Cost-effectiveness analysis of nimodipine treatment after aneurysmal subarachnoid haemorrhage and surgery

Karinen P, Koivukangas P, Ohinmaa A, Koivukangas J, Ohman 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
Nimodipine administration after aneurysmal subarachnoid haemorrhage (SAH) and surgery.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients undergoing surgery for aneurysmal subarachnoid haemorrhage (SAH).

Setting
Secondary care. The economic study was conducted in Oulu, Finland.

Dates to which data relate
Effectiveness and resource use data were collected between April 1985 and April 1987. Cost data were adjusted to 1996 cost levels.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
Costing was undertaken retrospectively on the same study sample as that used in the effectiveness analyses.

Study sample
The study sample consisted of 127 patients of both sexes who had ruptured aneurysm (verified using angiography), who presented with Hunt and Hess Grades I to III on admission, who underwent an operation within the first week after SAH and who had participated in a randomised prospective clinical trial. The initial trial included 213 patients, aged 16 to 70 years (mean 45 years). Patients with associated life-threatening intracerebral hematoma and a decreased level of consciousness were excluded from this initial trail. Other exclusion criteria included: pregnancy, hepatic or renal insufficiency, severe cardiac decompensation, and arrhythmia. Patients receiving any other investigative drug therapy or any other calcium channel blocker were also excluded from the initial study. The patients were randomly assigned to one of two treatment groups: one group received intravenous administration of nimodipine for 7 to 10 days after the haemorrhage and oral administration thereafter for a total of 21 days, whilst the other group received placebo in a
similar manner. The patients were randomly assigned to three surgery groups: acute surgery (operation 0-3 days after SAH), intermediate surgery (operation 4-7 days after SAH) and late surgery (operation 8 days or later after SAH). The present study population consisted of 127 patients who underwent an operation within the first week after SAH. The nimodipine group consisted of 62 patients and the placebo group 65 patients. Power calculations relating to the sample size were not reported in this paper.

**Study design**
This was a retrospective cost-effectiveness study based on a subset of patients enrolled in a randomised, placebo-controlled, double blind clinical trial (Ohman and Heiskanen, 1988). The duration of follow-up was 10 years. The loss to follow-up was not reported.

**Analysis of effectiveness**
The analysis of effectiveness appears to have been based on intention to treat. The main health outcomes used in the analysis were: 3-month follow-up mortality, mortality during the 10-year follow-up period, difference in sickness pensions during 10 years after SAH (pension was considered to reflect the limitation in functional ability) and length of hospital stay (LOS). Patients' baseline characteristics were not reported.

**Effectiveness results**
There was a statistically significant difference in 3-month mortality between the two treatment groups (p=0.03).

Eight patients in the placebo group died (12%), compared to only one in the nimodipine group (1.6%). Mortality during the 10-year period was 20 patients (30%) in the placebo group compared to 13 (21%) in the nimodipine group.

Within 10 years after SAH, 49 patients were granted pensions, 30 (45%) in the placebo group and 19 (30%) in the nimodipine group. This difference was not statistically significant (p=0.1).

Average LOS was 15.3 days, with no statistically significant difference between the treatment groups (p=0.2).

**Clinical conclusions**
Nimodipine has positive clinical effects on the outcome of SAH patients.

**Measure of benefits used in the economic analysis**
The benefit measure was life years gained.

**Direct costs**
Only direct hospital costs were analysed and these were derived from activity-based costing calculations at the Department of Neurosurgery, University of Oulu, Finland. These costs were divided into three categories: surgical management, inpatient days and drug (nimodipine). Surgical and inpatient day costs included light, heat, rent, cleaning and salaries. The drug cost was the actual price paid by the hospital. Intensive care unit day costs were estimated from the database of the Helsinki University Hospital. All costs were adjusted to the 1996 cost level and were not discounted as they occurred in the first year of the study.

**Statistical analysis of costs**
Not performed.

**Indirect Costs**
Not considered.
Currency
All costs were converted into US dollars ($), using the 1996 exchange rate ($1 = Fmk4.59).

Sensitivity analysis
Not performed.

Estimated benefits used in the economic analysis
The patients in the nimodipine group had 3.46 years longer life expectancy (incremental effectiveness) than those in the placebo group. Benefits do not appear to have been discounted.

Cost results
The total cost of nimodipine treatment was $9,981, and for the placebo group, $9,208.

Synthesis of costs and benefits
The incremental cost-effectiveness ratio was $223 for each additional life year gained.

Authors’ conclusions
The authors concluded that Nimodipine is cost-effective. Therefore, its use in the management of patients with SAH seems economically justified because it increases patient life years at very low incremental costs.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear, as both treatment alternatives were used in the authors’ setting. You, as a database user, should consider if the same applies to your own setting.

Validity of estimate of measure of benefit
The study sample represents a subsample of a double blind RCT. The patient groups’ baseline characteristics were reported in the article by Ohman et al, 1988 (see "Other Publications..." below), however, from the information presented in this paper, it is not clear, whether the two patient groups were comparable in their baseline characteristics, or whether the sample size was appropriate for the study: it is therefore difficult to judge the validity of the study findings. It appears that benefits were not discounted.

Validity of estimate of costs
Direct hospital costs were considered. The cost databases of several hospitals were used for data collection. Extensive comparisons were made with other studies regarding costs, and the authors found that costs vary depending on geographical location and resource use. Some studies estimated the cost of hospital admission to be double the figure estimated by the authors. A broader societal perspective could have been adopted, where costs to patients and others in society were also included in the analysis. Costs may not be generalisable to other settings or countries.

Other issues
The use of pensions for assessing limitation in functional ability following SAH is debatable, as the authors themselves acknowledge that the principal diagnosis leading to a pension grant was SAH, but degenerative joint disease and mental disorders were also important.

Implications of the study
Nimodipine might have a positive effect on health outcomes in the long run, but this was not proved in the study. Further studies are necessary to address the long-term outcomes.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
10515471

**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adolescent; Adult; Aged; Aneurysm, Ruptured /drug therapy /economics /surgery; Combined Modality Therapy; Cost-Benefit Analysis; Double-Blind Method; Female; Hospital Costs /statistics & numerical data; Humans; Intracranial Aneurysm /drug therapy /economics /surgery; Male; Middle Aged; Nimodipine /economics /therapeutic use; Postoperative Complications /drug therapy /economics; Retrospective Studies; Subarachnoid Hemorrhage /drug therapy /economics /surgery; Treatment Outcome; Vasodilator Agents /economics /therapeutic use; Vasospasm, Intracranial /drug therapy /economics

**AccessionNumber**
21999001887

**Date bibliographic record published**
30/09/2000

**Date abstract record published**
30/09/2000