Cost-benefit analysis of sumatriptan tablets versus usual therapy for treatment of migraine
Biddle A K, Shih Y C, Kwong W J

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 sumatriptan tablets (50 mg) for the treatment of migraine.

Type of intervention
Treatment.

Economic study type
Cost-benefit analysis.

Study population
The study population comprised patients suffering from migraine. The specific inclusion and exclusion criteria were not reported.

Setting
The setting was primary care. The economic study was conducted in the USA.

Dates to which data relate
The effectiveness evidence came from a study published in 1996, while the resource use data referred mainly to a study published in 1998. The price year was 1998.

Source of effectiveness data
The effectiveness evidence was derived from a single study (Adelman et al., see Other Publications of Related Interest) and from some authors' assumptions.

Link between effectiveness and cost data
The costing was performed, in part, prospectively on the same sample of patients as that used in the effectiveness analysis.

Study sample
Limited information on the study group was reported. The final sample comprised 220 nursing personnel. Further details were provided elsewhere (Adelman et al., see Other Publications of Related Interest).

Study design
This was an open, randomised clinical trial, which was conducted at 21 centres across the USA. The trial consisted of two phases. After a migraine attack, patients took usual therapy for a 2-month period and recorded migraine
symptoms, drugs taken, and the pain rating at baseline and at 2 and 4 hours after the first dose. Those who successfully completed the first phase started the second phase of the study, in which migraine attacks were treated with sumatriptan for up to 6 months. Other details of the study design and methods of outcome assessment were not reported.

Analysis of effectiveness
The outcome measures used in the analysis were a set of probability values that were subsequently in the decision model. The following probabilities were considered:

resolution within 2 hours;
use of rescue therapy if resolution was not achieved within 2 hours;
resolution with rescue therapy;
resolution without rescue therapy; and
physician office visit and emergency room visits (in the case of no resolution).

Productive time lost due to migraine was also estimated for resolution after 2 or 4 hours. No further information on the analysis of effectiveness was provided.

Effectiveness results
The estimated probability values with sumatriptan and usual therapy, respectively, were:

0.47 (sumatriptan) versus 0.09 (usual therapy) for resolution within 2 hours;
0.2453 (sumatriptan) versus 0.5055 (usual therapy) for the use of rescue therapy if resolution was not achieved within 2 hours;
0.96 (sumatriptan) versus 0.1733 (usual therapy) for resolution with rescue therapy;
0.3125 (sumatriptan) versus 0.1778 (usual therapy) for resolution without rescue therapy;
0.0439 (sumatriptan) versus 0.0276 (usual therapy) for physician office visit (in the case of no resolution); and
0.0044 (sumatriptan) versus 0.0052 (usual therapy) for emergency room visits (in the case of no resolution).

Productive time lost due to migraine was 38.6 minutes for resolution after 2 hours and 77.2 minutes for resolution after 4 hours.

Clinical conclusions
The effectiveness results suggested that sumatriptan was more effective (higher resolution rates) than usual therapy for the treatment of migraine. These values were used in the decision model.

Modelling
A model, based on a decision tree, was used to represent treatment alternatives and the possible outcomes of migraine treatment. After a migraine attack, the patient was offered sumatriptan or usual therapy and the two branches of the tree were similar. Nine possible, mutually exclusive outcomes were considered in the decision tree on the basis of the following six situations:

migraine is resolved (pain free) 2 hours after the first dose of treatment;
the patients received a second rescue dose of the same treatment if migraine was not resolved; 
migraine was resolved within 4 hours of the first dose; 
patients whose pain was not resolved visited a primary care doctor for further treatment; or 
grew an emergency room; or 
did not seek further medical care.

The model appears to have been deterministic.

**Methods used to derive estimates of effectiveness**
The authors made some assumptions that were used in the decision model.

**Estimates of effectiveness and key assumptions**
Some of the assumptions made in the model were as follows:

- sumatriptan 50 mg was considered comparable to sumatriptan 100 mg in terms of efficacy;
- the patient's productivity depended on the resolution of migraine within the first 4 hours of treatment;
- rescue therapy 2 hours after the failure of the first therapy did not change the 4-hour resolution rate;
- the maximum productivity loss for each migraine attack was 1 day's wages based on an 8-hour workday, given that most migraine attacks resolve within 24 hours; and
- productivity loss with usual therapy was assumed to be equal to that of sumatriptan.

**Measure of benefits used in the economic analysis**
The summary benefit measure used in the economic analysis was the economic benefit associated with the patient's ability to return to work after the migraine attack. This was estimated using the human capital approach, the treatment benefits being quantified by applying the national wage rate to a patient's productivity (assessed by productive working hours) after receiving migraine treatment. A modelling approach was used to assess the estimated benefits. A range of 0.4 to 1.5 migraine attacks per month, as reported in the epidemiological study, was considered. No discounting was applied.

**Direct costs**
Discounting was not relevant since the costs were incurred during a short time. The unit costs and the quantities of resources used were reported separately. The health services included in the economic analysis were sumatriptan, non-5HT1 agonists (usual therapy), physician office visits and emergency room visits. The cost/resource boundary reflected the societal perspective adopted in the study. The costs were estimated based on the average wholesale prices for non-5HT1 drugs (weighting the cost of each nontriptan agent by its rate of use as reported in the clinical trial and market share data) and on an administrative claims data analysis performed between 1989 and 1990 for visits to emergency room and physician offices. Resource consumption was derived from actual data estimated in a double-blind clinical trial. Some assumptions were also made. All of the costs were inflated to 1998 prices using the medical care component of the Consumer Price Index.

**Statistical analysis of costs**
The costs were treated deterministically in the base-case.
Indirect Costs
Indirect costs (i.e. productivity losses) were not considered on the cost side of the study, but were included in the economic benefit measure.

Currency
US dollars ($).

Sensitivity analysis
Uni- and bi-variate sensitivity analyses were conducted to assess the robustness of the estimated net benefits to variations in the model inputs and assumptions.

Estimated benefits used in the economic analysis
The total expected benefit was $66.75 with sumatriptan and $22.59 with usual therapy.

Cost results
The total expected cost was $17.03 with sumatriptan and $2.85 with usual therapy.

Synthesis of costs and benefits
The costs and benefits were combined by calculating the net benefit (difference between total expected benefit and total expected cost for each treatment).

The expected net benefit was $49.72 with sumatriptan and $19.73 with usual therapy. Therefore, the incremental net benefit with sumatriptan relative to usual therapy was $29.99 per attack and $114 to $540 per year (based on an estimate of 0.4 to 1.5 attacks per month).

The sensitivity analyses showed the key variables that had the greatest impact on the estimated net benefits. For usual therapy relief rates of lower than 11%, sumatriptan was the preferred strategy. However, when the usual therapy relief rate was between 11 and 84%, the incremental benefit of sumatriptan over usual therapy increased as its resolution rate increased, but there was little chance for usual care to become the preferred strategy.

The net benefits of sumatriptan were greater than those of usual therapy if a patient not achieving resolution at 4 hours lost at least 3 hours of productive time. Otherwise, usual therapy led to more net benefits.

The estimated financial advantage of sumatriptan was not affected by changes in the migraine resolution rate at 4 hours with and without rescue therapy, by changes in the cost estimates, or by changes in the wage estimates.

Authors' conclusions
Despite the higher initial acquisition cost, sumatriptan was more efficient than usual therapy for the treatment of migraine.

CRD COMMENTARY - Selection of comparators
The authors justified their choice of the comparator. Since no single non-5HT1 drug could be considered the 'gold' standard for migraine treatment, other non-5HT1 drugs were used as basic comparators in an aggregate manner. You should decide whether this approach would be valid in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness was mainly based on clinical data derived from a clinical trial. Limited information on
the primary study, which had been published, was provided. Therefore, it was not possible to assess the internal validity of the source of the effectiveness evidence. Some assumptions were also made and were used in the decision model. The authors investigated the robustness of the results by performing extensive sensitivity analyses. These enhance the validity of the analysis.

Validity of estimate of measure of benefit
The economic impact of treatment on the patients' working ability was considered the summary benefit measure. This was appropriate due to the cost-benefit approach taken in the economic evaluation. The quantification of benefits was based on the human capital approach, which represents a validated instrument used within the cost-benefit framework. The authors provided a justification for their choice of the human capital approach, but also reported the disadvantages of this approach. Discounting was, appropriately, not conducted due to the short time horizon of the analysis. The impact of the intervention on quality of life was not assessed due to the negligible impact of the therapy on quality-adjusted life-years. Indeed, migraine is considered a time-limited, episodic condition.

Validity of estimate of costs
The societal perspective was adopted, which was appropriate as migraine has an impact on resources borne by different subjects. The indirect costs were not included because they were already incorporated in the monetary benefit measure. Details of the cost analysis were satisfactorily reported. The resources used and the unit costs were presented separately and the price year was provided. These factors enhance the possibility of replicating the study in other settings and of conducting reflation exercises. The sources of both the resources and costs were reported. The costs were treated deterministically in the base-case, but extensive sensitivity analyses were conducted to deal with variability in the cost estimates.

Other issues
The authors compared their findings with a Canadian study that showed similar conclusions. The costs of treating migraine were also compared with those estimated in two published studies, to show the validity of the estimates used.

Implications of the study
The authors suggested that further research should investigate the economic impact of other triptans beside sumatriptan. The study results suggested that improvements in productivity losses and reductions in health care resources were observed in migraine patients treated with sumatriptan, compared with those treated with usual care.

Source of funding
None stated.

Bibliographic details

PubMedID
11079284

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Absenteeism; Cost of Illness; Cost-Benefit Analysis; Decision Trees; Double-Blind Method; Female; Humans; Migraine Disorders /drug therapy /economics; Randomized Controlled Trials as Topic; Serotonin Receptor Agonists /economics /therapeutic use; Sumatriptan /economics /therapeutic use; Time Factors

Accession Number
22000001810

Date bibliographic record published
30/09/2004

Date abstract record published
30/09/2004