the various institutions. Clinic visits, drugs, laboratory tests, nursing visits, hospital, pump, intravenous solutions and miscellaneous charges were included in the analysis. The quantities were reported separately from the prices. A discounting rate of 5% was applied. The cost of hospitalization, clinic visits, laboratory tests, drugs and parenteral solutions were based on 1996 charges at the Albany Medical Center. The cost of parenteral solutions was estimated by using 1996 Medicare allowable charges.
Nursing visits, pump rental and miscellaneous charges were taken from 1996 Medicare allowable charges. Enteral tube feeding charges per packet or can were obtained from the 1996 Red Book using the average wholesale price. The quantities/cost boundary adopted was the payer. The price year was 1996.

**Statistical analysis of costs**
Not undertaken.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
Not undertaken.

**Estimated benefits used in the economic analysis**
Of 39 lifestyle-related questionnaires mailed, 78% were returned (10 from HEN patients and 22 from HPN patients). The impact of HPN therapy on lifestyle was similar between the two groups and was mainly in the areas of sleep (8 in the HEN group and 13 in the HPN group), travel (6 in the HEN group and 13 in the HPN group), exercise (5 in the HEN group and 8 in the HPN group), leisure (3 in the HEN group and 8 in the HPN group) and social life (4 in the HEN group and 9 in the HPN group). Of 36 lifestyle-related questionnaires mailed, 62% were suitable for analysis (7 from HEN patients and 17 from HPN patients). There was no significant difference between the scores of the HPN patients and those of the HEN group, (p<0.01).

**Cost results**
The average annual cost per patient for hospitalization for HPN patients varied from $1,703 (+/- 2,906) in 1992 to $9,128 (+/-28,075) in 1995. The mean annual cost per HEN patient for hospitalization varied from zero in 1991, 1992, 1993 and 1995 to $4,901 (+/- 13,861) in 1994. The average annual cost for miscellaneous items in HPN varied from $6,865 (+/-2,044) in 1991 to $8,948 (+/-2,2600) in 1996. The average annual cost for miscellaneous items in HEN patients varied from $2,190 (+/- 298) in 1991 to $5,605 (+/- 776) in 1996. The cost of pump rental in both the HEN and HPN groups varied widely from a minimum of $1,322 (+/-948) in 1992 to $3,267 (+/- 856) in 1991 in the HPN group and from $377 (+/- 140) in 1992 to $1,198 (+/- 595) in 1996 in the HEN group. The cost of solutions per patient per year ranged from $27,904 (+/-13,139) in 1993 to $32,167 (+/- 15,544) in 1996 (from $55,193 (+/-30,596) in 1996 to $63,600 (+/- 27,732) in 1995 when estimated from 1996 Medicare allowable charges). The mean cost per patient per year for enteral tube feedings varied from $4,710 (+/- 2995) in 1992 to $10,536 (+/- 10,343) in 1995. The total costs for HPN therapy were $70,000 (range: $15,000 - $169,000) per year based on 1996 data. The corresponding figures for HEN therapy was $18,000 (range: $5,000 -50,000). As the cost data included all complications, regardless of whether hospitalization was required, the total costs might have been overestimated.

**Synthesis of costs and benefits**
Costs and benefits were not combined.

**Authors' conclusions**
This study showed that the majority of the cost of HPEN therapy is associated with the direct provision of nutrition, although, in some patients, hospitalization due to complications of therapy exceeded the cost of HPEN and constituted the largest portion of expenditure. HPEN was associated with a quality of life similar to dialysis patients but lower than...
that of the US population.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of comparator is clear. The use of HPEN is growing rapidly in the USA. However, reports from the literature have suggested significant cost savings when nutrition support is provided in the home instead of in the hospital environment. You, as a user of this database, should consider whether these are widely used health technologies in your own setting.

**Validity of estimate of measure of benefit**
The estimate of measure of benefits used in the economic analysis is likely to be internally valid. As the responses of the entire HPEN population have not been captured, the impact of therapy on lifestyle and the health status reported might be misleading. The data do not appear to have been used selectively. However, the robustness of the results was not examined using a sensitivity analysis. As the authors noted, the comparison of health status scores of the HPEN population with historical, non-randomised controls was a shortcoming of this study.

**Validity of estimate of costs**
Because actual costs were not readily available, costs were based on charges billed by the various institutions, and they do not, therefore, reflect the true cost to the institution. Resources and quantities were reported separately from the charges and adequate details of methods of quantity/cost estimation were given. As stated by the authors, the true cost to the system, the cost to the provider of the service, was not calculated. No statistical analysis was conducted and, as the study was retrospective, the costs need to be treated with a degree of caution.

**Other issues**
Appropriate comparisons were made with other studies in terms of clinical and economic outcomes and the results do not appear to have been presented selectively. However, the findings need to be treated with caution when extrapolated to the general HPEN population (the major new indication for HPEN therapy was neoplasms). Furthermore, as this study was conducted in a well-established programme, the findings may not be applicable in less-experienced centres.

**Implications of the study**
As HPEN was associated with a quality of life similar to dialysis patients but lower than that of the US population, further analysis is required in comparing to a matched, parallel group of dialysis patients and the general population. Direct non-medical costs such as transportation and lodging and indirect costs could be included in the analysis to broaden the perspective. Data could also be analysed according a potential mortality rate.

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