Retrospective evaluation of the conversion of amlodipine to alternative calcium channel blockers
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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
The use of a variety of calcium channel blockers in the treatment of patients with hypertension.

Type of intervention
Treatment; Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Individuals with a diagnosis of hypertension, for whom two blood pressure measurements prior to and post formulary conversion were available. Only 1% of the final study sample of 100 patients was female. 94% of the population were Caucasian and 6% African–American.

Setting
Hospital. The economic analysis was conducted in West Palm Beach, Florida, USA.

Dates to which data relate
Effectiveness and resource data were collected between 1 February 1999 and 30 October 1999. A 1999 base price year was used.

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

Link between effectiveness and cost data
Cost data were collected retrospectively using the same population sample as that used in the effectiveness analysis.

Study sample
314 patients who had undergone conversion from amlodipine to other calcium channel blockers were identified. The method of sample selection and randomisation to identify this group were not stated in the paper. 212 (67.5%) of these patients did not meet the study protocol criteria and were excluded from the analysis. Another two patients (0.6%) appear to have been excluded although the reason for their exclusion was not stated, leaving 100 patients in the final study sample. It was calculated that, to have 80% power at a significance level of 0.05 of identifying a 4+/− 12 mm Hg change in diastolic blood pressure, or a change of 5+/− 15 mm Hg in systolic blood pressure, would require a study sample of 71 patients. 84 patients were initially switched to felodipine.
Study design
This was a single centre before and after study. The duration of follow up was until the second post conversion blood pressure reading. The mean time to this reading was 145 days. There was no loss to follow up.

Analysis of effectiveness
The analysis of effectiveness was based on the intention to treat. The primary clinical endpoints in the analysis were the levels of systolic and diastolic blood pressure. Secondary endpoints included mean arterial pressure, adverse events, and incidence of angina.

Effectiveness results
Mean diastolic blood pressure was reduced significantly following conversion from 74 +/- Std dev 9.5 to 72.6 +/- 10 mm Hg, (p=0.032). Mean arterial pressure also reduced significantly from 97.0 +/- 10.0 mm Hg, (p=0.026). Mean systolic blood pressure reduced and average pulse beats increased although neither of these results were significant. In subsequent analysis excluding 24 patients who had additional changes made in their treatment regimens at the time of conversion (5) or following conversion (19), diastolic blood pressure reduction, and mean arterial pressure remained significantly reduced. Mean systolic blood pressure was also now found to have reduced significantly from 141.4 +/- 14.5 to 137.7 +/- 14.3 mm Hg, (p=0.022), and the difference in pulse rate remained insignificant. 3 patients were switched back to amlodipine treatment and the remaining 16 patients had significantly increased systolic and diastolic blood pressure levels following conversion. This appeared to be primarily due to being switched to a calcium channel blocker other than felodipine or to a non-equivalent dose of felodipine. However the sample was too small to draw firm conclusions. Only three potential adverse events were observed.

Clinical conclusions
Switching patients from amlodipine to alternative calcium channels blockers is both safe and effective.

Measure of benefits used in the economic analysis
The effectiveness analysis demonstrated that switching patients to alternative calcium channel blockers was at least as effective and as safe as keeping patients on amlodipine, and therefore the economic analysis was based on the difference in costs only.

Direct costs
The costs associated with drug therapy and any adverse events were included in the analysis. Specifically, in addition to costs of the calcium channel blockers, the costs of additional co-therapy following conversion, such as additional anti-hypertensives and hospitalisations, and additional outpatient visits. Resources were identified separately from costs from a retrospective analysis of patient records. Veterans Administration acquisition costs were applied to drugs, and hospital specific costs were applied to additional costs of hospitalisation and outpatient visits. Costs were determined from the perspective of the study hospital. 1999 prices were used. Costs were not discounted, which was appropriate given the short duration of the study.

Indirect Costs
Indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

**Estimated benefits used in the economic analysis**
Not applicable.

**Cost results**
The mean cost per year per 100 patients receiving amlodipine treatment was $32,175. The costs per year for the 100 patients following conversion were $17,317, representing a reduction in costs of $14,858.

**Synthesis of costs and benefits**
Not applicable.

**Authors' conclusions**
Switching patients from amlodipine to other calcium channel blockers is safe, effective and leads to a reduction in the costs of treatment. It may be appropriate to switch patients to an equivalent dosage of felodipine, to reduce the likelihood of patients requiring adjustments to their therapy.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparators used in the analysis, namely that these alternative calcium channel blockers, felodipine, nifedipine, diltiazem and verapamil have previously been shown to be effective in the treatment of hypertension. You, as a user of the database should decide if these are widely used technologies in your own setting.

**Validity of estimate of measure of benefit**
The analysis was based on a retrospective before and after study, which does limit the usefulness of the analysis, and may introduce bias compared with prospective, randomised trials. The authors acknowledge the limitations of this study design, but noted that using such a naturalistic approach could help in observing the prescribing patterns used by physicians, as well as identifying inappropriate practice that should be eliminated. The authors did conduct sub-analysis excluding patients who had their treatment protocols changed at, or following conversion, to account for some potential bias in the sample. It was stated that a random study sample was used, but it is not clear how the original 314 patient records were identified. 214 records appear to have been excluded, but explanations were only provided for 212 of these. No estimate of benefit was used in the economic analysis; this was appropriate as the clinical analysis demonstrated that the comparator treatments were at least as effective as amlodipine.

**Validity of estimate of costs**
Cost information provided in the paper was relatively limited, although all categories of cost relevant to the perspective of the health care payer appear to have been included in the analysis. Quantities were reported separately from costs in the analysis, although only gross cost rather than unit cost data were provided. Resource use was determined from retrospective chart review. Cost data were taken from the authors' own setting and the price years used were reported. Discounting was not conducted, which was appropriate given the short duration of the study. In future analysis the authors may also wish to consider the impact on costs if a different perspective, such as the costs to society, were adopted.

**Other issues**
This is an interesting study, in an area where little economic data exists. The authors did make appropriate comparisons of their clinical findings with those from other studies. The economic conclusions of the analysis cannot, however, be generalised outside the authors' study setting.
Implications of the study
Within the caveats of dosage levels (see authors conclusions) the study's findings suggest that switching to calcium channel blockers is warranted on both clinical and economic grounds.

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