Long-term transcutaneous electrical nerve stimulation (TENS) use: impact on medication utilization and physical therapy costs
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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
Using transcutaneous electrical nerve stimulation (TENS) in the pain management of chronic pain patients (CPPs).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Chronic pain patients (CPPs).

Setting
Hospital. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data for TENS use related to the period between October 1993 and 31 May 31 1994. The fiscal year was 1994.

Source of effectiveness data
Effectiveness data were derived from a single study (Fishbain, 1996).

Link between effectiveness and cost data
Costing was retrospectively performed on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. A total of 506 patients from a population of 2,003 who bought TENS devices were interviewed. The long-term users (LTU) of TENS (at least for six months) accounted for 74.3% (n=376) of the interviewed patients with an average (SD) age of 47.9 (14.7) years, while 75 patients were among the non-user (NU) patient group (not using TENS for at least six months). 11.3% of patients (n=256) with auto-insurance payer status were excluded from the study.

Study design
This was a before-and-after study, carried out in a single centre. The patients were randomly chosen for interview from
a population of 2,003 patients divided into equal groups of worker-compensation and non-worker-compensation patients in terms of the replicates method. The duration of the follow-up was at least 6 months. The loss to follow up was 29 patients in the LTU group and 26 patients in the NU group.

Analysis of effectiveness
The analysis of effectiveness was based on treatment completers only. The primary outcome measures were reported for the LTU group and included: satisfaction (overall satisfaction, ease of use/convenience, effectiveness of pain management, quality of device, and comfort of the stimulation); change in pain interference, actual pain relief, and change in medication use from pre-TENS use; change in therapy use; patient perceptions for change in activity level, pain management, help in return to work, and medication use. The effects of potential confounding variables including placebo response, regression to the mean, the effects of pre-TENS treatment in a sub-sample of patients, recall bias, lack of factual information, and the definition of the LTU group were discussed.

Effectiveness results
The LTU patients had a mean (SD) overall satisfaction of 8.19 (2.08) on a 10-point scale, with 10 representing excellent. The mean change (based on a 10 point scale) in pain interference with work outside the home was 2.70, with activity inside the home was 3.03, with social activity was 2.79, and with pain relief was 2.47 (p<0.001). Positive values show decreased pain interference and increased pain relief.

The mean change (reduction) in medications was:

- narcotic/analgesic, -0.277 (p<0.001);
- tranquillisers, -0.021 (p<0.05);
- muscle relaxants, -0.043 (p<0.01);
- nonsteroidal anti inflammatory drugs (NSAIDS), -0.088 (p=0.003);
- steroids, -0.016 (p=0.014).

The percentage of mean change in other therapies was:

- physical therapy/occupational therapy (PT/OT), -55.8;
- chiropractic, -12.8;
- Rx medication, -26.1;
- no therapies, 30.8.

P was <0.001 for all categories.

Patient perceptions of change (in terms of the difference between 'yes' and 'no' answers) were: activity level 31.8%, pain management 71%, help in return to work 72.4%. All differences had p values of <0.0001. The patient perception of change in medication use difference figure was 1.6%, (p=0.826).

Clinical conclusions
The authors concluded that the results suggest that TENS improves multiple outcome variables as well as pain relief for CPPs who are long-term users. For some CPPs, long-term TENS use is effective.

Modelling
A cost simulation model was used to estimate the costs of pain medication and physical therapy.

**Outcomes assessed in the review**
The review assessed activity level, return to work, and pain medication consumption

**Study designs and other criteria for inclusion in the review**
Not reported.

**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**
A total of 6 studies were included.

**Methods of combining primary studies**
Not reported.

**Investigation of differences between primary studies**
Not reported.

**Results of the review**
It was reported that the non-treated group "showed a significant increase in the amount and number of pain medications used".

**Measure of benefits used in the economic analysis**
No summary benefit measure was identified in the economic analysis, and only separate health outcomes were reported.

**Direct costs**
Cost discounting was not required given the short follow-up period (less than one year). Quantities were reported separately from the costs and cost items were reported separately. The cost analysis covered the costs of medication and physical therapy. The perspective adopted in the cost analysis was not explicitly specified. The sources of cost data were a random survey of pharmacies, the Drug Topics Red Book, and fee schedules of the Washington State Department of Labor and Industries (L&I). L&I standard clinical guidelines were used to estimate the resource utilisation due to physical therapy. 1994 price data were used.

**Indirect Costs**
Not considered.
Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was conducted.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
The percentage per month cost reduction (for low and high dosages of the drugs) at 6-month follow-up in comparison to cost per month when TENS was initiated was up to 55% for medications and up to 69% for PT/OT.

Synthesis of costs and benefits
No synthesis of costs and benefits was performed.

Authors' conclusions
The long-term use of TENS is associated with a significant reduction in the utilization of pain medication and PT/OT. In this study population, cost simulations of medication and PT/OT indicate that, with long-term TENS use, costs can be reduced up to 55% for medications and up to 69% for PT/OT. The potential for TENS-associated improvement, combined with reduced medication-related complications and costs, are important points that clinicians should consider when constructing a treatment plan for chronic pain patients. Finally, cost simulation techniques provide a useful tool for assessing outcomes in pain treatment and research.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear.

Validity of estimate of measure of benefit
The internal validity of the estimates of effectiveness may be weakened by the before-and-after design of the study. As acknowledged by the authors, a control group could have been included in the analysis. The use of a telephone survey and the retrospective reporting of data may have been subject to recall bias. Since no unique benefit measure was identified in the economic analysis the study may be regarded as a cost-consequence analysis.

Validity of estimate of costs
Quantities were reported separately from the costs and adequate details of methods of cost estimation were given. As acknowledged by the authors, the study lacked a comprehensive and prospective cost analysis.

Other issues
Given the lack of a prospective effectiveness analysis, sensitivity analysis, and statistical analysis of the costs, the results should be treated with some caution. The authors acknowledge that the results may not be generalisable to the general population and they should be interpreted in the light of the authors' caveats.

Source of funding
Research supported by Empi Inc.
Bibliographic details

PubMedID
9535316

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Data Collection; Drug Costs; Drug Therapy; Female; Health Care Costs; Humans; Interviews as Topic; Male; Middle Aged; Palliative Care /methods; Physical Therapy Modalities /economics; Telephone; Time Factors; Transcutaneous Electric Nerve Stimulation

AccessionNumber
21998000499

Date bibliographic record published
31/05/2000

Date abstract record published
31/05/2000