

### What is already known on this topic

Non-specific low back pain is typically a recurrent condition associated with high health and social costs

Many people with back pain seek acupuncture treatment; however, evidence for long term effectiveness is sparse

### What this study adds

Weak evidence was found of an effect of acupuncture care on non-specific low back pain at 12 months, but stronger evidence of a small benefit at 24 months

Referral to a qualified acupuncturist seems safe and acceptable to patients with low back pain

Ethical approval: This study was approved by York research ethics committee.

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## A randomised controlled trial of acupuncture care for persistent low back pain: cost effectiveness analysis

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### Abstract

**Objective** To evaluate the cost effectiveness of acupuncture in the management of persistent non-specific low back pain.

**Design** Cost effectiveness analysis of a randomised controlled trial.

**Setting** Three private acupuncture clinics and 18 general practices in York, England.

**Participants** 241 adults aged 18-65 with non-specific low back pain of 4-52 weeks' duration.

**Interventions** Ten individualised acupuncture treatments over three months from acupuncturists trained in traditional Chinese medicine (n = 160) or usual care only (n = 81).

**Main outcome measure** Incremental cost per quality adjusted life year (QALY) gained over two years.

**Results** Total costs to the United Kingdom's health service during the two year study period were higher on average for the acupuncture group (£460; £673; \$859) than for the usual care group (£345) because of the costs associated with initial treatment. The mean incremental health gain from acupuncture at 12 months was 0.012 QALYs (95% confidence interval -0.033 to 0.058) and at 24 months was 0.027 QALYs (-0.056 to 0.110), leading to a base case estimate of £4241 per QALY gained. This result was robust to sensitivity analysis. The probabilistic sensitivity analysis showed acupuncture to have a more than 90% chance of being cost effective at a £20 000 cost per QALY threshold.

**Conclusion** A short course of traditional acupuncture for persistent non-specific low back pain in primary care confers a modest health benefit for minor extra cost to the NHS compared with usual care.

Acupuncture care for low back pain seems to be cost effective in the longer term.

**Trial registration** ISRCTN80764175.

### Introduction

The annual cost of low back pain to the United Kingdom's health service has been estimated at £480m (€703m; \$901m).<sup>1</sup> The use of acupuncture as an approach for the management of chronic pain, including low back pain, is receiving increasing recognition. We assessed the cost effectiveness of acupuncture for the treatment of low back pain.

### Methods

Patients (n = 241) with persistent non-specific low back pain of 4-52 weeks' duration, diagnosed as suitable for management in primary care, were recruited to the trial by 43 general practitioners. Patients were randomly allocated to receive either up to 10 acupuncture treatments over three months (n = 161) or usual care only (n = 81). The primary clinical outcome was



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the bodily pain dimension on the SF-36, measured at 12 and 24 months. After adjusting for baseline score and for any clustering by acupuncturist, we found an estimated intervention effect of 5.6 points (95% confidence interval -0.2 to 11.4) at 12 months (n=213) and 8.0 points (2.8 to 13.2) at 24 months (n=182; see accompanying clinical paper for details).<sup>2</sup> The difference in final pain scores between groups was about 10%-15% that of the usual care group. Costs were measured from both an NHS and a societal perspective. Effectiveness was measured as quality adjusted life years (QALYs) gained. The primary economic analysis is over the 24 month period.

### Health outcomes and health resource use

We devised a single preference based measure of health related quality of life, the SF-6D, from patients' responses to the SF-36 at baseline and at 3, 12, and 24 months. The valuations are based on the preference weights for a series of health states defined by the SF-6D from a sample of the UK general population. The QALY gain for each patient was calculated from the area under the curve.<sup>3</sup>

We collected details of healthcare utilisation from general practice notes and from a patient completed questionnaire at 12 and 24 months on resource use and questions relating to the estimation of costs due to lost productivity. We also collected information on admissions to hospital, outpatient visits, and other visits to NHS facilities. Data on duration of stays in an NHS hospital were from the questionnaire and cross referenced with the relevant hospital. Patients were also asked about use of private treatments.

### Unit costs

Unit costs (see bmj.com) are based on the financial year 2002-3. When national costs were unavailable, we obtained local unit costs from the healthcare centres in the trial location. Unit costs for acupuncture delivered in the study reflect payments made to practitioners by York Health Authority for the duration of the study. We matched NHS acupuncture costs to local private sector fees at the start of the study. Time lost from work because of low back pain was valued using age and sex adjusted average daily wage rates from the Office for National Statistics new earnings survey, 2003.<sup>4</sup> Patients reported costs for non-prescription drugs and visits for private health care.

### Cost utility analysis

Economic analyses were carried out on an intention to treat basis. In estimating the incremental cost effectiveness ratio of acupuncture for low back pain for the base case we did not impute for cases with missing SF-6D data, therefore the cost effectiveness analysis sample included those patients who completed the SF-36 at all four time points and therefore for whom QALYs could be calculated.

To confirm the validity of the base case results we used a probabilistic sensitivity analysis with bootstrapping when the original data were used to provide an empirical estimate of the sampling distribution through repeated resampling from the observed data.<sup>5</sup> We carried out sensitivity analyses to test the robustness of the results to changes from the base case by using multiple imputation (see bmj.com) of missing data relating to NHS costs and SF-6D outcomes<sup>6</sup>; by

Cost effectiveness of acupuncture care or usual care for treatment of persistent non-specific low back pain

Variable	Mean (SD) acupuncture care	Mean (SD) usual care	Difference (95% CI) in means
Base case:			
Mean NHS cost, discounted (£)	459.70 (376.39); n=105	345.21 (550.44); n=44	114.50 (-39.74 to 268.73)
QALY gain (SF-6D)	1.453 (0.248); n=105	1.426 (0.191); n=44	0.027 (-0.056 to 0.110)
ICER (£): base case	—	—	4241 (191 to 28 026)
Imputation:			
Mean NHS cost, discounted (£)	460.20 (338.67); n=159	338.14 (421.38); n=80	122.07 (22.61 to 221.52*)
QALY gain (SF-6D)	1.459 (0.247); n=159	1.430 (0.208); n=80	0.029 (-0.034 to 0.092)
ICER (£): imputation	—	—	4209 (182 to 27 899)

QALY=quality adjusted life year; ICER=incremental cost effectiveness ratio.  
\*Significant difference between means P<0.05.

using lost productivity costs; and by excluding those patients who were permanently unable to work as a result of low back pain, when costs were expected to be higher and outcomes poorer.

We discounted costs and outcomes at 3.5% during the 12 to 24 months of the study. Cost effectiveness to the NHS was assessed bearing in mind guidance from the National Institute for Health and Clinical Excellence relating to the threshold the NHS can afford to pay for a new technology.<sup>7</sup>

## Results

See bmj.com for the baseline characteristics of patients receiving acupuncture care or usual care for persistent non-specific low back pain for whom SF-6D and QALY scores could be calculated compared with those with missing SF-36 data at any time point. The group with complete data formed the sample for the base case analysis.

Patients in the acupuncture group had an average of eight sessions with a study acupuncturist (see bmj.com). Seven patients in the acupuncture group and nine in the usual care group received NHS acupuncture during the trial period. Nineteen patients in the acupuncture arm purchased an additional private acupuncture.

An improvement was found in health related quality of life over the 24 months in both groups, with the acupuncture arm reporting a slightly higher mean health related quality of life score at 24 months (see bmj.com). With the exception of acupuncture, the mean differences between groups were not statistically significant at any time point.

The costs of initial acupuncture treatment differed significantly between the groups (see bmj.com). The total mean costs of treatment to the NHS for the acupuncture group (£471.10) were higher than for the usual care group (£332.24) and the difference was significant. Initial acupuncture treatment accounts for about 45% of the total NHS costs of treatment for the acupuncture group.

Overall the incremental cost effectiveness ratio for acupuncture in the treatment of low back pain was positive (table), with a mean of £4241 at 24 months. The figure shows the probability of the intervention being cost effective using the base case data for a range of cost effectiveness ceilings. Assuming an implicit threshold of a maximum willingness to pay of £20 000 for a QALY, the probability of the cost per QALY of

**What is already known on this topic**

Many people seek acupuncture care for low back pain  
 No rigorous assessments have been made of the cost effectiveness of such care

**What this study adds**

A short course of acupuncture (up to 10 sessions) for low back pain is associated with increased costs to the United Kingdom's health service but improved health related quality of life in the long term  
 If decision makers are willing to pay up to £20 000 to gain one quality adjusted life year, then acupuncture for low back pain seems cost effective

acupuncture for low back pain falling below this threshold value was over 90%.

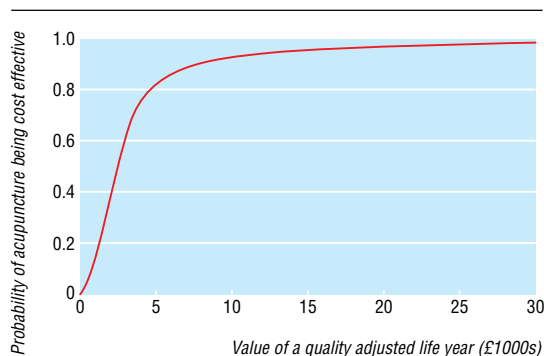
**Sensitivity analyses**

After imputation of missing data relating to NHS costs or QALYs, the incremental cost effectiveness ratio for acupuncture was £4209 at 24 months (table). When patients who were permanently unable to work because of their pain were excluded the incremental cost was reduced and the QALYs gained increased compared with the base case, resulting in improved cost effectiveness for acupuncture (see [bmj.com](http://bmj.com)).

The inclusion of productivity costs noticeably improved cost effectiveness, with this scenario indicating overall cost savings from using acupuncture (see [bmj.com](http://bmj.com)).

**Discussion**

Acupuncture for persistent non-specific low back pain confers a modest benefit to health (measured by quality adjusted life years, QALYs) at relatively minor extra cost to the NHS compared with usual care. We estimated the incremental cost effectiveness to be £4241 per QALY gained in the base case. This represents a conservative estimate because it excludes cost savings associated with productivity gains. From a societal perspective when gains in productivity are included then acupuncture for low back pain becomes dominant in that it is less expensive and confers greater health benefits than usual care. It is likely that this represents an underestimate of the cost per QALY



Cost effectiveness acceptability curve of acupuncture for persistent non-specific low back pain using base case data for range of cost effectiveness ceilings

because the quality of life measure will in part take into account this improved productivity.

A potential limitation of our study is the use of patient completed questionnaires. To minimise recall bias for hospital episodes related to low back pain, the date and duration of hospital stays were collected from the resource use questionnaire and cross referenced with the hospital. A further limitation is the proportion of missing data for the base case analysis, but this is not unusual for community based interventions and also reflects the extended duration (24 months) of the trial. Although the missing data may affect the generalisability of the findings, patients excluded from the base case analysis were broadly similar to those included.

It is difficult to assess the extent to which our results are comparable to those of other studies assessing interventions for low back pain because they have tended to assess effectiveness or costs and not to use a generic outcome measure such as QALYs that would facilitate comparisons across interventions. The open and pragmatic nature of our trial allowed acupuncture to be compared with usual care in everyday practice. Given that usual care comprised a mix of interventions,<sup>2</sup> it was not possible to isolate the costs and effectiveness of individual treatments.<sup>8</sup>

Recent guidance from NICE indicates that a ceiling ratio of £20 000 per QALY represents the threshold of what the NHS can afford to pay for additional QALYs.<sup>7</sup> If £20 000 is taken as the maximum acceptable cost effectiveness ratio, then acupuncture for low back pain seems cost effective.

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Competing interests: None declared.

Ethical approval: This study was approved by York research ethics committee.

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