Cost-effectiveness of migraine prevention: the case of topiramate in the UK

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 study assessed the use of topiramate (TPM, 100 mg/day), a neuromodulatory compound with stabilising properties, as a migraine preventive therapy. This was compared with no preventive therapy.

Type of intervention
Primary care.

Economic study type
Cost-effectiveness analysis and cost-utility analysis.

Study population
The study population for the model comprised adults with a moderate to high frequency of migraine.

Setting
Although the setting was not explicitly stated, it appears to have been outpatient. The economic study was carried out in the UK.

Dates to which data relate
The effectiveness data were derived from sources published between 1995 and 2005. Resource use was derived from sources published in 2003. The cost data were based on sources published in 1999 and 2005. The price year was 2005.

Source of effectiveness data
The clinical parameters associated with the two treatment alternatives included the monthly migraine frequency, the clinical responses to TPM treatment, the treatment discontinuation rate, and the reduction in migraine rate by response category.

Modelling
The authors used a US model to assess the cost-effectiveness of TPM from the UK NHS perspective (Brown et al. 2005, see 'Other Publications of Related Interest' below for bibliographic details). As the model had been published already, no further details were provided in the present paper. The time horizon was 12 months.

Sources searched to identify primary studies
The base-case monthly migraine frequency, the probabilities of response (>= 75%, 50 - 75% and <50% reduction in migraine frequency) and the treatment discontinuation rate were derived from pooled data from three randomised, double-blinded, placebo-controlled trials (RCTs) of TPM (Brandes et al. 2004, Diener et al. 2004 and Silberstein et al. 2004, see 'Other Publications of Related Interest' below for bibliographic details). The average reduction in migraine
frequency for each response group was determined from a simulation conducted using Crystal Ball 2000.2 Standard Edition software (Decision Engineering, Denver).

**Methods used to judge relevance and validity, and for extracting data**
The process used to identify the published studies and clinical trials was not reported. No inclusion criteria were specified for any of the parameters. The method used to select the estimates was neither reported nor discussed.

**Measure of benefits used in the economic analysis**
The measures of benefit used were the number of migraines averted and the quality-adjusted-life-years (QALYs). Quality of life weights (utility values) were derived from SF-36 data derived from TPM trials. The utility values associated with drop-outs and no-treatment categories were based on authors’ assumptions.

**Direct costs**
Patient and health service costs were included in the analysis. Visits to the physician, hospitalisations, visits to the emergency room, triptan medication for the treatment of migraine attack and usual care, TPM treatment and drug dispensing fees were costed. The resources quantities were derived from published studies. Specifically, the use of acute medical services per attack was derived from Caro et al. 2000 and 2001, (see ‘Other Publications of Related Interest’ below for bibliographic details), while the costs of direct preventive treatment were based on authors’ assumptions. The unit costs were mainly taken from national British published unit costs. The costs were not discounted. The price year was 2005. The resource quantities and the unit costs were reported separately.

**Statistical analysis of costs**
The costs were treated deterministically and no statistical tests were carried out.

**Indirect Costs**
Although they were not included in the base case analysis, indirect costs were assessed in the sensitivity analysis, through the loss of work days. The authors valued indirect costs according to lost productivity costs (i.e. the number of hours of lost work associated with each migraine) and, therefore, they included only those attacks occurring on work days. The unit cost of this was reported, an average hourly wage taken from UK National Statistics being used. Quantities and costs were reported separately. The quantities were taken from Caro et al. 2000 and 2001. The price year was 2005.

**Currency**
UK pounds sterling (€).

**Sensitivity analysis**
One-way sensitivity analyses were conducted to investigate the robustness of the results to variability of the input parameters. Key model parameters investigated in the sensitivity analyses were the number of migraines per month (3 to 12), the rate of triptan use per attack (0 to 100%), the treatment discontinuation rate (0 to 50%) and the utility value (-60 to +60%). The impact of indirect costs was also assessed in the sensitivity analysis.

**Estimated benefits used in the economic analysis**
The number of migraines averted with the TPM treatment was 1.81 compared with no preventive treatment.

The mean number of QALYs gained with the TPM treatment was 0.0384 compared with no preventive treatment.
Cost results
The total monthly medical cost was 37.13 for the TPM treatment and 18.80 for the comparator. Therefore, the incremental monthly cost for preventive TPM treatment was 18.33.

The projected incremental cost per year was reported to be 220.

Synthesis of costs and benefits
An incremental cost-effectiveness analysis was performed.

When compared with no preventive treatment, TPM treatment resulted in an incremental monthly cost per migraine averted of 10.13 and an incremental annual cost per QALY gained of 5,728.

The results of the sensitivity analysis showed that the cost per migraine averted was sensitive to the assumed baseline migraine frequency and also to the gain in health utilities.

If indirect costs were included, the total cost of TPM treatment was 17.91 lower than the cost of no preventive treatment. Thus, from a societal perspective, the TPM treatment was the dominant strategy (the effectiveness was higher and the costs were lower).

Authors' conclusions
"Use of topiramate (TPM) versus no preventive treatment may be a cost-effective way to prevent occurrence of migraine headache in the UK."

CRD COMMENTARY - Selection of comparators
Although no explicit justification was provided for the comparator used, it would appear to represent current practice in the UK setting. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The authors did not state that they undertook a systematic review of the literature, thus the available data might have been used selectively. In addition, the authors applied their own estimate, which they stated was consistent with the data from various trials, i.e. they justified their assumptions with reference to the literature but did not extract the data directly. The authors do not appear to have taken weights for different sample sizes into account, nor did they consider the impact of differences between the studies. Although the authors carried out a number of sensitivity analyses investigating uncertainty around the estimates used, hence improving the generalisability of the results, it was difficult to determine whether the ranges used in the sensitivity analyses were appropriate given that the methods used to derive these ranges were not discussed.

Validity of estimate of measure of benefit
The estimate of benefits was modelled from the effectiveness evidence (the number of migraines averted). Health utility (QALYs) was also assessed. The utility values were derived from the literature and the method used to estimate the utility weights was reported. This measure enables broad comparisons to be made with other technologies.

Validity of estimate of costs
From the cost perspective adopted all the relevant categories of cost appear to have been included in the analysis. The unit costs were reported separately from the resource quantities, which will enhance the generalisability of the authors' results. The resource use quantities were taken from the literature and no other sources. No statistical analysis or any other analysis of the quantities was carried out. A sensitivity analysis of the costs was conducted to investigate the effect of not including indirect costs. Prices were taken from published sources only. No statistical, sensitivity analysis or any analysis of the prices was carried out. Since all the costs were incurred during a short time, discounting was unnecessary and was appropriately not carried out. The price date was adequately reported, which will assist future inflation.
exercises.

**Other issues**
The authors compared their findings with those of US studies that analysed TPM as a treatment for patients with migraine and those of other generally accepted health interventions. No comparisons in the field of UK migraine cost-effectiveness models could be made since this was the first attempt to evaluate the economic impact of TPM for the prevention of migraine in the UK. The issue of the generalisability of the results to other settings was not directly addressed.

The authors acknowledged various limitations to their study. First, they used conservative assumptions to build the model, which may explain the differences found in outcomes between the model and the results of the trials. Second, the assumptions used in the model were based on data not specific to the UK setting. Third, the authors used the SF-36 to derive the QALYs, although this tool is not a utility instrument for economic analysis; directly measured utilities would have been preferable. Finally, the use of the human capital approach to value lost work time in the cost analysis might have led to an overestimation of the indirect costs. In addition, the authors did not include the costs associated with the patients' travel time or the costs of care provided by friends or family members in the analysis, although these are not required from a health service perspective.

**Implications of the study**
The authors did not make explicit recommendations for changes in policy or practice. However, the discussion highlighted areas where more information is needed.

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**Bibliographic details**

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**Other publications of related interest**
Because readers are likely to encounter and assess individual publications, NHS EED abstracts reflect the original publication as it is written, as a stand-alone paper. Where NHS EED abstractors are able to identify positively that a publication is significantly linked to or informed by other publications, these will be referenced in the text of the abstract and their bibliographic details recorded here for information.


Adelman JU, Lainez MJA, Jacobs D, et al. Safety assessment of topiramate in migraine prevention: pooled results from over 1500 patients. 56th Annual Meeting of the American Academy of Neurology; 2004; San Francisco (CA), USA.


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Cost-Benefit Analysis; Decision Support Techniques; Fructose /analogcs & derivatives /economics /therapeutic use; Great Britain; Humans; Migraine Disorders /prevention & control; Models, Economic; Neuroprotective Agents /economics /therapeutic use; Quality of Life; Quality-Adjusted Life Years

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