ResearchOnline@ND

University of Notre Dame Australia
ResearchOnline@ND

Health Sciences Papers and Journal Articles

School of Health Sciences

1-1-2004

Early intervention for the management of acute low back pain: A single blind randomised controlled trial of biopsychosocial education, manual therapy and exercise.

Benedict Wand
University of Notre Dame Australia, Benedict.Wand@nd.edu.au

Christien Bird
Central Middlesex Hospital Trust

James H. McAuley

Caroline J. Dore
Clinical Trials Unit London

Maureen MacDowell

See next page for additional authors

Follow this and additional works at: http://researchonline.nd.edu.au/health_article

COMMONWEALTH OF AUSTRALIA
Copyright Regulations 1969
WARNING

This material has been copied and communicated to you by or on behalf of the University of Notre Dame Australia pursuant to part VB of the Copyright Act 1969 (the Act).

The material in this communication may be subject to copyright under the Act. Any further copying or communication of this material by you may be the subject of copyright protection under the Act.

Do not remove this notice.

Recommended Citation

Wand, B. M., Bird, C., McAuley, J. H., Dore, C. J., MacDowell, M., & De Souza, L. H. (2004). Early intervention for the management of acute low back pain: A single blind randomised controlled trial of biopsychosocial education, manual therapy and exercise. *SPINE, 29*(**21**), **2350–2356.**

This Article is brought to you by the School of Health Sciences at ResearchOnline@ND. It has been accepted for inclusion in Health Sciences Papers and Journal Articles by an authorized administrator of ResearchOnline@ND. For more information, please contact denise.mclinden@nd.edu.au.

Authors
Benedict Wand, Christien Bird, James H. McAuley, Caroline J. Dore, Maureen MacDowell, and Lorraine H. De Souza

This article is available at ResearchOnline@ND: http://researchonline.nd.edu.au/health_article/6

Early intervention for the management of acute low back pain: A single blind randomised controlled trial of biopsychosocial education, manual therapy and exercise.

BM Wand, C Bird, JH McAuley, CJ Doré, M MacDowell, LH De Souza

Department of Health Studies
Brunel University
Borough Road
Isleworth
Middlesex TW7 5DU
Professor Lorraine De Souza
Chair of Rehabilitation
James McAuley BSc PgDip PhD
Research assistant

Central Middlesex Hospital Trust
Acton Lane
Park Royal
London NW10 7NS
Christien Bird MSc MCSP SRP
Research Physiotherapist
Maureen MacDowell
Head of Therapies

University of Notre Dame Australia
School of Physiotherapy
19 Mouat St Fremantle
WA 6959,Australia
Benedict Wand PT, PhD
Senior lecturer

MRC Clinical Trials Unit
222 Euston Road
London NW1 2DA
Caroline Doré BSc

Senior Statistician

Correspondence to:
Christien Bird
White Hart Lane Therapy Centre
10 White Hart Lane, Barnes
London SW13 OPY
Christien.Bird@btopenworld.com
Tel 0044 208 876 9897
Fax 0044 208 3929393

Source of Support

Funding: NHS Executive, South West Regional Office. Physical and Complex Disabilities National Programme. Caroline Doré is funded by the Arthritis Research Campaign.

We thank the physiotherapists and secretarial staff at Central Middlesex Hospital for participating in this study. We especially thank Paul Watson and Julius Sim for their helpful comments. We would like to thank Anne Golden and Mary Sexton for their initial contribution.

Contributors: All the authors took part in the design and analysis of the study and, jointly wrote the paper.

Competing interest: None declared

Abstract

Design

A single blind randomised controlled trial comparing two models of care for patients with simple acute low back pain (ALBP).

Objectives

To compare two research-based models of care for ALBP, and investigate the effect of the timing of physical intervention.

Summary of Background Data

National guidelines offer conflicting information on the delivery of physical treatment in the management of ALBP. Review of guidelines suggests two different models of care. Direct comparisons between these models are lacking in the literature. The present study aims to compare these two approaches to the management of ALBP.

Method

Among 804 referred patients, 102 subjects met the specific admission criteria and were randomly assigned to an 'assess/advise/treat' group or an 'assess/advise/wait' group. The intervention consisted of biopsychosocial education, manual therapy and exercise. Assessment of short-term outcome enables comparison to be made between intervention and advice to stay active. Assessment of long-term outcome enables comparison to be made between early and late intervention. Study outcomes of reported pain (VAS), functional disability (RMDQ), mood (MZSRDS, MSPQ, STAIS), general health

(Euroqol) and quality of life (SF-36) were assessed at baseline, six weeks, three months and six months.

Results

At six weeks, the ‘assess/advise/treat’ group demonstrated greater improvements in disability, mood, general health and quality of life than patients in the ‘assess/advise/wait’ group ($p<0.05$). Disability and pain were not significantly different between the groups at long-term follow up ($p>0.05$). However, mood, general health and quality of life remained significantly better in the ‘assess/advise/treat’ group ($p<0.05$).

Conclusions

At six weeks physiotherapy intervention is more effective than advice on staying active, leading to more rapid improvement in function, mood, quality of life and general health. The timing of intervention affects the progression of psychosocial features. If treatment is provided later, the same psychosocial benefits are not achieved. Therefore an 'assess/advise/treat' model of care seems to offer better outcomes than an 'assess/advise/wait' model of care.

Key words: Acute low back pain, disability, manual therapy, exercise, biopsychosocial education, early intervention, psychosocial factors.

Key points

- International guidelines for ALBP differ in their support for physical therapy and in the suggested timing of physical intervention.
- Patients receiving physiotherapy treatment demonstrate better short term outcome than those given advice to stay active.
- There was no long term difference in pain and disability between early and late intervention.
- The timing of intervention affects the progression of psychosocial features. If treatment is provided later, the same psychosocial benefits are not achieved.

Mini abstract

Two models of care for ALBP were compared in a randomised controlled trial. Short term outcome is better in patients receiving physiotherapy. Long term outcome for pain and disability is not affected by the timing of treatment. However, the timing of treatment affects the long term progression of psychological features

Introduction

Evidence based guidelines for the management of acute low back pain (ALBP) have been formulated by the Health Authorities of a number of countries[1]. Clear evidence has emerged that 'advice on staying active' and appropriate drug therapies are effective interventions for ALBP and that bed rest and general back exercises are not.[2,3,4,5]

A major discrepancy between guidelines is in the use of physical therapy, particularly the timing of physical intervention. Based on the inconclusive evidence for physical therapy, the potential negative effect of treatment dependency, the cost, and the sometimes passive nature of the treatment, the Dutch and Australian authorities propose a 'wait and see' approach during the first 6 weeks.[1,6] More recent reviews have further strengthened this approach.[3,5] Alternatively the UK Clinical Standards Advisory Committee (CSAG) report[7], the American guidelines[2] and the more recent UK guidelines[4] recommend various forms of early physical intervention.

The discrepancies between these guidelines represent two different models of care for ALBP. In one system patients are assessed, advised to stay active and active treatment is commenced early (assess/advise/treat). In the alternative model active treatment is delayed (assess/advise/wait).

Direct comparisons between these two models are lacking in the literature. The present study aims to compare these two approaches to the management of ALBP.

The present study addressed three major research questions:

1. Do patients treated with an active intervention programme differ significantly at six weeks in outcome from patients who have received advice on staying active only?
2. At long-term follow-up do patients who received treatment early differ significantly in outcome from patients who were asked to wait six weeks for their treatment?
3. Are there any meaningful differences in outcome between an 'assess/advise/treat' model and an 'assess/advise/wait' model of care for ALBP?

Materials and Methods

Design

A randomised, controlled, single-blind trial, with the assessor independent and blind to the patient group allocation, was conducted in the Physiotherapy Outpatients Department at Central Middlesex Hospital, London.

Support was provided by the Department of Health Studies at Brunel University. Ethics approval was obtained from the local Health Authority Research Ethics Committee and informed consent was obtained from all study participants.

Recruitment

Subjects were recruited from ALBP patients referred to the Physiotherapy Department by either their General Practitioners or the Hospital Accident and Emergency Department. Patients were screened for eligibility within the Physiotherapy Department based on referral details and telephone screening. All eligible patients were contacted and invited to participate. The first patient was recruited on the 31st of March 1998 and the last patient on the 21st of December 1999.

Procedure

Following completion of their baseline questionnaires, subjects underwent a full physical examination by a physiotherapist to determine final eligibility for the study.

Each patient entering the trial was randomised to the 'assess/advise/treat' or 'assess/advise/wait' group using random number tables with odd/even number allocation to group and drawn by an independent person not involved in the study. Both groups underwent a physical examination, received information and advice on staying active[4] and a copy of the Back Book.[8] The 'assess/advise/wait' group were given an appointment to begin physiotherapy treatment at six weeks from baseline. Patients in the 'assess/advise/treat'

group received immediate physiotherapy treatment. All patients were followed up by postal assessment at six weeks, three months and six months from baseline. Patients who failed to return their questionnaires within two weeks were sent a second set. After a further two weeks patients were contacted by phone and encouraged to complete and return their questionnaires.

Outcome Assessment

The primary outcome measure was the Roland and Morris Disability Questionnaire (RMDQ)[9]. Secondary outcome measures were: Visual Analogue Scale (VAS) Usual Pain Intensity[10]; 6 Items from the Spielberger State-trait Anxiety Inventory (STAIS)[11]; Modified Zung Self Rated Depression Score (MZSRDS)[12]; Modified Somatic Perception Questionnaire (MSPQ)[13]; EuroQol health transition and health thermometer[14]; and the Short Form 36 (SF-36)[15].

Clinical Interventions

Investigations of physiotherapy have most often focused on individual elements of physiotherapy care and reflect neither the reality of clinical practice nor the philosophical framework of physiotherapy. The current study adopted a pragmatic, evidence-based approach to physiotherapy treatment. Patients were assessed using a locally developed biopsychosocial protocol. From the biopsychosocial assessment a goal directed treatment plan was formulated. The treatment protocol was explained to the subjects and short and long-term functional goals were agreed. All sections of the assessment were documented as well as the clinical reasoning process. Manual therapy,[16] rehabilitative exercises,[17,18,19,20,21,22,23,24,25,26,] advice on staying active[1,4] and

education,[8,27] were the major interventions used. Electrotherapy, traction and general back exercises were not included in the treatment model.[4]

The manual therapy intervention followed the regimen described by Maitland et al.[16] In this approach both low-velocity joint mobilization techniques and high-velocity manipulation techniques are used. In keeping with normal clinical practice the choice of initial and subsequent manual therapy techniques was at the treating therapist's discretion. Treatment decisions were based on the initial and progressive assessment of the patient's joint dysfunction. Patients could receive a combination of low- and high-velocity techniques as indicated as best clinical practice within the Maitland regimen.

The exercise therapy intervention could include exercises designed to: affect pain distribution and intensity;[22,26] improve spinal motion, alignment and posture;[17,24,25] enhance spinal stability;[23,24] or improve cardiovascular fitness and lower limb and back strength.[18,27] Therapist's were encouraged to ensure that all exercise treatment was delivered in a rehabilitative framework that attempted to increase the feeling of control over pain and increase confidence in the ability to carry out normal activities. All exercises were delivered on an individual basis. As with the manual therapy, the choice of initial and subsequent exercise treatment was at the discretion of the treating therapist.

The educational intervention was based on the information provided in The Back Book.[8] The education programme attempted to explain the nature of the patients symptoms, disavow the structural basis for simple low back pain,

emphasis the self limiting nature and favourable outcome of the condition, encourage graded return to activity, emphasise the therapeutic benefit of movement and participation in normal work and leisure activities, decrease the focus on pain, explain the principles of sensitisation if appropriate and make clear that hurt does not equal harm.

All of the recently developed clinical guidelines recommend that assessment should address psychological, occupational and socio-economic factors[1]. Evidence indicates that these are more important risk factors for the development of chronicity than biomedical symptoms and signs.[28] Every effort was made to ensure that psychosocial assessment and management strategies were integrated into the physiotherapy treatment model for this study. [27]

Advice to Stay Active

Evidence suggests that advice on staying active is an effective treatment strategy for simple low back pain, leading to faster recovery and less chronic disability.[4] Encouraging patients with simple low back pain to stay active and continue normal activities is included as first line treatment in most national guidelines.[1] However, whether advice on staying active is the optimal management for acute low back pain is, at present, unclear. Direct comparisons between advice on staying active and more active approaches to managing acute low back pain are lacking in the literature. There is some evidence from studies on sub-acute low back pain that more intensive treatments produce better outcomes.[29] Furthermore, there would seem to be some discrepancy between the evidence base and the clinical guidelines as far

as advice on staying active is concerned. The majority of studies included in the reviews on advice on staying active include more than simply advice.[21,30] This is not always explicit when reviewing the algorithms of care in management guidelines.[1] It is important that more studies investigate advice on staying active in the way that it has been interpreted by clinical guidelines and applied in everyday practice, that is, as a one-off intervention.

Sample size

Prospective sample size was calculated using the method of Altman[31]. Assuming a standard deviation of six points[32] on the primary outcome of the Roland and Morris Disability Questionnaire (RMDQ),[9] a clinically significant difference of four points could be detected with two groups of n=49 subjects (alpha = 0.05, power = 0.90).

Statistical Methods

The statistical analysis was performed using Stata Release 6 statistical software. Seven baseline co-variates (RMDQ,[9] VAS usual pain intensity,[10] MZSRDS,[12] MSPQ,[13] STAIS,[11] QTF Classification,[33] Acute low back pain screening questionnaire[34]) were used to adjust for baseline characteristics known to influence outcome and the potential confounding effects of missing data at follow up. Regression models investigated whether there was any interaction between group and follow-up responder status for each baseline characteristic.

After adjustments for baseline co-variates, regression co-efficients and their associated *p* values were calculated for each outcome variable at six weeks

and at long-term follow-up. The significance level was set at 0.05. Long-term follow-up estimates were derived from all available data at three months and six months. The regression models used robust sandwich estimates of the standard errors of the regression co-efficients to take account of any correlation between the repeated assessments on the same subject. All statistical analyses were based on an intention-to-treat methodology.

Fisher's exact tests (categorical variables) and t-tests (continuous variables) were used to compare the baseline characteristics of follow-up responders (those who did and did not complete the follow up assessments). Sensitivity analyses were performed by repeating the regression analyses using last value carried forward for those patients who did not respond to follow-up assessments.

Results

Sample Derivation

804 patients were considered for inclusion in the study. Following the application of the eligibility criteria, 102 (13%) patients were randomised to either the 'assess/advise/treat' (n=50) or the 'assess/advise/wait' (n=52) group (Figure 1). One patient from each group was excluded after randomisation due to commencing litigation. Reasons for exclusion are presented in Table 1.

Response rate

65 patients (64%) at six weeks and 63 patients (62%) at long-term follow-up returned their assessments. There was no significant difference between the groups in the proportion of patients who returned questionnaires at either six week (chi-square = 1.75, p=0.19) or long-term (chi-square=0.004, p=0.95) follow-up.

Baseline Characteristics

Following randomisation six patients failed to complete their baseline assessments and two patients were excluded due to commencing litigation. Baseline characteristics are presented in Table 2 for the 94 patients who provided baseline assessment. No significant differences were detected between groups at baseline (p>0.05).

Six weeks

There was a significant (p<0.05) effect of treatment on STAIS, RMDQ, MZSRDS, EuroQol Total Score, EuroQol Health Thermometer, SF-36 Vitality, SF-36 Social Functioning, and SF-36 Mental Health (Table 3). Patients randomised to the 'assess/advise/treat' group reported significantly lower disability, fewer symptoms of depression and anxiety and had better quality of life, vitality, social functioning and mental health at six weeks than those patients randomised to the 'assess/advise/wait' group.

Long-term follow-up

There was a significant (p<0.05) long-term effect of treatment on STAIS MZSRDS, MSPQ, EuroQol Health Thermometer and SF-36 Role Emotional, Mental Health and Health Transition (Table 4). Those patients in the 'assess/advise/treat' group reported fewer symptoms of depression, somatic

distress and anxiety, had better quality of life and mental health and reported less interference of emotional problems in everyday activities than those patients in the 'assess/advise/wait' group.

Sensitivity analysis

The potential effects of missing data were explored by re-fitting the regression models (which assessed short and long term effects of treatment) with missing data replaced by the last value carried forward (LVCF). Apart from VAS for usual pain intensity (short-term follow-up VAS was significantly lower for the 'assess/advise/treat' group (regression coefficient=-1.2, se=0.5, p=0.02)), there were no other differences between these models and the regression models using all available data. Furthermore there were no significant interactions between group and responder status for any baseline variable ($p>0.05$).

Discussion

Baseline

This study was undertaken in the physiotherapy department of a UK metropolitan National Health Service hospital. Patient baseline characteristics (table 3) indicated that on average patients fell within the normal range of distress or illness behaviour.[35] However 41% (n=38) of patients were assessed at baseline as either at Risk for Depression or Distressed – Depressive.[35] Similarly 31 patients (30%), demonstrated risk of long term work loss as assessed by the Yellow Flags Questionnaire.[34] These findings indicated that an important proportion of patients with ALBP referred for physiotherapy in a primary care setting exhibited psychosocial features associated with poor outcome.[28,34]

This study was driven largely by the discrepancies that exist in recently published LBP guidelines.[1] In this study the definition of simple low back pain offered by these reports was used as the inclusion criteria for the study, yet relatively few ALBP patients referred to the department fulfilled these criteria. Based on our data, 74% of ALBP patients referred fell outside the criteria for simple ALBP (table 1). These findings have clear implications for the utility of these guidelines in primary care, as the population presenting for treatment might not represent the population from which the evidence base is derived. Our first recommendation therefore is that health care professionals become aware of the demographics of their client group and interpret and implement guidelines in keeping with these characteristics.

Six-week follow-up

Analysis at this time point enabled comparison between advice on staying active and active physiotherapy treatment. Our findings suggested that early active physiotherapy treatment led to improved outcomes in disability, general health, social function, anxiety, depressive symptoms, mental health and vitality. In the short term it appears that physiotherapy is a superior intervention to advice on staying active for patients with ALBP. This is in keeping with findings on sub-acute LBP.[29]

A number of reviews have concluded that the evidence for the use of physical interventions in ALBP is negative, or at best weak.[3, 5, 36, 37, 38] This is reflected in the Dutch and Australian guidelines where physiotherapy is not recommended in the acute stage.[1] Our findings challenge these

recommendations. We have shown that patients obtain significant benefit from being involved in an early active physiotherapy programme. Further research is being undertaken to thoroughly analyse the content of treatment and the clinical reasoning process employed by the treating therapists so that the aspect or aspects of care that led to such favourable outcomes can be identified. It is our impression however that effective intervention needs to be multi-modal and delivered within a rehabilitative framework, with the individual interventions themselves probably of less importance than the philosophical construct in which the treatment is delivered.

Long- term follow-up

Neither pain nor disability was significantly different between the groups during the course of the long-term follow-up, indicating that these parameters were unaffected by the treatment model. ''assess/advise/wait'' led to a delay in improvement of disability, but with no long-term consequences.

A number of other important outcome variables, however, were adversely affected by an 'assess/advise/wait' approach. Patients seen promptly had significantly less anxiety, depressive symptoms and distress. They also had better general health, social functioning, and mental and emotional health. Very few studies of physiotherapy intervention for ALBP have assessed psychosocial variables as part of long-term follow-up. This study provides evidence that early active treatment can improve psychosocial outcomes and that the effect on psychosocial function appears to be dependent on the timing

of intervention. Delaying the onset of treatment does not provide the opportunity for physiotherapy intervention to have this favourable effect.

Overall our study supports the hypothesis that 'assess/advise/treat' produces better long-term outcomes than an 'assess/advise/wait' approach. Furthermore, as it is recognised that psychosocial variables are predictive of chronicity in ALBP[28], early active treatment may have the potential to reduce the risk of chronicity developing.

Sensitivity analysis

All our sensitivity analyses to examine the consequences of missing follow-up data suggested that, although it comprised approximately one third of the randomised cases, this was unlikely to result in substantial bias to the results of the study.

The amount of missing data was similar for both groups at both six week and the long-term follow-up. Furthermore there was no difference between responders or non-responders in any of the baseline variables. For those patients for whom data were available, non-responders at six weeks did not differ significantly from the rest of the cohort at long-term follow-up. Similarly, non-responders at long-term follow-up for whom there were six week data available are not significantly different from the rest of the cohort at six weeks. The results of a sensitivity analysis using LVCF indicated little change in the regression coefficients. Finally, the finding that 16 patients (42%) were lost to follow-up due to changes of their address provided further

evidence that data were missing at random. However, despite these results and the strenuous efforts made to obtain follow up information on all randomised patients, bias is always a possibility when follow up rates are low.

Conclusion

In the UK the CSAG report[7] called for a change in the health service provided for patients with low back pain. The report concluded that although there is a high probability that an acute attack will settle, this should not be taken as grounds for complacency, inactivity or a policy of "wait and see" on the part of the health professionals. The report was criticized for basing recommendations on anecdotal evidence and on making a bold claim that the provision of 'services at the acute stage…will prevent chronic pain and disability'.[39] Our results do not specifically support the CSAG recommendation. Early intervention does not affect long term pain and disability. However, other important features of the low back pain experience are dependant on the timing of intervention. Further research is needed to fully clarify the role of early intervention.

References

References

1. Koes BW, van Tulder MW, Ostelo R et al. Clinical guidelines for the management of low back pain in primary care. Spine 2001;26:2504-2513.

2. Agency for Health Care Policy and Research. Acute low back pain problems in adults: Clinical practice guidelines 14. Rockville, MD:AHCPR, 1994.

3. Effective Health Care. Acute and chronic low back pain. York: University of York 2000;6:5.

4. Royal College of General Practitioners. Low back pain evidence review London: 1996, update 1999.

5. van Tulder MW, Koes BW, Assendelft WJJ, Bouter LM, Kaams J, van der Laan JR. Acute lage rugpijn: actief blijven, NSAID's en spierverslappers effectief, bedrust en specifieke oefeningen niet effecctief; resultaten van reviews. Ned Tijdschr Geneesk 2000; 144(31):1484-89.

6. Faas A, Chavannes AW, Koes BW, et al. Practice guideline 'low back pain'. Dutch College of General Practitioners, 1996.

7. CSAG (Clinical Standards Advisory Group). Report on back pain. London: HMSO, 1994.

8. The Back Book. Norwich: Stationary Office 1996.

9. Roland M, Morris R. A study of the natural history of low back pain. Part 1: Development of a reliable and sensitive measure of disability in low back pain. Spine 1983; 8: 141-4.

10. Bolton JE. Accuracy of recall of usual pain intensity. Pain 1999; 83: 533-539.

11. Speilberger CD, Gorsuch RL, Lushene R. The State-trait Anxiety Inventory Manual. Palo Alto, California: Consulting Psychologists Press, 1970.

12. Main CJ and Waddell G. The detection of psychological abnormality in chronic low back pain using four simple scales. Current Concepts in Pain 1984; 2:10-15.

13. Main CJ. The Modified Somatic Perception Questionnaire. Journal of Psychosomatic Research 1983; 27(6):503-514.

14. The EuroQol Group. EuroQol - a new facility for the measurement of health-related quality of life. Health Policy, 1990;16: 199-208.

15. Ware JE, Snow KK, Gandek B. SF-36 Health Survey manual and interpretation guide. Boston, MA: New England Medical Center, The Health Institute, 1993.

16. Maitland GD, Hengeveld E, Banks K, et al. Maitland's Vertebral Maniplation. 6th ed. London: Butterworth, 2000.

17. Brukner P & Khan K. Clinical Sports Medicine. Sydney: McGraw-Hill 2001.

18. Frost H, Klaber Moffett J, Moser JS, et al: Randomised controlled trial for evaluation of fitness programme for patients with chronic low back pain. British Medical Journal 1995; 310**:**151-154.

19. Hides J, Richardson C, Jull G. Multifidus muscle recovery is not automatic after resolution of acute, first episode low back pain. Spine 1996; 21:2763-2769.

20. Klaber Moffett J, Torgerson D, Bell-Syer S, et al. Randomised controlled trial of exercise for low back pain: clinical outcomes, costs, and preferences. British Medical Journal 1999; 319: 279-83.

21. Lindstrom I, Ohlund C, Eek C, et al. The effect of graded activity on patients with sub-acute low back pain: a randomised prospective clinical trial with an operant conditioning behavioural approach. Physical Therapy 1992;72:279-293.

22. McKenzie R. The Lumbar Spine Mechanical Diagnosis and Therapy. Waikanae, New Zealand: Spinal Publications Ltd. 1981.

23. Richardson C, Jull G, Hodges P, et al: Therapeutic Exercises for Spinal Segmental Stabilization in Low Back Pain. London, Churchill Livingstone, 1999.

24. Norris, M. Spinal stabilisation Part 5. An exercise programme to enhance lumbar stabilisation. Physiotherapy, 1995; 81: 61-78.

25. Poterfield J and De Rosa. Mechanical Low Back Pain. Perspectives in Functional Anatomy. Philadelphia: W.B. Saunders. 1998.

26. Stankovic R, Johnell O. Conservative treatment of acute low back pain. A 5-year follow-up study of two methods of treatment. Spine 1995; 20:469-472.

27. Kendall NAS, Linton SJ, Main CJ. Guide to assessing psychosocial yellow flags in acute low back pain: risk factors for long-term disability and work loss. Accident Rehabilitation and Compensation Insurance Corporation of New Zealand and the National Health Committee. Wellington NZ, 1997.

28. Linton SJ. Review of psychological risk factors in back and neck pain. Spine 2000; 25:1148-56.

29. Torstensen T, Ljunggren A, Meen, et al. Efficiency and costs of medical exercise therapy, conventional physiotherapy, and self-exercise in patients with chronic low back pain. A pragmatic, randomised, single-blinded, controlled trial with 1-year follow up. Spine 1998; 23:2616-2624.

30. Linton S, Hellsing A, Andersson D. A controlled study of the effects of an early intervention on acute musculoskeletal pain problems. Pain 1993;54:353-293.

31. Altman DG. Practical statistics for medical research. Chapman and Hall, London: 1991.

32. De Souza LH, Sharma V, McAuley JH, Main CJ et al. Influence of gender and culture on self-reported functional disability in patients with low back pain. International Association for the Study of Pain 8th World Congress. 1996; 59.

33. Spitzer W, LeBlanc F, Dupuis M. (eds). Scientific Approach to the assessment and management of activity-related spinal disorders. A monogram for clinicians. Report on the Quebec Task Force on Spinal Disorders. Spine 1987; 12:S1-S59.

34. Linton SJ and Hallden K. Risk factors and the natural course of acute and recurrent musculoskeletal pain: developing a screening instrument. Proceedings of the 8th World Congress on Pain. Seattle: IASP Press,1996.

35. Main CJ, Wood P, Hollis S, et al. The distress and risk assessment method: a simple patient classification to identify distress and evaluate the risk of poor outcome. Spine 1992; 17: 42-52.

36. Abenhaim L, Rossignol M, Valat J-P et al. The role of activity in the therapeutic management of back pain. Spine 2000; 25 (suppl) 1S-33S.

37. Haigh R and Clark A. Effectiveness of rehabilitation for spinal pain. Clinical Rehabilitation 1999; 13:63-81.

38. van Tulder MW, Koes BW, Bouter L et al. Conservative treatment of acute and chronic non-specific low back pain: A systematic review of randomised controlled trials of the most common interventions. Spine 1997; 22:2128-2156.

39. Feder G and Hemingway H. Bad backs, good policy? British Journal of General Practice 1995;456-57.