Multidisciplinary rehabilitation for chronic low back pain: systematic review

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Abstract

Objective To assess the effect of multidisciplinary biopsychosocial rehabilitation on clinically relevant outcomes in patients with chronic low back pain.
Design Systematic literature review of randomised controlled trials.
Participants A total of 1964 patients with disabling low back pain for more than three months.
Main outcome measures Pain, function, employment, quality of life, and global assessments.
Results Ten trials reported on a total of 12 randomised comparisons of multidisciplinary treatment and a control condition. There was strong evidence that intensive multidisciplinary biopsychosocial rehabilitation with functional restoration improves function when compared with inpatient or outpatient non-multidisciplinary treatments. There was moderate evidence that intensive multidisciplinary biopsychosocial rehabilitation with functional restoration reduces pain when compared with outpatient non-multidisciplinary rehabilitation or usual care. There was contradictory evidence regarding vocational outcomes of intensive multidisciplinary biopsychosocial intervention. Some trials reported improvements in work readiness, but others showed no significant reduction in sickness leaves. Less intensive outpatient psychophysical treatments did not improve pain, function, or vocational outcomes when compared with non-multidisciplinary outpatient therapy or usual care. Few trials reported effects on quality of life or global assessments.
Conclusions The reviewed trials provide evidence that intensive multidisciplinary biopsychosocial rehabilitation with functional restoration reduces pain and improves function in patients with chronic low back pain. Less intensive interventions did not show improvements in clinically relevant outcomes.

Introduction

In many countries chronic low back pain is the most common cause of long term disability in middle age.[1] Chronic low back pain is resistant to treatment, and patients are often referred for multidisciplinary treatment.[2] Current multidisciplinary biopsychosocial rehabilitation regards disabling chronic pain as the result of multiple interrelating physical, psychological, and social or occupational factors.[3 4]

Multidisciplinary treatments for chronic pain have been evaluated in many non-randomised studies and non-systematic reviews; both are prone to bias.[5] We are aware of two published systematic reviews on this topic. Flor et al reviewed 65 controlled and non-controlled studies available in 1990.[6] They calculated overall effect sizes within and between groups. They concluded that multidisciplinary treatments were effective, although the methodological quality of the studies was marginal. Cutler et al combined studies of multidisciplinary treatments and of other non-surgical treatments—a total of 37 controlled and non-controlled studies.[7] They concluded that non-surgical treatment of chronic pain does enable patients to return to work. Estimating treatment effects in the absence of a control group and pooling together controlled and non-controlled studies implies a high risk of bias. Furthermore, these systematic reviews included no randomised controlled trials.

We aimed to assess systematically, based on available randomised controlled trials, the effect of multidisciplinary biopsychosocial rehabilitation on clinically relevant outcomes in patients with chronic low back pain.

Methods

The study was conducted under the sponsorship of the Back Review Group of the Cochrane Collaboration. It adhered to the methodological guidelines approved by the group.[8] A detailed protocol was peer reviewed and published before data were collected.[9]

Selection of studies for review

To be included, a study had to fulfil several criteria. Participants had to be adults with disabling low back pain for more than three months (with or without sciatica). One group of participants had to have received multidisciplinary biopsychosocial rehabilitation; a minimum of the physical dimension and one of the other dimensions (psychological or social or occupational) had to be present as defined in the protocol.[9] One group of participants had to have received a control treatment that did not fulfil our criteria for multidisciplinary rehabilitation. The study had to report treatment effect in at least one of these variables: pain severity, global improvement, functional status, quality of life, and employment status. Interventions described as back

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Tables detailing the content of multidisciplinary rehabilitation programmes and the crude outcomes of the trials are on the BMJ's website

schools were excluded, unless they were part of a programme that fulfilled our criteria for multidisciplinary biopsychosocial rehabilitation.

Identification and assessment of trials

We used three strategies to locate candidate randomised controlled trials: an electronic database search (using Medline, Embase, PsycLIT, CINAHL, Health Star, and the Cochrane Library from the beginning of each database to June 1998 with no language restrictions), citation tracking, and consultation with content experts.

Study selection, data extraction, and assessment of methodological quality and clinical relevance were done by two independent reviewers. Discrepancies were resolved by consensus or by a third reviewer if necessary. Our attempts to mask the names of journals and authors turned out to be impractical, as reviewers were already familiar with many of the trials.

Methodological quality was scored from 0 to 10 as recommended by the Back Review Group, even though blinding of care provider and patient might not be feasible with multidisciplinary rehabilitation.[8] Clinical relevance was described by answering the following questions: are the patients described in enough detail to decide whether they are comparable to the readers' patients, is the intervention described well enough to allow readers to provide the same for their patients, and were clinically relevant outcomes measured?

Data analysis

We calculated treatment effect sizes between groups and 95% confidence intervals for each randomised comparison for each outcome and follow up time. We calculated relative risks for dichotomous outcomes[10] and standardised mean differences for continuous outcomes. If necessary, we approximated the numbers required for calculations from graphs and statistics in the article. When the standard deviation at follow up was not available, we used the standard deviation at baseline. If none was reported, we assumed the average standard deviation reported by other studies for that outcome. All analyses were conducted using Meta-View Rev-Man software version 3.1.1 (Cochrane Collaboration, 1998).

Given the heterogeneity in study settings, interventions, and control groups, we decided not to pool effect sizes in a meta-analysis. Instead, we summarised findings by strength of evidence and nature of intervention and control treatments.[11 12] The evidence was judged to be strong when multiple high quality trials produced generally consistent findings. It was judged to be moderate when multiple low quality trials or one high quality and one or more low quality trials

Table 1 Participants, interventions, and outcomes assessed in 10 randomised controlled trials of multidisciplinary treatments for chronic low back pain (LBP)

Author, year of index publication	Participants*	Multidisciplinary intervention	Comparison treatment	Outcomes measured	Notes
Alaranta, 1994[15]	293 workers with LBP for ≥6 months in Finland selected by insurer	126 h inpatient functional restoration and a home programme	Three week inpatient programme. PM, exercises, back school	Insurance records, mobility, strength, pain, function, and psychological scales at 3 and 12 months	Workers less disabled than in other trials
Basler, 1997[25]	94 patients with chronic LBP referred to three pain clinics in Germany	12 cognitive-behavioural sessions plus usual medical treatment at the clinic	Usual medical treatment at clinic	Self reported pain, function, medication intake, and coping with pain immediately after treatment	Only short term follow up available, as control patients received intervention afterwards
Bendix, 1996[18]	106 patients with LBP ≥6 months, unemployed or on sick leave, referred to back centre in Denmark	135 h outpatient functional restoration	Not treated at back centre; could go anywhere else for treatment	Back endurance and self reported pain, function, employment status, and contacts with healthcare system over 5 years	Outcomes at 4 months, 2 years, and 5 years reported in separate articles
Bendix, 1995[17]	132 patients with LBP ≥6 months, unemployed or on sick leave, referred to back centre in Denmark	Two interventions: 135 h outpatient functional restoration, or 24 h outpatient psycho-physical training	24 h outpatient physical training plus back school	Back endurance and self reported pain, function, employment status, and contacts with healthcare system over 5 years	Outcomes at 4 months, 1 year, 2 years, and 5 years reported in separate articles
Harkäpää, 1989[21]	476 blue collar workers with chronic or recurrent LBP ≥2 years in Finland, selected by insurer	Two interventions: 3 weeks of inpatient PM, massage, exercise, relaxation, or 15 outpatient sessions of PM, exercise, relaxation	Assessment by a specialist in physical medicine plus printed and oral advice	Insurance records, mobility, strength, self reported pain, disability, and overall benefit over 30 months	Outcomes at 3 months and 30 months reported in separate articles
Jückel, 1990[26]	71 patients with LBP ≥6 months, on waiting list to attend spa hospital in Germany	4-6 weeks of inpatient hydrotherapy, PM, exercise, massage	Waiting list controls	Self reported pain, function, depression, and anxiety immediately after treatment	Only short term follow up available, as controls received intervention afterwards
Lukinmaa, 1989[16]	209 patients with LBP >2 months, referred by general practitioners to regional hospital in Finland	5 days of inpatient assessment followed by individualised treatment	30 minute assessment and recommendations by orthopaedic surgeon and nurse	Insurance records and self reported pain, global improvement, R&M, and healthcare use over 12 months	A few patients had LBP <3 months, some were still employed
Mitchel, 1994[29]	420 workers off work ≥90 days after work injury, selected by insurer in Canada	280 h outpatient functional restoration	Usual treatment in the community plus mailed advice to primary care provider	Insurance records over 2 years	Corey et al[30] reported pain ratings and self reported employment status in a subset
Nicholas, 1992[28]	20 patients with LBP >6 months, referred by pain clinic and physicians in Australia	17.5 h outpatient cognitive-behavioral therapy, PM, education, and exercise	17.5 h outpatient "attention control," PM, education, and exercise	Self reported pain, SIP, medication use, pain beliefs, depression, self efficacy, and coping over 6 months	Extensive assessment, numerous dropouts
Nicholas, 1991[27]	58 patients with LBP >6 months, referred by pain clinic and physicians in Australia	Four outpatient psycho-physical interventions of 17.5 h each	Two controls: 17.5 h outpatient "attention control", education, and exercise, or education and exercise only	Self reported pain, SIP, medication use, pain beliefs, anxiety, depression, and coping over 12 months	Extensive assessment, numerous dropouts

PM=physical modalities such as heat or cold applications and transcutaneos nerve stimulation (manual therapies and exercise are listed separately if described in the article); SIP=sickness impact profile; R&M=Roland and Morris disability index.
*Number of patients with low back pain randomised in the trial, except for Alaranta 1994 (number noted is after excluding 85 patients for medical reasons) and Mitchel 1994 (number noted is after excluding workers allocated to a third clinic, because of protocol violations). The number of patients followed up varied depending on the outcome and follow up time considered. In studies that included patients with other chronic pain syndromes, only patientss with low back pain were counted.

Table 2 Assessment of methodological quality and clinical relevance of 10 randomised controlled trials of multidisciplinary treatments for chronic low back pain

Characteristic	Alaranta 1994[15]	Basler 1997[25]	Bendix 1996[18]	Bendix 1995[17]	Harkäpää 1989[21]	Jückel 1990[26]	Lukinmaa 1989[16]	Mitchel 1994[29]	Nicholas 1992[28]	Nicholas 1991[27]
Methodological quality:										
Concealment of allocation	×	×	×	×	×	×	√	√	√	√
Blinding of care provider*	×	×	×	×	×	×	×	×	×	×
Avoidance of co-interventions	√	×	×	√	×	×	×	×	√	√
Acceptable compliance	√	×	×	√	√	×	√	×	×	√
Blinding of patient*	×	×	×	×	×	×	×	×	×	×
Blinding of assessor†	×	×	×	√	×	×	×	√	√	×
Outcome measures relevant‡	√	√	√	√	√	√	√	√	√	√
Acceptable dropout rate	√	√	√	√	√	×	√	√	√	×
Comparable timing of assessment§	√	√	√	√	√	√	√	√	√	√
Intention to treat analysis	×	×	√	×	×	×	×	√	×	×
Total score (out of 10)*	5	3	4	6	4	2	5	6	6	5
Clinical relevance¶:										
Detailed description of setting	√	√	×	×	√	√	√	×	×	×
Detailed description of participants	√	×	√	√	×	×	√	×	×	×
Detailed description of intervention	√	√	√	√	√	×	√	×	√	√
Control treatment described	√	×	×	√	√	×	√	×	√	√
Relevant outcomes measured‡	√	×	√	√	√	×	√	×	×	×

*It could be argued that the maximum possible methodological quality score is 8 instead of 10, since blinding of care provider and patient might not be feasible with multidisciplinary interventions.
†In the trial by Nicholas et al, a blinded assessor was available for 75% of the participants. Bendix et al quantified success of blinding of the assessor; blinding was broken for about 10% of participants.
‡In the internal validity scale proposed by the Back Review Group of the Cochrane Collaboration, a study that reports on at least one of pain, global improvement, back specific functional status, generic functional status, and return to work qualifies as "outcome measures relevant." In the clinical relevance assessment, a study had to measure pain, back specific disability, and ability to work to qualify as "relevant outcomes measured."
§In the trial by Basler et al, both groups were assessed post-treatment, but six months' follow up is available only for the intervention group.
¶For the assessment of clinical relevance, we had access to the full Finnish report on the studies by Alaranta et al, Lukinmaa et al, and Harkäpää et al.

produced generally consistent findings. Evidence was considered to be limited when only one randomised controlled trial existed or if the findings of existing trials were inconsistent. We designated trials with methodological quality scores of 5 or more as high quality.[12 13] A trial was judged positive if it reported statistically significant benefits of multidisciplinary biopsychosocial rehabilitation compared with the control treatment, neutral if it did not report significant differences, and negative if it reported significant benefit of the control treatment compared with multidisciplinary rehabilitation.

Results

Our search identified 32 candidate randomised controlled trials. Twenty one failed to fulfil the criteria for review. One other trial did not allow the estimation of treatment effect for any outcome.[14] Thus 10 studies were included in this review. The trials were performed in Scandinavian countries,[15–24] Germany,[25 26] Australia,[27 28] and Canada.[29 30] A list of excluded studies is available from the authors.

Table 1 lists the participants, interventions, and outcome measures of the trials. The trials included a total of 1964 people with low back pain. All trials excluded patients with significant radiculopathy or other indication for surgery. Most participants were workers selected from insurance listings[15 21 29] or patients referred to pain centres.[16–18 25–28] Two trials randomised patients into three groups: one control group and two treatment programmes that fulfilled our definition of multidisciplinary rehabilitation.[17 21] One trial randomised patients into six small groups in a block design.[27] For this review, the four multidisciplinary rehabilitation groups are compared with the two non-multidisciplinary rehabilitation groups. Thus, the 10 trials report on 12 randomised comparisons of multidisciplinary rehabilitation and a control condition. Follow up varied from immediately after treatment,[25 26] to up to five years after treatment.[17 18]

Table 2 summarises the methodological quality and clinical relevance of the trials. Most trials measured relevant outcomes and had an acceptable dropout rate and comparable timing of assessment. Four described adequate concealment of allocation.[16 27–29] None of the trials accomplished blinding of patient or care provider. Overall, the methodological quality score varied from 2 to 6 points. The Scandinavian trials were judged more clinically relevant than the others.

What kinds of multidisciplinary treatments have been tested?

Multidisciplinary biopsychosocial rehabilitation varied in setting (inpatient or outpatient) and the time and intensity of the three components (physical, psychological, and social or occupational). Programmes fell into two main categories: daily intensive programmes with more than 100 hours of therapy[15 17 18 21 26 29] and once or twice weekly programmes with less than 30 hours of therapy.[17 21 25 27 28] Five treatment programmes specifically described all three components[15–18 29]; four of these were modelled on the functional restoration approach first reported by Mayer et al.[31]

Most programmes had standard duration and interventions (table 1). They allowed limited individualisation in the intensity of exercise and individual psychological or social or occupational counselling. Lukinmaa et al tested highly individualised multidisciplinary rehabilitation.[16] Details of the content of multidisciplinary rehabilitation programmes are given in table A on the *BMJ*'s website. Control participants received non-multidisciplinary inpatient or outpatient rehabilitation, usual care, or no treatment (waiting list).

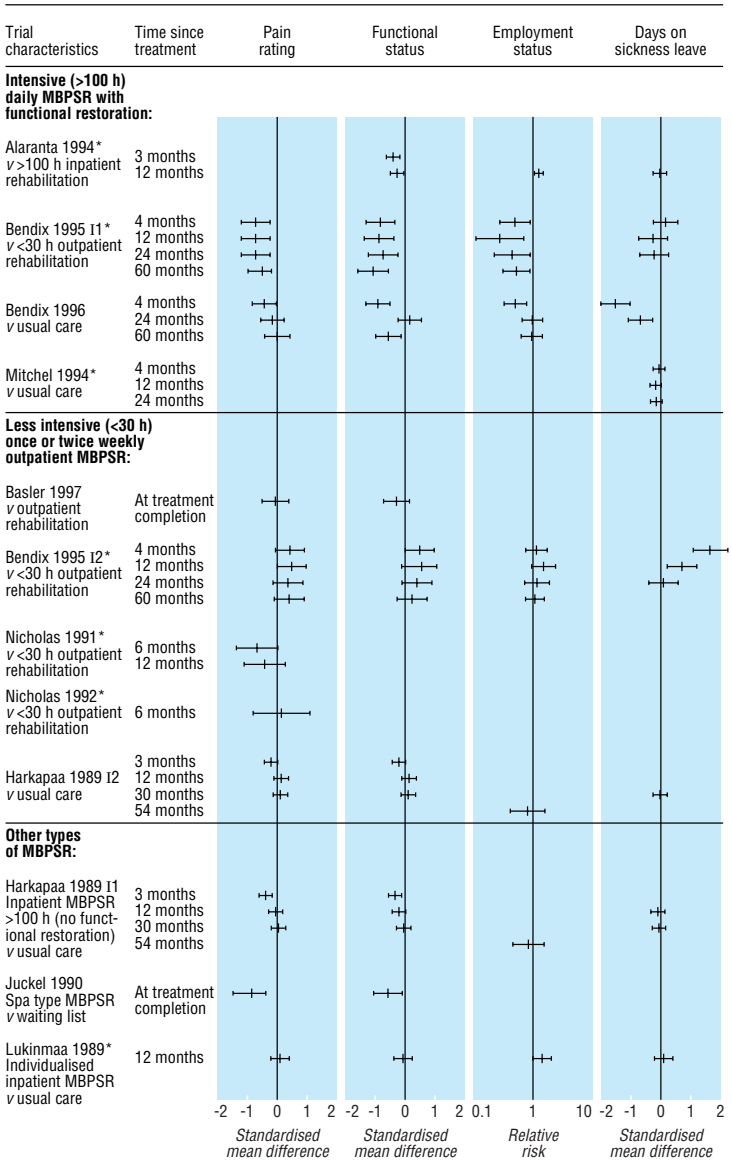
Are multidisciplinary treatments effective?

The figure depicts treatment effect sizes on pain, function, employment status, and sickness leaves after

different lengths of follow up. According to the effect sizes and following the described criteria for strength of evidence:

(1) There is strong evidence that intensive multidisciplinary biopsychosocial rehabilitation with functional restoration improves function when compared with inpatient or outpatient non-multidisciplinary rehabilitation.

(2) There is moderate evidence that intensive multidisciplinary biopsychosocial rehabilitation with functional restoration reduces pain when compared with outpatient non-multidisciplinary rehabilitation or usual care.



MBPSR = multidisciplinary biopsychosocial rehabilitation;
I1 = intervention 1 in a trial testing more than one multidisciplinary intervention;
I2 = intervention 2 in a trial testing more than one multidisciplinary intervention.
* High quality trial.

Treatment effect sizes for 12 randomised comparisons of multidisciplinary biopsychosocial rehabilitation and a control condition. Bars represent standardised mean differences and 95% confidence intervals for comparison of intervention and control groups, except for employment status where bars represent relative risks. Treatment effect sizes entirely to the left of the vertical line indicate statistically significant differences in favour of the intervention

(3) There is contradictory evidence regarding vocational outcomes of intensive multidisciplinary biopsychosocial rehabilitation; whereas Bendix et al reported improvements in "work-readiness,"[17] Alaranta et al and Mitchel et al showed no benefit on sickness leaves in two high quality trials.[15 29]

(4) Regarding less intensive multidisciplinary biopsychosocial rehabilitation, five trials could not show improvements in pain, function, or vocational outcomes when compared with non-multidisciplinary outpatient rehabilitation or usual care.[17 21 25 27 28]

Two trials reported on the effect of less intensive outpatient multidisciplinary rehabilitation on quality of life,[27 28] and one reported improvement.[27] Global assessments were reported in three trials.[15 16 21] Table B on the *BMJ*'s website shows details of crude outcomes.

Discussion

The human and financial costs of disabling low back pain are staggering—an estimated 1.7% of the gross national product of a developed country.[32] Many different rehabilitation programmes of unclear efficacy are currently in use.[2] This study provides a classification of multidisciplinary biopsychosocial rehabilitation and reviews 10 randomised controlled trials of such rehabilitation for chronic low back pain, which have not been included in previous systematic reviews.[6 7] We were able to locate these trials because we did not impose any language or date restrictions and because our definition of multidisciplinary rehabilitation relied on the content of the intervention rather than its name (many trials did not use the term multidisciplinary biopsychosocial rehabilitation). The studies reviewed show that intensive multidisciplinary rehabilitation with a functional restoration approach decreased pain and improved function. Less intensive programmes were not better than control non-multidisciplinary treatments.

Study limitations

Our findings must be interpreted in the light of the shortcomings of systematic reviews, in particular publication bias.[33] Four other potential limitations need to be considered.

Firstly, this review focused on selected clinical outcomes, ignoring data on physical measurements and psychological scales. We believe that clinically relevant endpoints should be used for judging treatments for chronic low back pain.[8 34]

Secondly, the cut-off point for a high quality randomised controlled trial was arbitrary. The cut-off point and the specific scale used to measure methodological quality can change the conclusions of meta-analyses.[35] The scale and cut-off point used here are comparable to those of other recent systematic reviews on low back pain.[12 13] If the cut off was set at 7 or more points, all the trials would be considered low quality and the strength of evidence would be moderate.

Thirdly, some assumptions were made for calculation of treatment effect sizes (see methods section). In theory, these should not bias our estimates since the same assumptions applied to intervention and control groups. Calculation of treatment effect sizes allows meaningful comparisons across trials. Crude trial outcomes are available on the *BMJ*'s website (table).

Fourthly, the studies consisted of selected patients with severe disabling low back pain treated in well estab-

lished multidisciplinary rehabilitation programmes. The results might not apply to most patients seen in primary care or to less established programmes.

Should patients with chronic low back pain be referred for multidisciplinary treatment?

Given the variability across multidisciplinary treatments, it is inappropriate to refer patients for multidisciplinary biopsychosocial rehabilitation without knowing the actual content of the programme. The reviewed trials provide evidence that intensive daily multidisciplinary rehabilitation with a functional restoration approach produces improvements in pain and function in patients with chronic disabling low back pain. Less intensive treatments did not seem to be effective.

These intensive programmes might have a large impact on healthcare resources. From the studies reviewed, it is not clear whether the benefits outweigh the costs. A crucial element in cost-benefit analyses is cost of wage replacement. Some trials reported improvement in readiness for work at follow up, but no consistent reduction in sickness leaves was reported. Also, it is not clear whether to apply human capital or friction cost analysis to estimate the cost of sickness leaves.[36]

Conclusion

The reviewed studies provide evidence that intensive (>100 hours of therapy) multidisciplinary biopsychosocial rehabilitation with functional restoration produces greater improvements in pain and function for patients with disabling chronic low back pain than less intensive multidisciplinary or non-multidisciplinary rehabilitation or usual care. Whether the improvements are worth the expense of these intensive programmes is open for discussion. The final judgment will depend on societal resources, available alternatives, and the value attached to the observed decreases in human suffering from back pain.

Contributors: JG contributed to the conception, design, and writing of the study protocol, helped to select and assess trials, conducted the data analysis, and drafted and approved the final manuscript. RE contributed to the conception, design, and writing of the study protocol, helped to select and assess trials, and revised and approved the final manuscript. KK contributed to the design and writing of the study protocol, helped to select and assess trials, and revised and approved the final manuscript. AM contributed to the design of the study protocol, helped to select and assess trials, and revised and approved the final manuscript. EI contributed to the design of search strategies and writing of the study protocol, located and obtained trial reports, and revised and approved the final manuscript. CB contributed to the conception and design of the study protocol, assembled and supervised the research team, and revised and approved the final manuscript. All the authors will act as guarantors for the paper.

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Competing interests: None declared.

What is already known on this topic

Disabling chronic pain is regarded as the result of interrelating physical, psychological, and social or occupational factors requiring multidisciplinary intervention

Two previous systematic reviews of multidisciplinary rehabilitation for chronic pain were open to bias and did not include any of the randomised controlled trials now available

What this study adds

Intensive, daily biopsychosocial rehabilitation with a functional restoration approach improves pain and function in chronic low back pain

Less intensive interventions did not show improvements in clinically relevant outcomes

It is unclear whether the improvements are worth the cost of these intensive treatments

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Population based intervention to change back pain beliefs and disability: three part evaluation

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Abstract

Objective To evaluate the effectiveness of a population based, state-wide public health intervention designed to alter beliefs about back pain, influence medical management, and reduce disability and costs of compensation.
Design Quasi-experimental, non-randomised, non-equivalent, before and after telephone surveys of the general population and postal surveys of general practitioners with an adjacent state as control group and descriptive analysis of claims database.
Setting Two states in Australia.
Participants 4730 members of general population before and two and a half years after campaign started, in a ratio of 2:1:1; 2556 general practitioners before and two years after campaign onset.
Main outcome measures Back beliefs questionnaire, knowledge and attitude statements about back pain, incidence of workers' financial compensation claims for back problems, rate of days compensated, and medical payments for claims related to back pain and other claims.
Results In the intervention state beliefs about back pain became more positive between successive surveys (mean improvement in questionnaire score 1.9 (95% confidence interval 1.3 to 2.5), $P<0.001$ and 3.2 (2.6 to 3.9), $P<0.001$, between baseline and the second and third survey, respectively). Beliefs about back pain also improved among doctors. There was a clear decline in number of claims for back pain, rates of days compensated, and medical payments for claims for back pain over the duration of the campaign.
Conclusions A population based strategy of provision of positive messages about back pain improves population and general practitioner beliefs about back pain and seems to influence medical management and reduce disability and workers' compensation costs related to back pain.

Introduction

Patients' attitudes and beliefs, particularly fear avoidance beliefs and passive coping strategies, are increasingly accepted as having an important role in disability related to back problems,[1–4] as is management based on the biopsychosocial model.[5] Despite an increase in evidence that staying active and continuing or resuming ordinary activities is more effective than rest[6] and that early investigation and referral to a specialist are unwarranted in most cases,[7] surveys of physicians continue to show that only few give this advice on management.[8 9] This may reflect physicians' knowledge and beliefs,[8] although physicians' behaviour may also be influenced by patients' expectations and other psychosocial factors.[10 11]

As previously suggested by Deyo, with such a paradigm shift from the traditional model of management of back pain it may be that the public as well as the medical profession need to be re-educated.[12] If re-education can change attitudes and beliefs and give rise to a concomitant alteration in patients' expectations and physicians' behaviour, the rising incidence of disability from low back pain may be stemmed or reversed.

In Victoria, Australia, a state of 4.3 million people,[13] the workers' compensation system paid out $A385 million (£142m) in claims for back pain in the 1996-7 financial year.[14] This figure had tripled in one decade.[14] In 1997 the Victorian WorkCover Authority, the manager of the workers' compensation system, embarked on a state-wide public health campaign aimed at altering the general population's attitudes and beliefs about back pain. We measured the effectiveness of the impact of this campaign on population beliefs about back pain and on the knowledge and attitudes of general practitioners in telephone and mailed surveys. As the campaign was ubiquitous in the state of Victoria we used a quasi-experimental, non-randomised, non-equivalent before and after study designs, with an adjacent state, New South Wales, as control. We measured the effect of