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Primary care

Cost effectiveness analysis of a randomised trial of acupuncture for chronic headache in primary care

David Wonderling, Andrew J Vickers, Richard Grieve, Rob McCarney

Abstract

Objective To evaluate the cost effectiveness of acupuncture in the management of chronic headache.

Design Cost effectiveness analysis of a randomised controlled trial.

Setting General practices in England and Wales.

Participants 401 patients with chronic headache, predominantly migraine.

Interventions Patients were randomly allocated to receive up to 12 acupuncture treatments over three months from appropriately trained physiotherapists, or to usual care alone.

Main outcome measure Incremental cost per quality adjusted life year (QALY) gained.

Results Total costs during the one year period of the study were on average higher for the acupuncture group (£403; $768; €308) than for controls (£217) because of the acupuncture practitioners’ costs. The mean health gain from acupuncture during the one year of the trial was 0.021 quality adjusted life years (QALYs), leading to a base case estimate of £9180 per QALY gained. This result was robust to sensitivity analysis. Cost per QALY dropped substantially when the analysis incorporated likely QALY differences for the years after the trial.

Conclusions Acupuncture for chronic headache improves health related quality of life at a small additional cost; it is relatively cost effective compared with a number of other interventions provided by the NHS.

Introduction

Migraine and chronic tension headache represent a considerable societal burden in terms of both costs to the health service—for example, for prescription drugs and visits to general practitioners—and also the costs of lost productivity because of reduced effectiveness and time off work. We have not found recent estimates of the total economic burden of migraine for the United Kingdom. A decade ago the annual costs to the health service were estimated to be between £250m and £611m. Since these studies were published health service costs have probably increased, given the prescription of more expensive drugs (such as the triptans). The relatively modest observed costs to the health service are often attributed to low consultation rates, poor recognition of disease, and underprescribing. A much greater burden is the cost to the economy of lost productivity; in the early 1990s this was estimated to be between £250m and £611m annually.

Public and scientific interest is increasing in acupuncture as an approach for chronic headache disorders. Although several randomised studies have been conducted, few reliable data are available on the cost effectiveness of this intervention. We present a cost effectiveness analysis carried out alongside a randomised trial that seeks to assess the value for money of acupuncture for chronic headache (ISRCTN9657534).

Methods

In the trial 401 patients aged 18-65 who reported an average of at least two headaches per month were recruited from general practices in England and Wales and randomly allocated to receive either up to 12 acupuncture treatments over three months from appropriately trained physiotherapists or usual care alone.

For the purposes of this evaluation we assume that the acupuncture intervention to be provided in the community by the NHS; hence we measure costs from both an NHS perspective and a societal perspective. We measured effectiveness in terms of the quality adjusted life years (QALYs) gained. For our base case, we have taken a conservative approach by excluding savings in productivity costs and by adopting a time horizon of 12 months, the length of the trial follow up. Given the time horizon, no need arose to discount costs or effects. We measured costs in UK prices (£) for 2002-3. We used the algorithm devised by Brazier et al.—a single index measure of health related quality of life (HRQoL)—the SF-6D—to calculate for each patient at baseline, three months, and 12 months from patients’ responses to the SF-36 at each of these time points.

The patients themselves reported unit costs associated with non-prescription drugs and private healthcare visits. We used the health component of the harmonised index of consumer prices (HICP) to inflate these costs to 2003 levels. Table 1 details other unit costs. We used standard NHS costs for a specific service if these had been published. For NHS visits to practitioners of complementary or alternative medicine we used the mean cost of a private visit, as recorded in the trial. We recorded drug prescriptions for a subgroup of patients (n = 71) from the database of their general practitioner.

To estimate the cost of the study intervention we took the standard cost (including overheads, capital, and training) for an NHS community physiotherapist and multiplied it by the contact time for each individual patient with the physiotherapist trained in acupuncture. We did not include the cost of needles and other consumables as these are negligible compared with staff time. We assumed that acupuncture sessions on the NHS, but not by a study acupuncturist, had a duration equal to the mean duration of a study session, 31 minutes.

We used using linear regression (analysis of covariance, ANCOVA) with age, sex, diagnosis (migraine or non-migraine...
threshold of cost effectiveness consistent with decisions that have for an additional unit of health outcome, and from this any addi-

private acupuncture visit Various Trial data Patients reported individual costs

NHS visits

General practitioner 27.00 Netten and Curtis 2002* Cost per clinic consultation

Outpatient 82.00 Netten and Curtis 2002* Generic cost per outpatient attendance

Counsellor or psychotherapist 35.75 Netten and Curtis 2002* Clinic visit to community based counsellor

Physiotherapy 17.00 Netten and Curtis 2002* Clinic visit to community based physiotherapist

Chiropractor or osteopath 25.38 Trial data Mean cost of a private visit

Medical herbalist 18.17 Trial data Mean cost of a private visit

Homoeopath 31.46 Trial data Mean cost of a private visit

Hypnotherapist 38.75 Trial data Mean cost of a private visit

Relaxation therapy 6.92 Trial data Mean cost of a private visit

Other costs (base case)

Private health care visits Various Trial data Patients reported individual costs

Over the counter medication Various Trial data Patients reported individual costs

Other costs (sensitivity analysis)

General practitioner cost per hour 118.00 Netten and Curtis 2002* Cost per hour of patient contact

Private acupuncture 28.38 Trial data Mean cost of a private visit

Prescription drugs Various BNF September 2002* Specified by dosage and pack size

Cost of a day off sick 88.05 Office for National Statistics Average earnings per hour-average working hours = £31.74 / 8

*All NHS visit costs include salary, on-costs, qualifications, overheads, and capital overheads.

Results

Table 2 shows the baseline characteristics for the patients who completed the SF-36 on all three occasions. This group forms our sample for our base case analysis of cost effectiveness. Tables 3 and 4 show resource use, HRQoL, and cost; for these tables we report the results from all responding individuals.

Patients in the acupuncture arm had on average 4.2 hours of contact with a study acupuncturist (table 3). Two patients in the control arm were treated by one of the study acupuncturists, and 18 patients in the acupuncture arm did not attend for acupuncture. Some patients (50 in the acupuncture arm and two in the control arm) visited an acupuncturist for further acupuncture (either NHS or private). Hence the cost of the study acupuncture sessions was augmented by the cost of additional acupuncture sessions (table 4).

We found small but statistically significant reductions in expenditure on visits to general practitioners and complementary or alternative medications (table 4). Differences in other cost components did not reach significance. We obtained costs for prescription drugs from a subsample of 71 patients, and we had hoped to extrapolate results from these patients to the full study sample. However, regression models of these costs had poor properties: linear regression was heteroscedastic, and results differed depending on the various alternative regression methods used. We therefore excluded costs for prescription drug costs.

No of participants with migraine (%) 128 (94%) 113 (95%)

Mean headache severity score at baseline (SD)* 24.1 (14.0) 27.0 (16.9)

No of participants with migraine (%) 128 (94%) 113 (95%)
from the cost effectiveness analyses. As differences between groups were small (< £50 per patient) and tended to favour the acupuncture group, exclusion of the costs of prescription drugs is a conservative measure that is unlikely to have an important influence on cost effectiveness estimates.

Table 3 reports HRQoL as measured by the SF-6D. We noted an improvement in QALYs over the 12 months in the acupuncture group but not in controls, with the difference between groups reaching significance (P = 0.02). We estimated the mean health gain to be 0.021 QALYs, equivalent to eight quality adjusted days (table 5).

We estimated the mean incremental cost of the acupuncture intervention to the NHS to be £205 per patient, excluding the impact on prescription drugs (table 5). This was offset slightly by a small reduction in direct patient costs (over the counter medication and visits to practitioners of complementary and alternative medicine). Overall this equates to an additional cost of £9180 per QALY gained, including patient costs.

Figures 1 and 2 show the probability that the intervention is cost effective (under our base case assumptions) for a range of cost effectiveness ceilings. At a ceiling of £30 000 per QALY gained (a threshold of cost effectiveness consistent with decisions that have been taken by NICE). the probability that acupuncture is cost effective is 92%. The figures also show how cost effectiveness changes for several different scenarios (details and further scenarios in table 6). Given the relative value of a general practitioner’s time, acupuncture by physiotherapists represents better value for money. Even if a general practitioner can manage to treat four patients in an hour this is still less cost effective than a physiotherapist treating two per hour (the base case scenario).

We saw a marked improvement in cost effectiveness associated with the inclusion of productivity costs. However, this represents an underestimate of the cost per QALY since the quality of life measure will in part reflect this improved productivity, especially with respect to increased leisure time. Estimated
Cost effectiveness was also improved by the projection of effects beyond one year and the assumption that acupuncturists could improve their throughput by dealing with patients simultaneously. Cost effectiveness was not markedly different when we used private acupuncture costs. Similarly, imputing values for cases with missing data did not greatly influence the results, although the explanatory power of the imputation regressions was weak. Under none of the scenarios did the central estimate of cost indicate overall cost savings.

Discussion

Acupuncture lead to increases in both QALYs and health service costs. We estimated the incremental cost effectiveness to be £9180 per QALY gained. The estimated improvement in quality of life correlates with the observed reductions in headache severity and frequency.

We consider that the base case is likely to be conservative as it excludes cost savings associated with prescription drugs and productivity gains. More importantly, our base case analysis considers only the 12 months of the trial. The effects of acupuncture appear to be persistent as differences between groups were slightly larger at one year than immediately post-treatment. If we include likely QALY differences for subsequent years, then acupuncture appears even better value for money.

Acupuncture by medical general practitioners (as well as by specialist physiotherapists) appears to be reasonably cost effective compared with usual care, however, given the relative value of a general practitioner’s time, acupuncture by physiotherapists represents better value for money, unless general practitioners can achieve substantially better outcomes and or much shorter contact times.

The probability that the programme is cost effective at a ceiling of £30 000 was estimated to be 92% for the base case. This does not take into account the uncertainty owing to imputing missing values, which means that this probability is a slight overestimate. When only complete responders are included in the analysis the probability falls to 84%, but this estimate is biased conservatively. This study, like most economic evaluations, was not powered to detect a difference in cost effectiveness and therefore the lack of statistical significance at the 5% level should not be interpreted as evidence of non-cost effectiveness—few if any economic evaluations attain such levels of significance.

Table 6  Sensitivity analyses

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Incremental cost (£)</th>
<th>QALYs gained</th>
<th>Incremental cost per QALY gained (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base case (see table 5)</td>
<td>255</td>
<td>Incremental cost (£)</td>
<td>QALYs gained</td>
</tr>
<tr>
<td>Alternative unit costs associated with acupuncture*</td>
<td>255</td>
<td>189.42</td>
<td>0.021</td>
</tr>
<tr>
<td>Using average cost of a private acupuncture session</td>
<td>255</td>
<td>234.72</td>
<td>0.021</td>
</tr>
<tr>
<td>Physiotherapist can treat three patients per hour</td>
<td>255</td>
<td>117.64</td>
<td>0.021</td>
</tr>
<tr>
<td>General practitioner instead of physiotherapist (treating four patients per hour)</td>
<td>255</td>
<td>254.50</td>
<td>0.021</td>
</tr>
<tr>
<td>Strategy for handling of missing values</td>
<td>401</td>
<td>10836</td>
<td></td>
</tr>
<tr>
<td>Include only patients completing all cost questionnaires</td>
<td>220</td>
<td>201.52</td>
<td>0.018</td>
</tr>
<tr>
<td>Imputation of QALYs and cost†</td>
<td>401</td>
<td>164.59</td>
<td>0.015</td>
</tr>
<tr>
<td>Inclusion of additional cost component</td>
<td>255</td>
<td>67.34</td>
<td>0.021</td>
</tr>
<tr>
<td>Projection of results into the future</td>
<td>255</td>
<td>183.33</td>
<td>0.039</td>
</tr>
<tr>
<td>Trial arms converge by 5 years</td>
<td>255</td>
<td>166.39</td>
<td>0.092</td>
</tr>
<tr>
<td>Trial arms converge by 10 years</td>
<td>255</td>
<td>142.10</td>
<td>0.177</td>
</tr>
</tbody>
</table>

All analyses adjust for baseline variables.

* Assumes same health outcome as the base case.
† Using linear regression to predict missing values from baseline parameters.
To our knowledge, this is the first rigorous economic evaluation of acupuncture. Prior economic studies on acupuncture for pain have typically been conducted by acupuncture advocates and have used questionable methods. For example, studies have claimed cost savings on the basis of hypothetical interventions that would have been necessary had acupuncture not been administered.13 19 Other studies have used before-after comparisons13 or non-randomised controls.20 Cost savings have been shown by retrospective studies of acupuncture for other conditions, but similar methodological problems have been described.15

Our study, with a relatively large sample size, a randomised comparison arm, and prospective evaluation of costs, has not found such overall cost savings for headache patients: we can be fairly certain from our results that acupuncture adds to health service costs for these patients. Therefore the pertinent question is whether this additional cost is justified by the associated health gains. Even when we use our conservative base case estimate of £9180 per QALY gained, acupuncture for migraine seems to be better value for money than several interventions that have been recommended by NICE.14 To our knowledge, a cost per QALY analysis has only been performed for one other antimigraine intervention—sumatriptan compared with oral caffeine and ergotamine—which had a cost per QALY of $C29 366 (£16 000).24 Acupuncture therefore compares favourably.

Clinicians, commissioners, and patients should consider acupuncture for migraine and chronic headache as it seems to reduce the severity of headache and improves HRQoL at a small additional cost. It is an intervention that is relatively cost effective compared with a number of interventions provided by the NHS.

Contributors: DW undertook the economic analyses and is the study guarantor; AJV conceived and designed the randomised trial and advised on statistical aspects of the economic analyses; RG advised on the analyses; RM contributed to design of resource outcome assessment.

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Competing interests: None declared.

Ethical approval was received from South West Multi-centre Research Ethics Committee and appropriate local ethics committees.

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