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**Costs and
Outcomes of
Chiropractic
Treatment for
Low Back Pain**

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Canadian Coordinating Office for Health Technology Assessment

**Costs and Outcomes of Chiropractic
Treatment for Low Back Pain**

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July 2005

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Conflicts of Interest

Phil Jacobs reported that after beginning the project, he took a one-day trip to Calgary to meet with the Alberta government health quality council. The Alberta Chiropractic College paid for this trip. Since then, he has begun an Alberta government-funded study on alternative funding arrangements for chiropractors in Alberta.

The other reviewers and authors reported no conflicts.



REPORT *IN BRIEF*

July 2005

Costs and Outcomes of Chiropractic Treatment for Low Back Pain

Technology

Chiropractic treatment

Disease

Low back pain (LBP) is tiredness, discomfort or pain in the low back. It is experienced by 70% to 80% of adults at some time during their lives. In Canada, it is estimated that medical expenditure on LBP costs \$6 billion to \$12 billion annually. In addition, there are societal costs due to lost productivity from days off work and disability payments.

Issue

Chiropractic care is a common treatment for LBP. Public funding support for chiropractic care varies across the provinces and territories in Canada. A clinical and economic review of chiropractic care for LBP was done because there is uncertainty about clinical and cost effectiveness compared with standard medical treatment or physical therapy; and there is variability in public funding for this treatment across Canada.

Methods and Results

Chiropractic care was compared with physical therapy and standard medical care for effectiveness and costs of treatment for LBP. Effectiveness was primarily determined by examining evidence from existing systematic reviews. Eighteen review articles were identified after screening available literature. Four trials published after the reviews were completed, were also identified. Relative costs were examined from 10 identified economic

studies (four cost comparisons and six cost-consequence studies). Nine of the included economic studies were from the US and one was from Australia. None of the included studies were full cost-effectiveness studies.

Implications for Decision Making

- **There is no clear clinical advantage to chiropractic treatment for LBP versus standard medical care or physical therapy.** Studies show that the three treatment methods have similar effects on pain relief and functional improvement. The higher quality reviews did not find significant differences in effectiveness.
- **There is no clear cost advantage for any of the three methods studied.** One of the included economic studies compared chiropractic care with physical therapy; and found costs to be similar. Cost results varied among the studies comparing chiropractic care with standard medical care. In terms of improving lost time from work, chiropractic care was similar to physical therapy; and as effective as or better than standard medical care.
- **Regional costs will require consideration.** The impact on regional health care budgets will need to be considered when decisions on the funding of chiropractic care for LBP are being made. A well-designed Canadian study that compares the cost-effectiveness of LBP care provided by chiropractors, physical therapists and primary care physicians would be of benefit.

This summary is based on a comprehensive health technology assessment available from CCOHTA's web site (www.ccohta.ca): Brown A, Angus D, Chen S, Tang Z, Milne S, Pfaff J, Li H, Mensinkai S. *Costs and outcomes of chiropractic treatment for low back pain.*

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EXECUTIVE SUMMARY

The Issue

Low back pain (LBP) can be defined as tiredness, discomfort or pain in the low back region, with or without radiating symptoms to the legs. Most LBP has uncertain causes that are probably multifactorial. Treatment relies on pain relief and functional improvement, rather than the elimination of the underlying condition. LBP is one of the most common and most costly medical problems in industrial countries.

Chiropractic care is a common treatment for LBP. Public funding support for chiropractic care varies across the provinces and territories in Canada. A clinical and economic review of chiropractic care for LBP was done because there is uncertainty about clinical and cost effectiveness compared with standard medical treatment or physical therapy; and there is variability in public funding for this treatment across Canada.

Objectives

The objective of this report is to review the clinical and economic implications of chiropractic care in the treatment of LBP. The report is intended to help decision makers who are involved in the provision of chiropractic services for LBP.

The objective is accomplished by addressing the following questions:

- what is the clinical evidence (RCT and non-RCT) of the effectiveness of chiropractic for adults with LBP (acute and chronic) compared with standard medical care and physical therapy?
- what is the evidence of cost-effectiveness of chiropractic for adult patients with LBP compared with standard medical care and physical therapy?
- how do the costs of chiropractic compare with those of standard medical care and physical therapy for adults with LBP?

Clinical Review

Methods: A search strategy was developed for existing systematic reviews of RCTs. It was supplemented by a literature search on new RCTs from 2002 onward. The search strategy also covered non-RCTs.

Results: After implementing the clinical evidence selection process, the inclusion criteria were met by 18 systematic reviews, two RCTs since the end of 2002 and two non-RCTs. Overall results suggest that for acute and chronic LBP, chiropractic treatment gives outcomes similar to those of standard medical care and physical therapy. The results of the review suggest that serious adverse events are unlikely to occur with chiropractic treatment for LBP.

Economic Review

Methods: A search strategy was developed for the review of economic evidence and for the review of the regulatory and insurance environment of chiropractic care in Canada.

Results: Ten papers were included for the review of economic evidence. Nine studies were conducted in the US and one in Australia. No full cost-effectiveness studies were identified. Four studies were cost comparisons and six were cost consequence studies. There was variation in the reported relative costs of chiropractic care, medical care and physical therapy for the treatment of LBP. The consequence analyses in the six cost-consequence studies were consistent with the results of this report. Chiropractic services are partially funded in the provincial health care plans of Manitoba, Saskatchewan, Alberta and British Columbia.

Conclusions

Chiropractic care for LBP is similar in effectiveness to that of standard medical care and physical therapy. The evidence from other countries is inconclusive about the costs for chiropractic treatment of LBP, relative to physical therapy or medical care. A well-designed Canadian study that compares the cost-effectiveness of LBP care provided by chiropractors, physical therapists and primary care physicians, would be of benefit.

ABBREVIATIONS

AHC	Alberta Health Care
HMOs	health maintenance organizations
LBP	low back pain
MCIB	medical claim insurance branch
NSAIDs	non-steroidal anti-inflammatory drugs
RCT	randomized controlled trial
RCMP	Royal Canadian Mounted Police
RMDQ	Roland-Morris Disability Questionnaire
TENS	transcutaneous electrical nerve stimulation
WCB	Workers' Compensation Board

GLOSSARY

Chiropractic spinal manipulation: Spinal manipulation as practised by a chiropractor.

Chiropractic treatment: The full range of treatment options available to chiropractors (including, but not exclusive to chiropractic spinal manipulation).

Diathermy: Diathermy is a form of heat treatment used in physical therapy and chiropractic.

Exercise therapy: Exercise therapy encompasses several types of spinal movement: combined movements, extension, flexion, lateral inclination and rotation.¹ It serves to correct posture, relax muscle spasm, strengthen trunk muscles and enhance general aerobic fitness. Exercise is used for functional restoration, once normal joint biomechanics have been restored to the involved segments. Exercise is one of the techniques used in physical therapy for the treatment of low back pain (LBP). Chiropractors may also give advice on exercise therapy.

Lumbar roll: A lumbar roll is a type of back support that helps maintain good back alignment, through supporting the curve in the low back while sitting.

Massage therapy: Massage is the manipulation of the body's soft tissues (i.e., muscle and fascia) by stroking, rubbing, kneading or tapping with the hands or an instrument. It is also the anointment, smearing or rubdown of the skin with oil or cream, to promote circulation and relaxation of muscle spasm or tension.² Massage is a technique that is used in physical therapy for the treatment of LBP.

McKenzie therapy: McKenzie therapy is a form of physical therapy that emphasizes exercise and patient education.³ It is characterized by extending the spine through exercise, thus reducing pain in the intradiscal region.

Systematic review: A review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research; and to extract and analyze data from the studies that are included in the review. Statistical methods (meta-analysis) may be used.⁴

Traction: Spinal traction, which is the application of a pulling force along the long axis of the spine, is used to stretch soft tissues, separate joint surfaces or separate bony fragments.⁵ Traction is a technique that is used in physical therapy and chiropractic care for the treatment of LBP.

Transcutaneous electrical nerve stimulation (TENS): TENS is widely used in the treatment of chronic LBP.¹ It is applied through surface electrodes and it causes an analgesic effect believed to be mediated by the stimulation of large sensory fibers; interruption of a self-perpetuating, memory-like loop or chain of neural activity; or release of endogenous endorphins.⁵ TENS is a technique that is used in physical therapy and chiropractic care for the treatment of LBP.

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1 INTRODUCTION

1.1 Background

Low back pain (LBP) affects people in all cultures and ethnic groups. It is experienced by 70% to 80% of adults at some time during their lives.⁶ LBP is one of the most difficult and costly medical problems in industrialized countries.⁷ In Canada, it is estimated that medical expenditure on LBP costs six to 12 billion dollars per year.⁸ The importance of methods of treatment that are both clinically effective and cost-effective is evident.

LBP can be defined as tiredness, discomfort or pain in the low back region, with or without radiating symptoms to the leg or legs.⁹ Many factors have been considered as correlated with LBP, such as occupations that require repetitive lifting in the forward bent-and-twisted position, smoking, obesity, previous back problems, pregnancy and sport activities.^{6,10,11} Although some cases of back pain have specific causes (i.e., tumour, infection or vertebral fracture), most episodes are classified as nonspecific,^{12,13} with causes that are uncertain and probably multifactorial. The results of a survey of 1,500 Canadian adults suggests that the main causes of back pain include health condition (22%), work-related injuries (15%), poor posture (10%), sports injuries (9%) and improper lifting (8%).¹⁴ As a result, the treatment of LBP mainly relies on pain relief and functional improvement rather than elimination of the underlying condition.¹³

The prognosis for LBP is mainly associated with and categorized on disease duration. LBP has been categorized as acute or chronic – or acute, subacute and chronic – with the cut-off points varying between researchers. A Cochrane review^{15,16} divided patients into acute LBP (<3 weeks), subacute LBP (three to 13 weeks) and chronic LBP (>13 weeks) groups for analysis. In the review analysis, the acute and subacute categories were combined. The categories used by an evidence-based clinical practice guideline expert panel¹⁷ were acute (<4 weeks duration), subacute (four to 12 weeks duration) and chronic (>12 weeks duration). Another systematic review¹⁸ used acute (<6 weeks) and subacute (six to 12 weeks).

A variety of health practitioners are involved in the treatment of LBP. Several non-surgical health-care options are available for LBP, including chiropractic care, standard medical care, physical therapy, acupuncture, back school and bed rest. This study emphasizes the most common comparators – standard medical care, chiropractic care and physical therapy. The typical therapeutic option for chiropractic care is manipulation; for standard medical care, it is medication; and for physical therapy, it is exercise. Some of the therapeutic options available to each profession may overlap.

1.2 Technology Overview

Chiropractic care, which specializes in manual therapy, particularly in spinal manipulation, emerged in the early 1900s.¹⁹ Chiropractic practice is defined as the “discipline of the scientific healing arts concerned with the pathogenesis, diagnostics, therapeutics and neurophysiological effects related to the statics and dynamics of the locomotor system, especially of the spine and

pelvis.”⁵ The Canadian Chiropractic Association defines chiropractic as “the science which concerns itself with the relationship between structure, primarily the spine, and function, primarily the nervous system, as that relationship may affect the restoration and preservation of health.”²⁰ Chiropractic care has become one of the most commonly used forms of alternative medicine in Canada and the US.²¹

Chiropractic spinal manipulation is the principal therapeutic procedure used by chiropractors for the management of LBP. It is defined as manoeuvres in which the hands are used to stretch, mobilize or manipulate the spine and paravertebral tissues for the purpose of relieving spinal-related pain and dysfunction. It is characterized by the use of high-velocity, low-amplitude manual thrusts to the spinal joints, slightly beyond the passive range of joint motion.²² This type of manual thrust is usually accompanied by an audible joint sound, caused by a temporary vacuum in the posterior spinal joints.²² The procedure is usually painless as the joint is moved past its passive range of motion, but not outside its limit of anatomical integrity. Several terms are used to refer to spinal manipulation, for example, spinal manipulative therapy,²² chiropractic spinal manipulation,²³ joint manipulation²⁴ and spinal adjustment.²⁰

Spinal manipulation can be differentiated from spinal mobilization. Spinal mobilization is the use of manual force on the spinal joints within the passive joint range of motion and does not involve a thrust.²² The difference between spinal manipulation and spinal mobilization is based on the range of joint motion; and on the fact that spinal mobilization will be unaccompanied by an audible joint sound.

Chiropractic treatment involves more than chiropractic spinal manipulation. Treatment that is provided by chiropractors typically includes co-interventions, such as therapeutic exercise, the use of an ice pack or a hot pack, nutritional counselling, traction, massage therapy, ultrasound or electrical stimulation.²⁰ It can also include general counselling; and advice on ergonomics, posture and repetitive stress-inducing activity. Not all chiropractors provide all these co-interventions.

1.2.1 Use of services

Different sources report that between 9.9% and 12.5%²⁵⁻²⁷ of the Canadian population has consulted a chiropractor at least once during a given year. One survey about back pain in Canada noted that 40% of Canadian adults have sought chiropractic care at some time in their life.²⁸ About 80% of chiropractic practice is for musculoskeletal pain, particularly LBP.²⁹ The use of chiropractic services varies with age; and use in all age groups is higher in women than men. People reporting use of chiropractic services predominantly have post-secondary education, are middle-aged and are in the higher income brackets.¹⁴

A study³⁰ of about 700 chiropractors in Ontario, between 2000 and 2001, found that of provinces with some government insurance coverage for chiropractic services, the sources of revenue are 40% from government insurance, 45% from patient co-payments, 10% from private insurance and 5% from the Workers' Compensation Board (WCB).

This study also reports that chronic LBP outweighs acute LBP by a ratio of two to one; and that most conditions handled with by chiropractors are musculoskeletal problems. Back problems are the leading reason for chiropractic consultation.³⁰

1.2.2 Risks and adverse effects of chiropractic treatment for LBP

A few studies^{20,21,31} have systematically examined the contraindications and adverse effects of chiropractic treatment. One report that summarized the evidence of harm²⁰ found that in general, a higher risk of harm occurred in patients with severe spondylitic changes, osteoporosis, fractures, tumours, ankylosing spondylitis, infections or signs of nerve root pressure. Injuries from lumbar spinal manipulation were less common than those from cervical manipulation and they were usually attributed to poor technique. The most frequently described severe complication was compression of the cauda equina syndrome by midline nuclear herniation at the level of the third, fourth and fifth intervertebral discs.²⁰ Another systematic review noted that the development of cauda equina syndrome can be a serious complication of lumbar spinal manipulation, yet the incidence was low.³¹ A systematic review of prospective data on harm from chiropractic care indicated that the adverse events, although common, seemed to be mild and transient.³² Another review stated that patients' common complaints after chiropractic treatment were local discomfort in the treatment area, headache or fatigue.²¹

1.2.3 Other conservative methods for treating LBP

a) **Standard medical care**

Patients with LBP can go to their primary health care practitioners from whom they receive standard treatment, such as drug prescription; advice on positioning and posture, bed rest and sick leave; or information about the self-curing nature of LBP. Analgesics, muscle relaxants and non-steroidal anti-inflammatory drugs (NSAIDs) are commonly prescribed as part of standard medical care for pain relief in patients with acute or chronic LBP.¹ The adverse effects of standard medical care mainly result from the side effects of the drugs used for pain relief, such as fluid retention, allergy, renal or hepatic dysfunction, gastric irritation, headache or dizziness.³³

b) **Physical therapy**

Physical therapy, also known as physical therapy, is the therapeutic application of forces and substances that induce a physiologic response and that uses or allows the body's natural processes to return to a more normal state of health.⁵ It is an accepted and applied method of treatment of LBP. In general, physical therapy includes therapeutic techniques, such as exercise, TENS, massage, traction, ultrasound and cold or heat therapy. The most common intervention is exercise. There are few references to adverse effects for physical therapy, other than the use of physical therapy for range of motion and back strengthening will probably increase pain during the acute phase of LBP.³⁴

c) **Acupuncture**

Acupuncture involves the insertion of fine needles into specific points throughout the body.⁵ The aim has been described as triggering the release of naturally occurring painkillers and keeping the body's normal flow of energy unblocked.

d) **Back school**

Back school is a generic term that may include education, exercise, advice or behavioural-cognitive approaches to protect the spine.¹

e) Bed rest

Bed rest may reduce intradiscal pressure and thus may benefit persons with LBP.²⁰ In the past, bed rest was regarded as a traditional treatment for LBP. Recent evidence is not as supportive of its effectiveness.¹ There has been a shift in the recommendations for treating LBP during the past 15 years from passive therapeutics to more active behaviours. Patients are discouraged from lying in bed for longer than two days and they are encouraged to undertake moderate activities in graduated steps.³⁴

1.2.4 Compensation and regulation for chiropractic services in Canada

Chiropractors in Canada typically focus on the spine in relation to the total body and they practise the following activities during their management of neuromusculoskeletal disorders: diagnosis of the patients' physical health through the use of x-rays and laboratory facilities; development of clinical indications of patients' health status based on diagnostic information; and provision of spinal manipulation and complementary therapies. In Canada, chiropractors are not permitted to prescribe drugs or perform surgery. Most chiropractors use x-ray services and laboratory analysis.

In Canada, where each province is responsible for the provision and administration of health care, chiropractors are organized and governed in a structure similar to that of medical and dental practitioners. While the Canadian Chiropractic Examining Board (CCEB) is the national examining body for the profession, each province has a regulatory agency, which has the authority and responsibility of licensing chiropractors; and enforcing disciplinary and regulatory procedures. Graduates of chiropractic colleges who wish to practise must pass both national and provincial examinations. The self-disciplining and regulatory processes in each province comprise extensive testing, peer review programs, continuing education and the disciplining of chiropractors who do not meet the licensing bodies' recognized standards (Appendix 6 and Appendix 7).

1.2.5 Public insurance coverage

Chiropractic services are partially government-funded in the provincial health care plans of Manitoba, Saskatchewan, Alberta and British Columbia. Patients in these provinces pay part of the chiropractor's fees out-of-pocket unless they are covered by private insurance. Chiropractic services are not government-funded in Québec and the Atlantic provinces. In mid-2004, the Ontario government announced that the delisting of chiropractic treatment was pending. This went into effect December 1, 2004. Under the terms and conditions of the Canada Health Act (1984), provinces are not required to cover non-medical services such as chiropractic, dentistry, podiatry, optometry and physical therapy. Veterans Affairs Canada, the Royal Canadian Mounted Police and all provincial workers' compensation boards insure chiropractic services.

a) Ontario^{35,36}

As of December 1, 2004, chiropractic services were no longer insured by the Ontario Health Insurance Plan (OHIP). Before that date, OHIP paid chiropractors \$11.65 for an initial consultation and \$9.65 for a subsequent treatment. The balance was paid by the patient or by private insurance.

b) Manitoba³⁷

As of April 1, 2003, the provincial government in Manitoba covers the adjustment portion of chiropractic treatment at \$9.00 (\$9.90 for patients north of 53° latitude) per visit to a maximum of 12 visits per calendar year, per patient. Excluded in the provincial coverage are examinations; re-

examinations; x-rays; consultations; general information on exercises or nutrition; or modalities used to support the chiropractic adjustment. Private insurance may be used to supplement the provincial plan coverage.

For motor vehicle accidents, Manitoba Public Insurance covers treatment, x-rays and supportive appliances associated with chiropractic care. The Workers' Compensation Board (WCB) of Manitoba gives full coverage for chiropractic examinations, x-rays, treatment, authorized supportive devices and return-to-work programs.

c) Saskatchewan³⁸

Saskatchewan Health pays a portion of the cost for a visit to the chiropractor. Generally, the chiropractor charges an additional fee to the patient. Patients' claims for re-payment of chiropractic services under the Chiropractic Act are submitted to Saskatchewan Health, indicating the total amount received by the chiropractor for each service, including any amount received from or on behalf of the beneficiary who received the service. The board of the Chiropractors Association of Saskatchewan requested that chiropractors not accept payments from or on behalf of beneficiaries in excess of the amounts to be paid pursuant to the act. The fee billed by the chiropractor is \$34.25 for an initial visit [\$20.00 paid by the patient and \$14.25 paid by the provincial health insurance medical claim insurance branch (MCIB)]. The fee billed for a subsequent visit is \$25.05 with \$14.00 paid by the patient and \$11.05 paid by MCIB.

Coverage for chiropractic care may be available through the workplace or through private insurance. The beneficiaries of provincial supplementary benefits programs have full coverage for chiropractic care. Chiropractic care is fully covered by the Saskatchewan WCB. For individuals injured in automobile accidents, the cost of chiropractic care is fully covered on a shared basis by Saskatchewan Government Insurance (SGI) and Saskatchewan Health.

d) Alberta^{39,40}

Subject to the Alberta Health Care Insurance Regulation and the Claims for Benefits Regulation, the benefits payable for insured services provided by a chiropractor are limited to a benefit maximum of \$200.00 annually for an individual receiving chiropractic adjustments. One x-ray benefit is paid annually unless extenuating circumstances exist. The base rates that Alberta Health Care pays for chiropractic care (as of April 1, 2003) are \$12.91 for a visit and \$21.37 for an x-ray. As is the case with some other provinces, the Alberta government pays part of the cost of chiropractic care, while the consumer pays the rest. When AHC pays part of the treatment, private insurers do not contribute to the payment.

Where chiropractic services are provided during the same visit for which portions are the responsibility of AHC and the WCB, only the WCB benefit will be paid. WCB pays for the initial assessment of \$40.00 and treatment visits at \$28.00 for a maximum of 22 treatments during six consecutive calendar weeks.

e) British Columbia^{41,42}

The Medical Services Plan (MSP) of British Columbia covers the services provided by chiropractors. Until January 2002, the MSP covered 12 visits per patient annually to the chiropractor (15 visits for seniors), for plan members. There was a patient visit charge of \$10.00 per appointment, in addition to the MSP fee schedule. There was a limit of \$150.00 per patient

annually and x-rays were not covered. MSP paid \$22.27 towards each initial visit and \$17.35 for subsequent visits. Since January 1, 2002, most British Columbians have paid privately for chiropractic services. Only those patients who qualify for premium assistance (i.e., those earning <\$20,000) are insured for ≤10 visits annually for chiropractic services. For most residents, Extended Health Care Plans bear the total cost of visits up to the maximum specified in the policy. The BC Chiropractic Association recommends rates of \$45 for the initial visit and \$35 for subsequent visits, with a portion of these fees being covered through private insurance.

For injuries resulting from motor vehicle accidents, the Insurance Corporation of British Columbia (ICBC) provides coverage for office visits and x-rays (no referral is required). ICBC usually pays part of the office fees, with the patient responsible for any remaining balance.

1.2.6 Workers' Compensation Boards of Canada

Each province and territory in Canada has a Workers' Compensation Board (WCB). Each WCB covers chiropractic services that may be required as a result of workplace injuries. There is full coverage for chiropractic examinations, x-rays, treatment, authorized supportive devices and return to work programs. Details related to each province or territory's coverage can be found at Workers Compensation Board – Alberta;⁴³ Workers' Compensation Board of British Columbia;⁴⁴ Workers' Compensation Board of Manitoba;⁴⁵ Workers' Health, Safety and Compensation Commission of New Brunswick;⁴⁶ Workers' Health, Safety and Compensation Commission of Newfoundland and Labrador;⁴⁷ Workers' Compensation Board – Northwest Territories & Nunavut;⁴⁸ Workers' Compensation Board of Nova Scotia;⁴⁹ Workplace Safety & Insurance Board of Ontario;⁵⁰ Workers Compensation Board of Prince Edward Island;⁵¹ Commission de la santé et de la sécurité du travail;⁵² Saskatchewan Workers Compensation Board;⁵³ and Yukon Workers' Compensation Health and Safety Board.⁵⁴

2 THE ISSUE

Chiropractic care is a common treatment for LBP. Public funding support for chiropractic care varies across the provinces and territories in Canada. A clinical and economic review of chiropractic care for LBP was done because there is uncertainty about clinical and cost effectiveness compared with standard medical treatment or physical therapy; and there is variability in public funding for this treatment across Canada.

It may be the leading cause of industrial disability payments. Much of the work of chiropractors is concerned with LBP. Funding support for chiropractic treatment by provincial and territorial health plans varies across Canada; and the degree of support has been under review by a few Health Ministries.

3 OBJECTIVES

The objective of this report is to review the clinical and economic implications of chiropractic treatment of LBP, to aid decision makers involved in the provision of chiropractic services for this indication.

The report's objective is accomplished by addressing the following questions:

- what is the clinical evidence (RCT and non-RCT) of the effectiveness of chiropractic care for adults with LBP (acute and chronic) compared with standard medical care and physical therapy?
- what is the evidence of the cost-effectiveness of chiropractic care for adult patients with LBP, compared with standard medical care and physical therapy?
- how do costs of chiropractic compare with those of standard medical care and physical therapy for adults with LBP?

4 CLINICAL REVIEW

4.1 Methods

Several reviews of the clinical evidence regarding chiropractic care have been published. This report derives its review of the clinical evidence of clinical trials from these reviews, as well as RCTs published since the completion of the reviews.

4.1.1 Literature search strategy

A search strategy was developed to identify review articles on chiropractic spinal manipulation for LBP, including qualitative and quantitative systematic reviews. Letters; historical articles; and reviews of case and multicase studies were excluded from the search strategy. On the DIALOG[®] system, the following databases were searched: Allied and Complementary Medicine[™] (AMED[™]); Manual, Alternative and Natural Therapy[™] (MANTIS); CINAHL[®]; CAB HEALTH; PASCAL; SPORTDiscus; and ExtraMed. The search also included core biomedical databases such as MEDLINE[®], EMBASE[®] and BIOSIS Previews[®]. These searches were supplemented by parallel searches on the Cochrane Library (web version, 2004), Index to Chiropractic Literature (ICL), PEDro, CISCOP, CINAHL and PubMed. There were no language or date restrictions.

A preliminary search identified one systematic review of RCTs published before January 2001 by the Cochrane Collaboration.¹⁵ Another systematic review¹⁸ identified RCTs as recent as 2002; thus a supplemental literature search of new RCTs from 2002 onwards was conducted on the same databases using an RCT filter with the disease and intervention terms. A softer study design filter was used to retrieve non-RCTs. The selection criteria (type of patients, intervention, comparator, outcomes) for RCT and non-RCT studies were identical to those for systematic reviews. Clinical search details are given in Appendix 1.

There are several limitations to identifying published systematic reviews as a summary of the clinical evidence. First, as systematic reviews provide a summary of individual RCT evidence, there may be overlap in the RCTs included in each systematic review, which inherently includes comprehensive literature searches. Second, significant differences may exist in the methods used and the quality of each systematic review. For these two reasons, systematic review results will not be quantitatively combined. Summaries of the Cochrane review, other included systematic reviews, RCTs and non-RCTs are provided.

4.1.2 Selection criteria and method

Two reviewers (SC and SM) independently screened the clinical search results according to the following inclusion and exclusion criteria.

a) Selection criteria

The selection criteria include population (adult patients with chronic or acute LBP), intervention (chiropractic treatment or chiropractic spinal manipulation for LBP), comparators (including including standard conservative non-surgical treatments such as standard physician care or physical therapy), outcomes (the level of pain or functional status) and study designs (systematic review, RCT since 2002 or non-RCT).

b) Selection method

The reviewers applied the eligibility criteria to the clinical search results. If the citation title or abstract met all the criteria; or if there was uncertainty or disagreement, the paper was obtained in full text. The reviewers applied the eligibility criteria to the papers obtained in full text. Disagreements were resolved through consensus or a third party.

4.1.3 Data extraction strategy

Two reviewers (SC and SM) independently extracted the data. Data regarding patient population, interventions, comparators, results and the number of primary studies included (for systematic reviews) were entered into evidence tables. Two reviewers (SC and SM) also independently checked the accuracy of the data.

4.1.4 Strategy for quality assessment

The Oxman and Guyatt Scale^{55,56} was used for quality assessment of the systematic reviews included. The Jadad scale⁵⁷ was used for quality assessment of the included RCTs. The Newcastle-Ottawa Quality Assessment Scale was used for quality assessment⁵⁸ of the included non-RCTs. Two reviewers (SC and SM) independently performed the quality assessment of the included articles. Disagreements were resolved through consensus.

4.1.5 Data analysis methods

Results of each study are presented in tabular form. Data were not quantitatively synthesized as this would have duplicated efforts undertaken with the existing systematic reviews. There were also significant differences in the methodologies of the included studies.

4.2 Results

4.2.1 Quantity of research available

Following the selection process, 18 systematic reviews, two new RCTs since the end of 2002 and two non-RCTs were included for review (Appendix 3). To assess agreement between reviewers, the Kappa values for paper selection were calculated after full-text versions of potentially relevant papers were retrieved. The Kappa values were 0.86; 0.64 and 0.41 for the selection of systematic

reviews, RCTs and non-RCTs, respectively. This indicated agreement between the two reviewers that ranged from moderate to almost complete agreement. Most disagreements were due to reading error or different understanding of the articles; and all disagreements were resolved by consensus. Flow charts for selection of systematic reviews; RCTs since 2002 and non-RCTs are shown below (Figure 1 to Figure 3).

a) Characteristics of systematic reviews of RCTs

We included 18 articles reporting on fourteen unique systematic reviews.^{15,16,18,31,59-72} Two of these articles reported the results of a Cochrane systematic review.^{15,16} Results from the selected systematic reviews indicated that spinal manipulation is as effective as standard medical care or physical therapy for patients with LBP. For 15 out of 18 articles, a moderate to high quality score was obtained (Oxman and Guyatt Index ≥ 4),^{15,16,18,31,60,61,63-68,70-72} three out of 18 articles obtained a lower score (Oxman and Guyatt Scale <4).^{59,62,69}

b) Characteristics of new RCTs on effectiveness of conservative treatments for LBP since 2002

The results of the new RCTs indicated that spinal manipulation is as effective as other conservative treatments. These RCTs could not have a perfect score using the Jadad scale for quality assessment, because a double-blind RCT is not feasible in adult trials of chiropractic.

c) Characteristics of non-randomized controlled trials of conservative treatments for LBP

The results of non-RCTs are similar to those from the systematic reviews and new RCTs: spinal manipulation is as effective as other conservative treatments. The quality of the included non-RCTs was good with respect to the selection of exposed and non-exposed cohorts, comparability of cohorts and the assessment of outcome.

4.3 Discussion

The highest Oxman Guyatt Scale score obtained by the included studies was six (out of a maximum of seven). A score of six was obtained by eight articles that reported the results of six unique systematic reviews (one of which was the Cochrane review).^{15,16,63-68} These high quality reviews did not find significant differences in effectiveness between chiropractic treatment, medical therapy for LBP and physical therapy. Seven articles reporting on five unique systematic reviews obtained a score of four.^{18,31,60,61,70-72} Three of these reviews^{18,60,61} favoured chiropractic care in place of medical therapy and physical therapy, while two reviews (reported in four articles)^{31,70-72} offered inconclusive results. Three articles reporting on three unique systematic reviews obtained a score of two or three.^{59,62,69} Two^{59,62} favoured chiropractic and one⁶⁹ was inconclusive.

The Cochrane review^{15,16} may be the best available summary of evidence of clinical effectiveness. This review was summarized in more detail than other reviews (Appendix 5) based on the criteria that it was published recently; it received a high quality score for its methodology and it included the largest number of trials.

Figure 1: Selection of systematic reviews (clinical evidence)

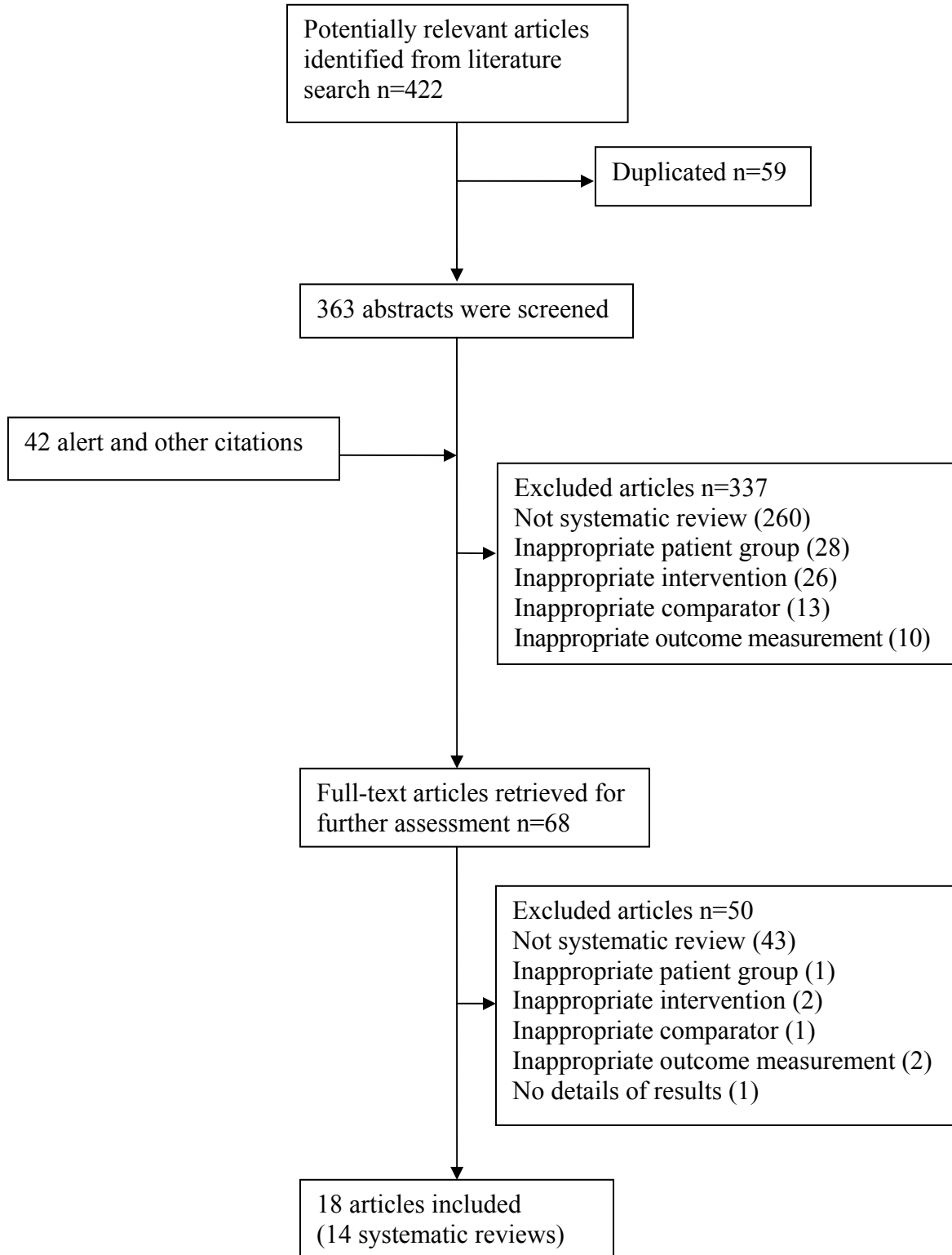


Figure 2: Selection of RCTs (clinical evidence)

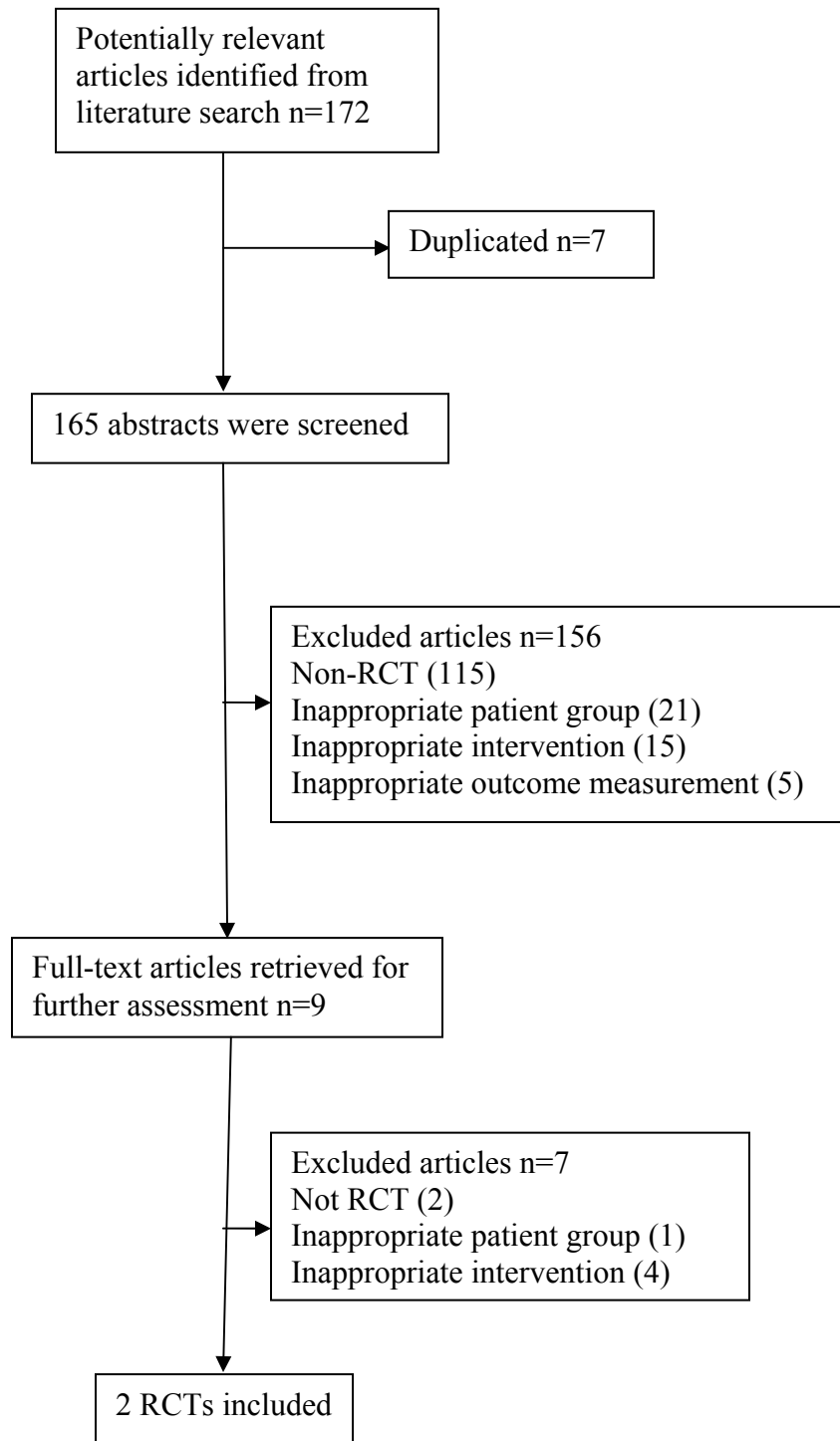


Figure 3: Summary of the selection of non-RCTs (clinical evidence)

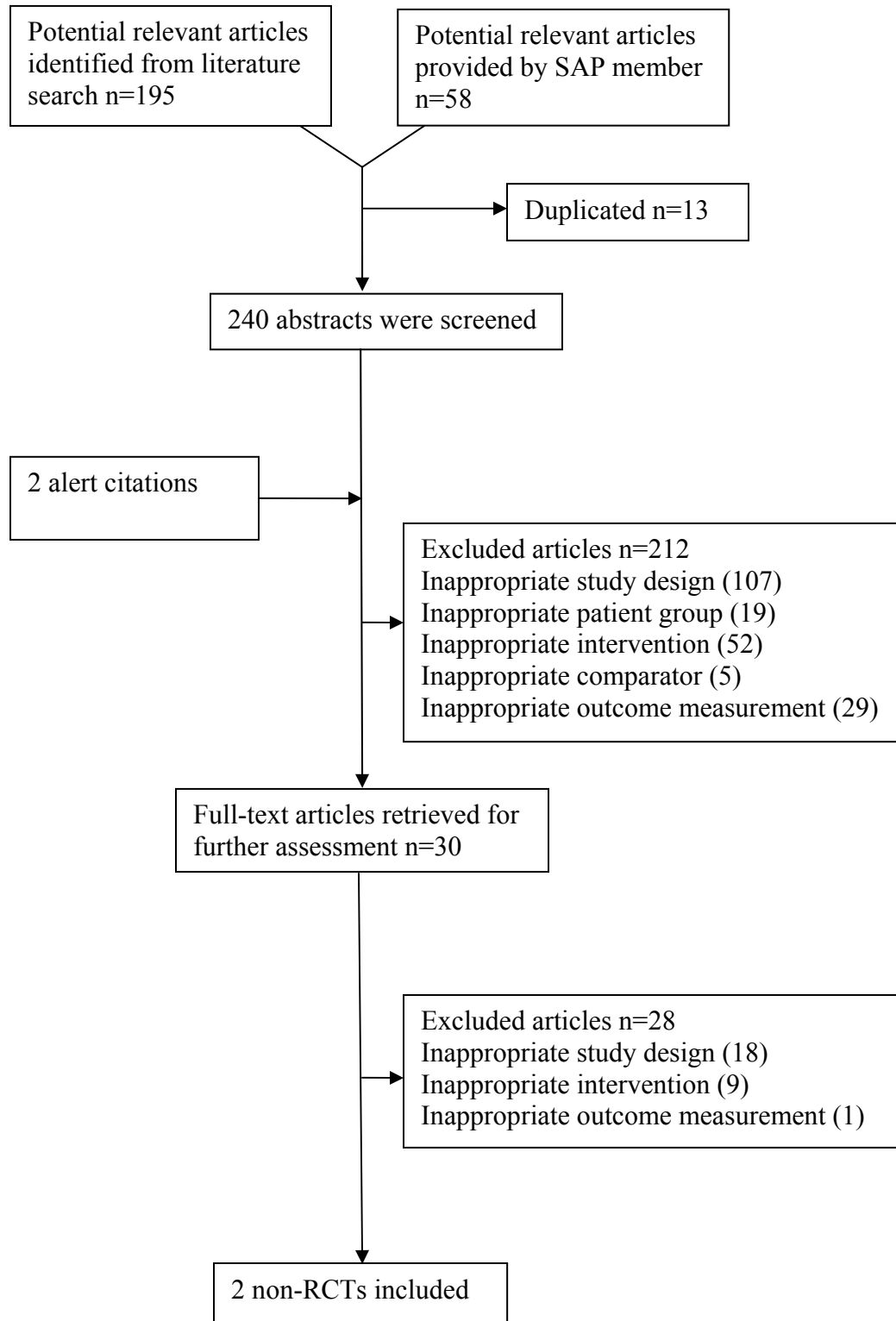


Table 1: Systematic reviews of RCTs – effectiveness of conservative treatments for LBP

Author	RCTs Included	Patient Group	Intervention and Comparators	Results*	Quality Assessment†
Anderson <i>et al.</i> ⁵⁹	23	LBP with or without leg pain; followed ≤3 years	Manipulation with or without mobilization versus medication, physical therapy, bed rest, education program and placebo	Effect size (computed by Cohen’s D) for subjective measures of pain: 0.38±0.38 (small effect of pain reduction); effect size for functional measures of work+activities of daily living (mean±SD): 0.70±0.51 (medium effect of function improvement)	3 out of 7
Assendelft <i>et al.</i> ⁶⁰	8	Acute or chronic LBP, with or without radiation; followed ≤3 years	Chiropractic or spinal manipulative treatment versus medical treatment, physical therapy, back education program and placebo	In 3 trials of acute patients, benefits from chiropractic were reported, as they were evident after follow-up of 3 weeks; for chronic patients, positive results of chiropractic were reported	4 out of 7
Assendelft <i>et al.</i> ¹⁶ (details in text), 2004 Cochrane review ¹⁵	39	Acute, subacute or chronic LBP; with or without radiation	Manipulation with or without mobilization versus general practitioner care and analgesics, physical therapy and exercise, traction, back school and sham	Acute patients: clinically significant improvement seen for short-term pain when spinal manipulation was compared to sham; chronic patients: clinical significant improvements found for spinal manipulation versus sham for short- and long-term pain, short-term function; and spinal manipulative therapy versus “ineffective” group in short-term function. ^Δ	6 out of 7 (quality assessment was performed for Cochrane review ¹⁵)
Bronfort <i>et al.</i> ⁶¹	31	Acute or chronic LBP; followed ≤3 years	Manipulation with or without mobilization versus mobilization, medication, physical therapy, acupuncture, back school, bed rest, corset, diathermy, education advice, electrical modalities, exercise, heat, injections, massage and trigger point therapy, no treatment, placebo, sham manipulation or ultrasound	Evidence showed that <ul style="list-style-type: none"> • spinal manipulation has better short-term benefit** than spinal mobilization and diathermy • manipulation or mobilization is superior to physical therapy and to home exercise for reducing disability in the long term** • manipulation and mobilization are also superior to general practice medical care and to placebo in the short term 	4 out of 7

Author	RCTs Included	Patient Group	Intervention and Comparators	Results*	Quality Assessment†
Di Fabio ⁶²	10 (14 trials identified in review; 10 of them relevant to our study)	Acute or chronic LBP	Manipulation versus mobilization, sham or no treatment; manipulation and mobilization versus physical therapy	Patients who received manipulation or mobilization presented favourable outcomes compared with control group	2 out of 7
Ferreira <i>et al.</i> ⁶³	27	Adults with non-specific LBP of <3 months	Spinal manipulative therapy versus medical care, usual physical therapy, short wave therapy, exercise, no treatment, massage, booklet or placebo	Compared with placebo or no treatment, pooled effect was statistically significant reduction in pain and disability at short-term follow-up; [§] compared with active treatments (McKenzie therapy, exercise and massage) at short-term follow-up, effects were clinically small or statistically non-significant (or both); compared with all other available treatments studied; spinal manipulative therapy is statistically effective in reducing disability and pain	6 out of 7
Ferreira <i>et al.</i> ⁶⁴	9	Chronic LBP, followed ≤12 weeks	Spinal manipulative therapy versus NSAIDs, short wave diathermy, acupuncture, back school or placebo	Effect sizes were small and not significant for individual trials; pooled effects were in favour of manipulative therapy group on reducing pain when compared with placebo treatment	6 out of 7
Furlan <i>et al.</i> ^{65,66}	3 (8 trials identified in this review; 3 of them relevant to our study)	Acute, subacute or chronic LBP; followed ≤3 weeks	Spinal manipulation versus massage	One study that reported on patients in chiropractic treatment group noted significant improvement in function; other two studies' results did not show significant improvement in function and pain intensity; or they showed a difference between the two groups that was not maintained to end of treatment	6 out of 7
Koes <i>et al.</i> ⁶⁷	36	Acute, subacute or chronic LBP; followed ≤12 weeks	Manipulation or mobilization versus physical therapy, drug therapy, back school or no treatment	Acute LBP patients: 5 out of 12 trials reported positive results for manipulation, 4 reported negative results; chronic LBP patients: 5 out of 8 trials reported positive results for manipulation, 2 reported negative results; ^Δ mixed patients: 10 out of 16 trials reported positive results for manipulation, 3 reported negative results	6 out of 7

Author	RCTs Included	Patient Group	Intervention and Comparators	Results*	Quality Assessment†
Koes <i>et al.</i> ⁶⁸	30 (35 trials identified in this review; 30 of them relevant to LBP patients)	Acute, subacute or chronic LBP; followed ≤6 months	Manipulation versus mobilization, physical therapy, drug therapy, sham treatment, back school or no treatment	Of 30 trials, 12 reported better short-term results for manipulation than for reference treatment and 3 reported better short- and long-term results for manipulation‡	6 out of 7
Mohseni-Bandpei <i>et al.</i> ⁶⁹	25	Acute, subacute or chronic LBP; followed ≤24 months	Manipulation versus physical therapy, NSAIDs, analgesics or placebo	Of 25 trials, 13 reported better short-term results in favour of manipulation, 4 reported better short- and long-term results in favour of manipulation‡	3 out of 7
Pengel <i>et al.</i> ¹⁸	2 (13 trials identified in this review; 2 of them relevant to our study)	Subacute non-specific LBP; followed ≤12 weeks	Spinal manipulation versus physician's care or physical therapy	One study reported that spinal manipulation was slightly better than TENS with respect to pain reduction and disability reduction after 3 weeks of treatment; it was also better than massage or corset in disability reduction after 3 weeks of treatment	4 out of 7
Shekelle <i>et al.</i> ³¹	25	Acute or chronic LBP; followed ≤6 weeks	Manipulation versus mobilization, physical therapy, analgesics, exercises, back school or diathermy	Acute LBP: benefit of manipulation when compared with non-manipulative conservative therapy is an improvement of between 0.11 and 0.17 in probability of recovery from back pain, when measured at 2 or 3 weeks from start of treatment; chronic LBP: data are insufficient to support or refute efficacy of spinal manipulation for patients with chronic LBP; mixed patient population: no conclusion could be made	4 out of 7
van Tulder <i>et al.</i> ⁷⁰⁻⁷²	16 trials of acute LBP and 9 trials of chronic LBP relevant to our study	Acute or chronic LBP	Spinal manipulation versus drug therapy, exercise, TENS, traction, bed rest, back school, behaviour therapy or acupuncture	Acute LBP: 11 out of 16 trials reported positive results for spinal manipulation, 4 out of 16 trials reported negative results; chronic LBP: 6 out of 9 trials reported positive results, 3 out of 9 trials reported negative results for spinal manipulation	4 out of 7

*Outcomes refer to pain relief or functional improvement; or both. †Quality assessment of review articles conducted using Oxman and Guyatt Scale.^{55,56} ‡Short-term effects=outcome measurements during or just after intervention. Long-term effects=those outcomes measured ≥3 months after randomization.^{68,69} ** Short-term follow-up= outcomes evaluated ≤3 months after initial study treatment. Long-term follow-up=outcomes evaluated >3 months after onset of study therapy.⁶¹ §Short-term follow-up=<4 weeks.⁶³ ^Short-term follow-up=<6 weeks. Long-term follow-up=>6 weeks.¹⁵

Table 2: New RCTs since 2002

Author	Patients and Sample Size	Comparison Groups	Results	Conclusion	Quality Assessment*
Chang-Yu <i>et al.</i> ²⁴	Subacute LBP (>3 weeks, <6 months); 200 patients followed for 6 months	Back school versus joint manipulation versus myofascial therapy versus combined joint manipulation and myofascial therapy; in this report, joint manipulation describes chiropractor intervention	All groups showed significant improvement in pain and activity scores after 3 weeks of care, but did not show further significant improvement at 6 months follow-up assessment; no difference found between joint manipulation groups and other groups for pain reduction and functional improvement	All four groups are effective for subacute LBP	3 out of 5
Hurwitz <i>et al.</i> ⁷³	Ambulatory LBP; 681 patients followed for 6 months	Medical care only versus chiropractic care only versus medical care with physical therapy versus chiropractic care with physical therapy	No statistically significant difference found in mean changes in LBP intensity and disability of participants in medical and chiropractic care-only groups	After 6 months of follow-up, chiropractic care and medical care for LBP were comparable in their effectiveness	3 out of 5

*Jadad scale was used for quality assessment.⁵⁷

Table 3: Non-RCTs

Author	Patients and Sample Size	Comparison Groups	Results	Conclusion	Quality assessment*
Carey <i>et al.</i> ⁷⁴	Patients with acute LBP (<10 weeks); 1,633 patients followed for 24 weeks	Patients seen by primary care physician (urban or rural) versus chiropractor (urban or rural) versus orthopedist versus HMO (health maintenance organization) provider	Patients had rapid improvement, with median of 8 days to functional recovery; no statistically significant differences among 6 strata in estimated mean disability scores on Roland-Morris scale	For patients with acute LBP, outcomes in 6 comparison groups are similar	Selection ^{♦♦♦♦} Comparability [♦] Outcome ^{♦♦}
Hurwitz <i>et al.</i> ⁷⁵	LBP of muscular-skeletal etiology; 290 patients followed for 3 months	Chiropractic management versus medical management	Chiropractic patients were 60% more likely to have their pain resolved after 3 months than were medical patients; chiropractic patients had better functional improvement than medical patients, but the results were not statistically significant	Chiropractic care was at least as effective as medical care in reducing LBP and functional disability due to LBP	Selection ^{♦♦♦} Comparability ^{♦♦} Outcome [♦]

*The Newcastle-Ottawa Quality Assessment Scale used for quality assessment.⁵⁸ ♦ Quality of non-RCTs: the greater the number, the greater the trial quality.

The Cochrane review extended the results of several previous reviews by including more recent RCTs. In addition, the use of meta-regression added depth to the interpretation of the results. The lack of high-quality RCTs included in the review is a limitation, but the authors used two techniques to assess the quality of included RCTs (quality lists from the Cochrane Back Review Group, and the Jadad scale) and provided sensitivity analyses with regard to the quality of the included studies.

Another limitation of the Cochrane review is the pooling of results for spinal manipulation and spinal mobilization. The authors performed a sensitivity analysis and demonstrated that the results remain stable regardless of the primary intervention.

The Cochrane study focused on spinal manipulation as the intervention of interest. Although spinal manipulation is the key intervention of chiropractic treatment, several common co-interventions are used by chiropractors; notably counselling about LBP, exercise, traction, ice packs and hot packs.

Health care practitioners, other than chiropractors, also use spinal manipulation. In Canada, the three professional groups who perform spinal manipulation are chiropractors, medical physicians and physical therapists.²⁰ In the US, spinal manipulation is commonly performed by chiropractors, osteopaths, medical physicians and physical therapists.²² These confounding problems suggest that caution is needed when drawing policy recommendations for chiropractic care from the Cochrane study alone. The results from the sensitivity analysis suggest that there is no detectable difference in effectiveness associated with the profession of the individual carrying out spinal manipulation, whether it be a chiropractor or someone of another profession. This suggests that the Cochrane results, although they studied spinal manipulation in general, can also be considered an indicator of the effectiveness of chiropractic spinal manipulation.

The results of the Cochrane review are supported by those in other sources of clinical evidence identified, such as high quality reviews of RCTs, newly identified individual RCTs since 2002 and non-RCT studies. The evidence suggests that the effectiveness of chiropractic treatment is similar to that of standard medical treatment and physical therapy.

5 ECONOMIC ANALYSIS

5.1 Review of Economic Evaluations

5.1.1 Methods

a) *Literature search strategy*

All databases searched for the clinical effectiveness review were also searched and updated regularly for the economic review. An economic filter was used with the disease and intervention terms to retrieve economic evaluations on chiropractic treatment for LBP. There were no language or date restrictions.

Besides searching the databases included in the clinical review search, additional databases such as the Health Economics Evaluations Database (HEED) and (UK) National Health Service Economics Evaluations Database (NHS EED) were also searched. Economic searches were

performed on the web sites of health technology assessment agencies, related agencies and chiropractic associations. Specialty databases that were searched included those of the Cochrane Complementary Medicine Field's Register of Controlled Trials; the Research Council for Complementary Medicine, UK; and the University of York NHS Centre for Reviews and Dissemination. Bibliographies of retrieved articles were hand-searched and content experts were contacted for additional references or information.

Regular alerts were set up on the DIALOG[®] system to capture newer articles. Updates were performed regularly on HEED, Cochrane Library, PubMed, PEDro and Index to Chiropractic Literature.

To search for cost information, other appropriate sources (besides literature search retrieval systems) were used, such as the web sites of workers' compensation boards, the Canadian Institute of Health Information (CIHI), hospitals, associations and experts. PubMed and the Internet were searched for utilization information on chiropractic services in Canada. Economic search details are given in Appendix 2.

b) Selection criteria

An economic study was included for review only if it satisfied all the following criteria:

- study design: either full economic evaluation or partial economic evaluation, such as a cost comparison or cost-consequence comparison
- population: adult patients with chronic or acute LBP
- intervention: care given by chiropractors
- comparator: standard conservative, non-surgical treatments (standard medical care or physical therapy)
- primary outcome: outcome reported as an incremental measure of the implication of moving from the comparator to the intervention (could be expressed as a summary measure, a cost difference or a difference in both costs and consequences).

c) Selection method

Two reviewers (HL and ZT) applied the selection criteria to the title and abstract (if available) of all searched literature to identify their relevance to our objective. For all articles that both reviewers rated as confirmed or undecided, full-text hard copies were obtained for further scanning. Then, the selection criteria were applied to the full text articles. An inclusion or exclusion form was used (Appendix 8). The study was included for review only if "yes" was indicated for all questions. Disagreements between the reviewers were solved by consensus or by a third reviewer (AB).

d) Data extraction strategy

A data extraction sheet (Appendix 9) was used by the two reviewers (HL and ZT) to independently extract the principal content of each included study. Disagreements were resolved through consensus or by the third reviewer (AB), if needed.

e) Strategy for quality assessment of the studies

As the included economic studies are partial economic evaluations focusing on cost information, general quality assessment scales, such as the BMJ checklist, are not applicable in assessing the quality of these studies. Thus, this short list of criteria was used.

The quality of included economic papers was assessed according to certain characteristics.

- What inputs were included in the study?
- Were physical measures (quantities of resources or services reported in physical units) and unit costs reported separately?
- Were costs or charges used to value services? Where governments partially pay for chiropractic services, the amount charged to the government health plans does not reflect the full societal cost. Patients or private insurance plans must supply a co-payment.
- What are the timelines of the study?

f) Data analysis methods

As the included studies varied significantly in terms of study design, data collection and analysis, no effort was made to pool the results quantitatively. Instead, a summary was given for each study and a qualitative comparison was undertaken.

g) Subgroup analysis

A subgroup analysis was presented based on whether the comparator for chiropractic care was medical care or physical therapy.

A subgroup cost comparison analysis was performed on the cost information contained in the more recent included economic studies (papers published since 1995). The analytical approach was a pairwise comparison of costs for chiropractic care and the comparators, with costs as defined in the papers either through administrative data or direct observation in the respective practice settings. Direct, indirect and total costs were presented where available. The approach taken is similar to that in a paper by Jacobs and Golmohammadi,⁷⁶ which reviewed studies on the comparative costs of alternative care approaches to preventing, diagnosing and treating LBP.

5.1.2 Results

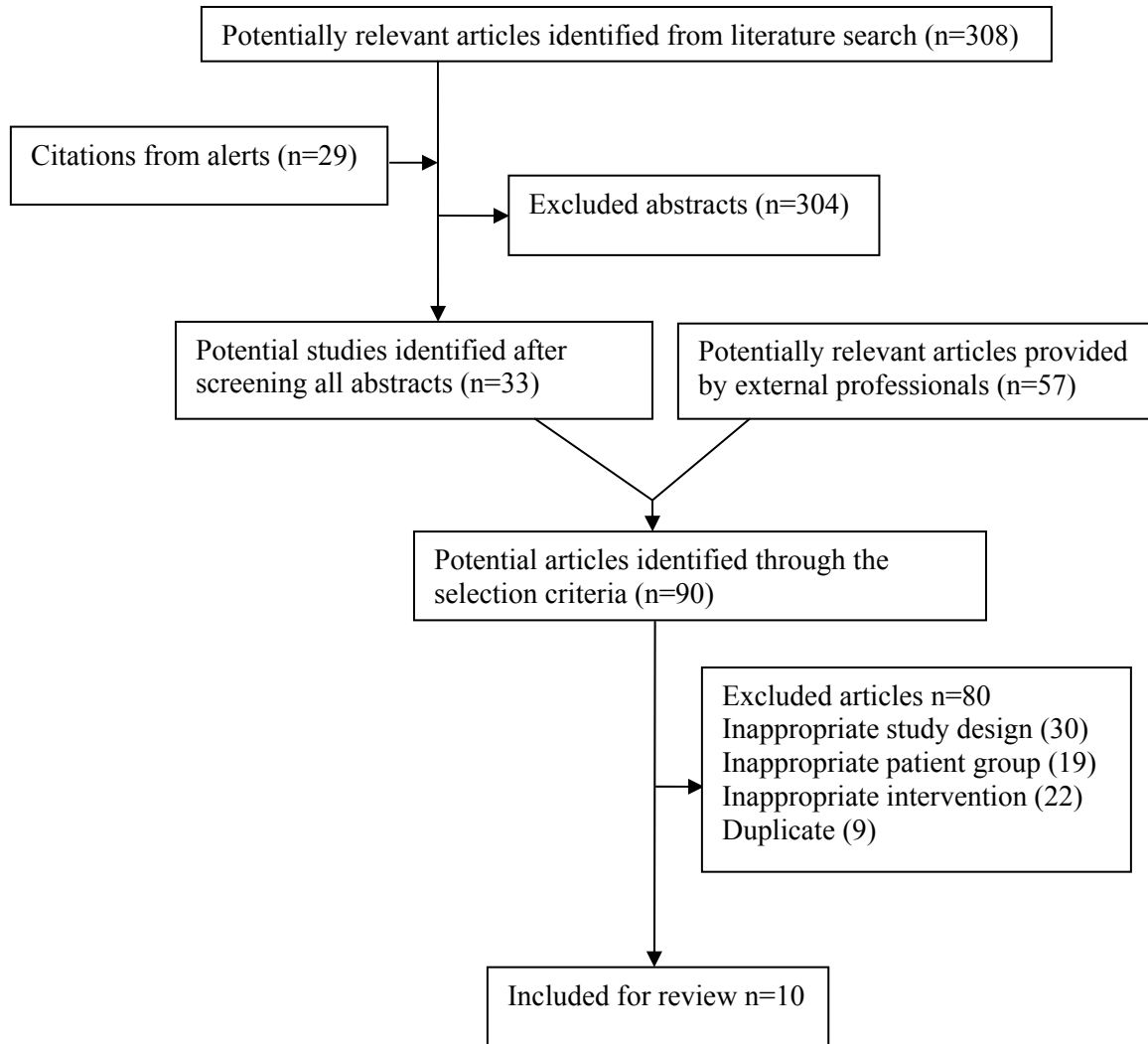
a) Literature search results

Ninety full-text studies were retrieved after the initial screening (Figure 4). A total of 10 studies were identified for review. Thirty papers were excluded because of inappropriate study design (e.g., no comparator group), 19 papers because of inappropriate patient group (e.g., patients with neck pain, rather than LBP), 22 because of inappropriate intervention (e.g., spinal manipulation by an osteopath) and nine because of duplication. For each excluded study, the key reason for exclusion is presented in Appendix 4. Some studies failed to meet several criteria.

No full economic evaluations were identified. A recent full economic evaluation from the UK may be of interest.⁷⁷ It examines the cost-effectiveness of physical treatments for back pain, but it does not meet our intervention and comparator criteria, which are based on the practitioner (chiropractic, physical therapy and standard medicine). The intervention is a spinal manipulation package developed and implemented by chiropractors, physical therapists and osteopaths. Their comparators are “best care” (active management and a back book); an exercise program; and a

combined exercise and manipulation program. Ten partial economic studies (four cost comparison studies and six cost-consequence studies) met all the criteria. One included study compared chiropractic care with physical therapy (Cherkin *et al.*⁷⁸). The others studies compared chiropractic care with standard medical care. Two cost consequence studies by Skargren *et al.*^{79,80} contain potentially useful information for the comparison of chiropractic with physical therapy, but they do not meet our patient group criterion as they include patients with neck pain as well as LBP.

Figure 4: Selection of economic evidence for review



b) Study quality assessment

Table 4: Quality assessment of cost comparison and cost-consequence studies *

Study	Inputs Included	Physical Measures and Unit Costs Reported Separately	Cost or Charges Used to Value Services	Timelines of Study
Cost comparison studies				
Stano & Smith ⁸¹	Outpatient care, inpatient care, medical cost (reported as total payment and outpatient payment)	No	Charge	For each episode of LBP; claims covered during two-year period
Jarvis <i>et al.</i> ⁸²	All medically necessary care, except surgery: diagnostic services, drugs, appliances, therapy and hospitalization	No	Study used cost to value resource use; database is claim data under Worker's Compensation Fund of Utah (WCFU); all reasonable and necessary medical expenses without limitation were covered under WCFU	Two years (two years allowed for each claim to mature, thus accounting for extended loss)
Shekelle <i>et al.</i> ⁸³	Physician services, drugs, medically necessary supplies and hospital costs	No	Cost	Cases followed up for three or five years
Nyiendo ⁸⁴	All medical services (diagnostic services including imaging and other; treatment services including office visit, emergency room, non-surgical hospital, surgery, drug, physical therapy, manipulation, supports and miscellaneous)	No	Cost	Cases followed for 2.5 years
Cost-consequence studies				
<i>Chiropractic care versus standard medical care comparator</i>				
Bergemann & Cichoke ⁸⁵	Health provider office call (might be for diagnosis or for treatment; excluding hospital expenses such as x-rays, room fees, medication, laboratory fees, prostheses or supports)	No	Cost	≤1 year

Study	Inputs Included	Physical Measures and Unit Costs Reported Separately	Cost or Charges Used to Value Services	Timelines of Study
Dillon ⁸⁶	Outpatient care	No	Charge	Unclear
Stano <i>et al.</i> ⁸⁷	Services provided in participating clinics	No	Cost	One year
Carey <i>et al.</i> ⁷⁴	Outpatient care (office visits; radiography and other imaging studies; medication; physical therapy; and other modes of treatment)	No	Charge	24 weeks
Johnson <i>et al.</i> ⁸⁸	Office visits, medication, diagnostic tests, legal consultation, laboratory tests, radiology procedures, drugs and hospital visits	Yes	Cost	Two years from California workers' compensation back claims
<i>Chiropractic care versus physical therapy comparator</i>				
Cherkin <i>et al.</i> ⁷⁸	For chiropractic care group, inputs included office visits and radiography; for physical therapy group, inputs included office visits, McKenzie book and lumbar roll	Yes	Charge	Two years

*One paper (Cherkin *et al.*⁷⁸) had physical therapy as comparator with chiropractic. Standard medical care was comparator for other nine studies. No studies compared all three care provider types.

c) Analysis

Economic studies in health technology assessment are classified according to the way in which consequences are measured.

Full economic evaluations, which are the gold standard, consider the cost of intervention expressed in dollars (or other monetary units); and the consequences expressed in dollars or clinically meaningful units, yielding a summary measure such as cost per additional life-year gained. Examples are cost-minimization analysis (with proof that the intervention and comparator are equally effective), cost-benefit analysis (consequences measured in dollars), cost-effectiveness analysis (consequences measured in natural units) and cost-utility analysis (consequences measured in derived units such as quality adjusted life-years). In this review, no full economic evaluation studies were identified.

Partial economic evaluations consider cost of intervention and consequences separately, without producing one summary measure that shows the trade-off between costs and consequences (e.g., cost per additional life year gained).

- Cost comparison studies focus on comparing costs associated with a particular intervention relative to the comparator treatments. They do not report consequences.
- Cost-consequence studies separately compare the costs associated with an intervention and its comparator(s); and each treatment's consequences (measured in clinically meaningful units such as degree of pain or economically meaningful units such as days off work).

The costs associated with interventions may be analyzed from several perspectives. At one end of the spectrum, the hospital or clinic perspective considers the direct cost to the institution that performs the treatment. From the perspective of a third-party payer (such as a provincial ministry of health; or in the United States, a health maintenance organization), other costs beyond those of the hospital or clinic are included (e.g. laboratory costs). From the broad societal perspective, direct and indirect costs to the patient are included. Patient direct costs encompass such items as co-payments and out-of-pocket expenses. Other direct costs include appliances and supportive devices. Indirect costs usually refer to lost productivity, which, in studies that captured this item, were represented by a measure of work loss, such as days off work.

d) Cost comparison studies

Four cost comparison studies were reviewed: Stano & Smith,⁸¹ Jarvis *et al.*,⁸² Shekelle *et al.*⁸³ and Nyiendo⁸⁴ (Table 5, Table 6). All the studies compared chiropractic care with medical care; none compared chiropractic care to physical therapy.

- The Stano & Smith and Jarvis *et al.*^{81,82} studies found evidence that the cost of care was lower for chiropractic care than for standard medical care.
- The Shekelle *et al.* and Nyiendo studies found that costs for chiropractors were higher than those for standard medical care.^{83,84}

Table 5: Study characteristics – cost comparison studies*

Author	Method	Intervention[†]	Geographic Location	Source of Data
Stano & Smith ⁸¹	Retrospective study; two-year time horizon; perspective not stated directly but appears to be third-party payer (insurance organization)	Chiropractic care versus standard medical care	Northeast, north central, south Atlantic and west districts of US	Client database of MEDSTAT insurance (derived from fee-for-service claims information of large corporations with self-insured plans including about two million beneficiaries)
Jarvis <i>et al.</i> ⁸²	Retrospective study; two-year time horizon; perspective not stated directly, but appears to be third-party payer (workers' compensation organization)	Chiropractic care versus standard medical care	Utah, US	Utah workers' compensation database; claims for 1986 used; allowed two years for claims to mature
Shekelle <i>et al.</i> ⁸³	Prospective study; time horizon unclear; perspective not stated directly but appears to be third-party payer (insurance organization)	Chiropractic care versus care by general practitioner, orthopedist, internist, and osteopath	Six regions in US	RAND health insurance experiment, using community-based sample of 686 patients; cost data collected from insurance claim records
Nyiendo ⁸⁴	Retrospective study; two and half years time horizon; perspective not stated directly, but appears to be third-party payer (worker compensation organization and insurance organization)	Chiropractic care versus standard medical care	Oregon, US	Oregon workers' compensation database and State Accident Insurance Fund database; claims examined in study occurred between June 3, 1985 and December 31, 1985. Cases followed during 2.5 year period to account for extended loss

*All four cost comparison studies used standard medical care as the comparator; none used physical therapy.

[†]For the medical care comparator, components of medical care were often unspecified in the papers, although it was care provided by medical doctors.

Table 6: Results – cost comparison studies

Author	Currency Year	Primary cost results
Stano & Smith ⁸¹	US\$ 1988	Health insurance payments compared patients with medical or chiropractic first-contact provider for episode of LBP; mean total outpatient payments per patient were \$477 for chiropractic care and \$598 for medical care; mean total payment per patient (defined as inpatient plus outpatient costs) were \$518 for chiropractic and \$1,020 for medical care
Jarvis <i>et al.</i> ⁸²	US\$ 1986	Mean cost per patient was \$527 for chiropractic care and \$684 for standard medical care; mean compensation per patient for lost time from work was \$68 for chiropractic care and \$668 for medical care
Shekelle <i>et al.</i> ⁸³	US\$ 1982	Mean outpatient cost per episode was \$281 for chiropractor, \$120 for general practitioner, \$281 for orthopedist, \$218 for internist and \$280 for osteopath; mean total cost per episode (defined as inpatient plus outpatient costs) of LBP was \$281 for chiropractor, \$199 for general practitioner, \$531 for orthopedist, \$332 for internist and \$388 for osteopath
Nyiendo ⁸⁴	US\$ 1985	Mean cost per patient was \$2,047 for chiropractic group and \$1,275 for medical care group; costs included diagnostics, treatment and other medical costs (e.g., ambulance; independent medical examinations ordered by insurer; reports; and claims for meals, mileage and motel)

Table 7: Study characteristics – cost-consequence studies

Author	Method	Intervention	Geographic Location	Source of Data
Bergemann & Cichoke ⁸⁵	Retrospective study; time horizon is unclear; perspective not stated but appears to be third-party payer (workers' compensation organization)	Chiropractic care versus medical care*	Oregon, US	Oregon workers' compensation database
Dillon ⁸⁶	Retrospective study; time horizon is unclear; perspective not stated but appears to be third-party payer	Chiropractic care versus medical physician care*	Armidale, a town in New South Wales, Australia	Data collected by patient-recall questionnaires and interviews
Stano <i>et al.</i> ⁸⁷	Prospective observational study; one-year time horizon; perspective not stated but appears to be third-party payer	Chiropractic care versus medical care; medical patients further classified into two groups: those who were referred for evaluation or treatment to surgeon or physical therapist; and those who were not referred	Oregon, US	Data collected during study by questionnaires and interviews
Carey <i>et al.</i> ⁷⁴	Prospective observational study; six-months time horizon; perspective not stated directly but appears to be third-party payer	Chiropractic care versus primary care†	North Carolina, US	Data collected during study by questionnaires and interviews
Johnson <i>et al.</i> ⁸⁸	Retrospective study; almost two-years time horizon; third-party payer perspective (workers' compensation organization)	Chiropractic care versus medical care	California, US	California workers' compensation data on back claims
Cherkin <i>et al.</i> ⁷⁸	Prospective RCT-based; two-years time horizon; third-party payer perspective (health maintenance organization)	Chiropractic manipulation versus physical therapy (McKenzie therapy method); comparison with educational booklet also done	Seattle, US	Data collected during study by questionnaires and interviews

*Patients considered to have received medical care if they visited a medical physician.

†Primary care defined as family practice, general internal medicine or general practice.

Table 8: Results - cost-consequence studies

Author	Currency Year	Primary Cost Results	Primary Consequence Results
Bergemann & Cichoke ⁸⁵	US\$ 1974 or 1975	Cost of office calls per patient was \$181.48 for chiropractic care and \$327.30 for medical care	Chiropractic care was superior to medical care in terms of time lost from work for a study of Workers' Compensation Board Case data; mean time lost from work per case was 18.9 days when receiving chiropractic care (28.0 days for patients with prior injury and 13.7 days for those without prior injury) and 41.2 days when receiving medical care (60.3 days for patients with prior injury and 36.1 days for those without prior injury)
Dillon ⁸⁶	A\$ 1979	Mean cost of treatment per patient was \$65.70 for chiropractic care group and \$101.30 for medical care group	Chiropractic care was superior to medical care in terms of work time loss; time off work per patient was 4.9 days when receiving chiropractic care and 19.9 days when receiving medical care
Stano <i>et al.</i> ⁸⁷	US\$ 1995	Mean cost per patient was \$214 for chiropractic care and \$123 for medical care	Patients treated in chiropractic clinics had a similar degree of pain relief to that of patients in medical clinics; in visual analogue score (VAS), 0 means "no pain" and 100 means "excruciating pain;" mean change \pm standard deviation in VAS score was 37.2 \pm 28.5 for chiropractic care, 38.7 \pm 30.1 for medical non-referred patients and 27.6 \pm 31.8 for medical referred patients; Revised Oswestry (OSW) Disability Questionnaire is 10-item instrument designed to measure effects of LBP on daily activities such as personal care, lifting, walking, sitting, sleeping and social life. OSW score ranges from 0 to 100, with higher values reflecting greater disability; mean decrease (\pm standard deviation) in OSW score was 26.3 \pm 21 for chiropractic care, 27.2 \pm 26.7 for medical non-referred patients and 25 \pm 21.8 for medical referred patients
Carey <i>et al.</i> ⁷⁴	US\$ 1992	Mean cost per episode of LBP was \$808 for an urban chiropractor and \$478 for an urban primary care physician (PCP);* adjusted mean cost per episode [†] was \$783 for an urban chiropractor and \$508 for an urban PCP [‡]	Times to functional recovery, return to work and complete recovery from LBP were similar among patients seen by all six groups of practitioners; no quantitative results of these outcomes were presented in text; a qualitative commentary is included; Kaplan-Meier and Cox proportional-hazards analyses were performed; telephone survey indicated patient satisfaction was highest for chiropractors

Author	Currency Year	Primary Cost Results	Primary Consequence Results
Johnson <i>et al.</i> ⁸⁸	US\$ 1991	Mean total costs (health care costs plus indemnity costs for time lost from work) for all claim types (medical only, temporary disability only, permanent partial disability) were \$1,526 for chiropractic patients and \$1,875 for physicians' patients	Chiropractors and physicians were equally effective in treating back pain; patients classified as having "temporary disability only" incurred a mean of 2.2 weeks of disability when receiving chiropractic care versus 2.6 weeks of disability when receiving physician care; for patients with permanent partial disability, mean temporary disability incurred was 4.5 weeks when receiving chiropractic care versus 4.6 weeks when receiving physician care
Cherkin <i>et al.</i> ⁷⁸	US\$ 1995	Mean short-term costs ^{**} were \$226 for chiropractic care group and \$239 for physical therapy group; mean costs during two-year period [§] to HMO were \$429 for chiropractic group and \$437 for McKenzie physical therapy group	McKenzie physical therapy and chiropractic manipulation had similar effects; study reported score of bothersome symptoms and Roland-Morris scale ⁷⁴ at baseline, four weeks and 12 weeks; no significant difference between chiropractic care and physical therapy groups regarding days missed from work

*Primary care defined as family practice, general internal medicine or general practice.

†Adjusted for baseline functional status, sciatica, income, duration of pain and workers' compensation.

‡Carey *et al.*⁷⁴ also provided adjusted and unadjusted mean costs for rural chiropractor and rural PCP, orthopedist and HMO provider. Medians were also provided.

**Short-term costs included study treatments and supplies over first month of treatment. For chiropractic, they included cost of study treatment visits and radiographs. For physical therapy, they included cost of study treatment visits, McKenzie book and lumber roll.

§Long-term costs included those described for short term plus costs to HMO for laboratory tests; medications; and additional radiology and office visits.

e) Cost-consequence studies

The following six cost-consequence studies were reviewed: Bergemann and Cichoke,⁸⁵ Dillon,⁸⁶ Stano *et al.*,⁸⁷ Carey *et al.*,⁷⁴ Cherkin *et al.*,⁷⁸ Johnson *et al.*⁸⁸ (Table 7, Table 8).

One of the cost-consequence studies compared chiropractic care with physical therapy (Cherkin *et al.*⁷⁸). The others compared chiropractic care with medical care.

- The Bergemann and Cichoke; and Dillon^{85,86} studies found that patients with chiropractic care incurred less cost and returned to work more quickly than those treated by medical physicians.
- The Carey *et al.* and Stano *et al.*^{74,87} studies reported that chiropractic treatment costs more than medical care, but had similar clinical outcomes, such as pain relief, functional recovery and reduced time off work.
- Two cost consequence studies found equivalence in both cost of care and health outcome between chiropractic care and medical care as the comparator in the Johnson *et al.*⁸⁸ study and physical therapy for the Cherkin *et al.*⁷⁸ study.

5.1.3 Subgroup analyses

a) Contrasting physical therapy and standard medical care comparators with chiropractic care

One of the included studies (Cherkin *et al.*⁷⁸) compared physical therapy with chiropractic care for LBP. In terms of costs, it found equivalence between physical therapy and chiropractic care. This contrasts with the studies of standard medical care comparator, which had mixed results in terms of relative cost.^{74,81-88} For health consequences, Cherkin *et al.* found equivalence between physical therapy and chiropractic care. This is consistent with the studies of standard medical care as comparator that reported health consequences.^{74,85-88}

b) Cost comparison using included economic studies

Applying the 1995 cut-off (examining studies published between 1995 and 2005) to the 10 included studies, returned six papers for a cost comparison under recent conditions: Shekelle *et al.*,⁸³ Carey *et al.*,⁷⁴ Stano & Smith,⁸¹ Cherkin *et al.*,⁷⁸ Johnson *et al.*,⁸⁸ and Stano *et al.*⁸⁷ The results of the relative cost comparison for these six papers are presented in Table 9.

Table 9: Costs summary of chiropractic, physical therapy and standard medical care for LBP – papers published since 1995

Provider Comparisons and Study Sources (all studies done in US; costs presented in US\$)												
Cost per Episode of LBP US\$	Chiropractors (C) to Physical Therapists (P)		Chiropractors (C) to Physicians (GPs)									
	Cherkin <i>et al.</i> ⁷⁸		Stano <i>et al.</i> ⁸⁷		Johnson <i>et al.</i> ⁸⁸		Stano & Smith ⁸¹		Carey <i>et al.</i> ⁷⁴		Shekelle <i>et al.</i> ⁸³	
Direct	429	437	214	123	1,043	1,074	518	1,020	808	478	281	199
Indirect	†	†	†	†	483	801	†	†	†	†	†	†
Total	429	437	214	123	1,526	1,875	518	1,020	808	478	281	199

*Direct costs for chiropractors was calculated based on Johnson *et al.*⁸⁸ page 195, Table 1: \$1,042=0.45X\$961+0.31x\$1,148+0.24x\$1,062. Direct costs for physicians: \$1,074=0.23x\$801+0.33X\$958+0.44X\$1,304. Total cost for chiropractor and physician patients were provided on page 195, last paragraph⁸⁸ (\$1,526 and \$1,875 respectively). Difference between total cost and direct cost returns indirect cost of \$483 and \$801 for patients of chiropractors and physicians respectively.

†No indication that indirect costs were included.

Direct costs relate to health care costs. Indirect costs are associated with lost time from work. The costs identified in these papers were primarily direct costs; however, there was variability between the papers in the components included for direct cost (Tables 5 to Table 8). The Johnson *et al.*⁸⁸ study (Table 9) allowed a calculation of indirect costs. It was assumed that for the Johnson *et al.* paper, indirect costs could be imputed by subtracting the values provided for direct cost from the total cost. It was also assumed that the direct cost components across the studies were similar enough to allow comparison.

Taking a pairwise comparison of the Table 9 data, Cherkin *et al.*⁷⁸ suggests that direct costs are similar for chiropractic care and physical therapy. Stano *et al.*,⁸⁷ Shekelle *et al.*⁸³ and Carey *et al.*⁷⁴ found direct costs for chiropractic to be higher than standard medical care, Stano & Smith⁸¹ found direct costs for chiropractic to be lower than standard therapy, and Johnson *et al.*⁸⁸ found direct costs to be similar, while indirect costs and total costs are lower for chiropractic relative to standard medical care.

5.2 Discussion

Of the 10 included economic studies, none examined all of the three provider types together: chiropractic care, physical therapy and medical care. One of the 10 studies had physical therapy as the comparator for chiropractic (Cherkin *et al.*⁷⁸). It found that chiropractic care and physical therapy were equivalent in terms of costs of care and health outcome. The other nine studies had medical care as the comparator and they suggest equivalence between chiropractic care and standard medical care for health outcomes, but their evidence on relative cost is mixed.

Five of the studies mentioned indirect costs (lost time from work) and direct costs to the health care system.^{78,82,85,86,88} Cherkin *et al.*⁷⁸ did not find a significant difference between the physical therapy and chiropractic care groups for number of days of missed work. The Bergemann & Cichoke,⁸⁵ and Dillon⁸⁶ papers found chiropractic care to be better than medical care for direct health care costs and lost time from work. The Johnson *et al.*⁸⁸ and Jarvis *et al.*⁸² studies gave a monetary figure for lost time from work, allowing a quantitative breakdown of total cost into direct and indirect costs. Johnson *et al.*⁸⁸ found chiropractic care to be similar to medical care for direct costs, but significantly lower for indirect costs to compensate for lost work time. Jarvis *et al.*⁸² found chiropractic care to be lower than medical care for direct health care costs and indirect costs to compensate for lost work time.

The limited evidence suggests that physical therapy and chiropractic care have similar effects on time lost from work due to LBP. Chiropractic care appears to have more benefit than standard medical care for the lost time from work evidence, although some of that research is dated.

Of the 10 included studies, none were full cost-effectiveness studies (i.e., covering both the cost outcome and health outcome components and presenting a summary measure of the trade-off between costs and consequences). Four of the studies were cost comparisons and six were cost-consequence studies.

The results of the four cost comparison studies were mixed. Stano & Smith⁸¹ and Jarvis *et al.*⁸² found the costs of chiropractic care to be lower than medical care, while Shekelle *et al.*⁸³ and Nyiendo had the opposite finding.⁸⁴

For the six cost-consequence studies, the two earliest studies did not report medical outcomes, but reported superior consequences for chiropractic care compared with medical care for time lost from work (Bergemann & Cichoke,⁸⁵ Dillon⁸⁶). Three studies found the consequences for chiropractic care to be similar to those for medical care (Stano *et al.*,⁸⁷ Carey *et al.*,⁷⁴ Johnson *et al.*,⁸⁸) and one found consequences for chiropractic and physical therapy to be similar (Cherkin *et al.*⁷⁸). This pattern of consequences is consistent with the results of our clinical review. The six cost-consequence studies had mixed results with respect to relative costs of care. Cherkin *et al.*⁷⁸ was the only study with physical therapy as the comparator; and found equivalence in cost of care for chiropractic care and physical therapy. Bergemann & Cichoke,⁸⁵ Dillon *et al.*⁸⁶ and Johnson *et al.*⁸⁸ found the costs of chiropractic care costs to be lower than medical care, while Stano *et al.*⁸⁷ and Carey *et al.*⁷⁴ found chiropractic costs to be higher than medical care.

The subgroup cost comparison analysis (Table 9) on the six recent studies published since 1995 was inconclusive. Cherkin *et al.*⁷⁸ compared chiropractor care with physical therapist costs and found them to be similar. The five other papers compared chiropractic care with standard medical care for LBP. Two found costs for chiropractic patients to be significantly lower than for physicians' patients (Johnson *et al.*,⁸⁸ Stano & Smith⁸¹), while three found chiropractic care costs to be significantly higher (Stano *et al.*,⁸⁷ Carey *et al.*,⁷⁴ Shekelle *et al.*⁸³).

The variability in cost results appears to be primarily a result of the differences in research design. Some papers used observational data, while others used administrative databases. Costs were captured and reported in different ways. Direct costs of treating LBP varied between studies largely due to the differences in the cost items included; prognostic factors (severity, disability, occupation, age, diagnosis, history of LBP, family history); insurance policies in the databases on which they were based; and differences in the extent to which chiropractic services were covered and thereby included in cost evaluations.

The following limitations of the economic analysis are worth noting.

- One of the studies included for review was concurrent with an RCT (Cherkin *et al.*⁷⁸). This was the only study with physical therapy as a comparator. The design suggests that the study may have good internal validity. Generalizability of the physical therapy versus chiropractic care results in a Canadian setting is questionable given that one study compares chiropractic care with physical therapy; the study was done using the McKenzie method of physical therapy; and patients were from two primary care clinics in an HMO in the Seattle US area.
- The other nine included studies (three observational non-randomized studies and six retrospective studies based on insurance data) compare chiropractic care with standard medical care. They have significant limitations related to internal validity (such as possible differences in the comparator groups regarding severity of LBP, age, occupation, severity of condition, history of LBP).
- Some of the included papers did not clearly define their study perspective.
- Not all studies clearly indicated the included categories as direct and indirect costs.

- Administrative data, especially from workers' compensation boards, may not be robust enough to accurately differentiate between LBP and neck pains.
- None of the studies compared all three practitioner groups together.
- Nine of the studies included were conducted in the US and one was conducted in Australia. Because the management of chiropractic care varies between and within the countries examined, it is unclear how generalizable the studies' findings are. As a result, the findings should be applied to the Canadian health care system with caution.
- The severity of LBP is inconsistently defined or differentiated from one study to the next.

6 CONCLUSIONS

Chiropractic care for LBP is similar in effectiveness to standard medical care and physical therapy.

The ten economic studies identified describe costs associated with the treatment of LBP, based on the three types of health care practitioners. All the studies were conducted outside of Canada.

Some of the included studies suggest that the costs for chiropractic care are higher than for physical therapy or medical care, while others suggest that it is lower. From the literature identified, it is difficult to draw conclusions about the relative costs of chiropractic care in Canada. Chiropractic care appears to be a reasonable substitute for physical therapy and conventional medicine in terms of consequences, but for costs, the results are inconclusive.

The limited evidence comparing chiropractic care to physical therapy for LBP suggests that the two may be similar for costs and consequences, although only one included study made this comparison. In terms of lost time from work due to LBP, the available evidence suggests that chiropractic care and physical therapy have similar benefits, while chiropractic care has similar or more benefit than standard medical care.

A well-designed Canadian study that compares the cost-effectiveness of LBP care provided by chiropractors, physical therapists and primary care physicians would be of benefit.

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Appendix 1: Literature Search Strategies (clinical)

Legend:

!	Explode the search term. Retrieves the search concept plus all narrower terms.
?	Truncation symbol, single character. Retrieves plural and variant endings.
()	Proximity operator. Words must be adjacent next to each other.
(n)	Proximity operator. Words must be near each other in any order.
de	Descriptor i.e., subject heading (a controlled, thesaurus term).
ti	Search in article title.
ab	Search in article abstract.

DATABASES	LIMITS	SUBJECT HEADINGS/KEYWORDS
MEDLINE® 1966-	Human	(Manipulation, Chiropractic OR Manipulation, Spinal)/de [MeSH] OR Chiropractic Medicine/de [BIOSIS] OR Manipulative Medicine/de [EMTREE]
EMBASE® 1974-		OR
BIOSIS Previews® 1969-		(Chiropractic OR Springing(2N)spine? OR relieve?(2N)subluxation? OR manipulat?()therap? OR arthral()alignment? OR chiropractic()manipulat? OR chiropractic()adjustment? OR spinal()manipulat? OR manipulat?(2N)spine?)/ti,ab
Alternative and Complementary Medicine™ (AMED) 1984-		OR
MANTIS™ 1880-		(Biokinetic()remediation OR manual()adjustment? OR manual()therap? OR spin?(1N)reposition? OR spin?()adjustment? OR vertebr?(1N)adjustment? OR relieve?(2N)spine? OR manual()treatment? OR corrective()spinal()care?)/ti,ab
SPORTDiscus 1962-		AND
ExtraMED™ 2000-		Low back pain/de (MeSH and BIOSIS)
PASCAL 1973-		OR
CAB HEALTH 1983-		((lower()back OR low()back OR low-back OR sacroiliac)/ti,ab OR sacroiliac joint/de [MeSH and EMTREE] OR (lumbar OR lumbo()sacral OR lumbosacral OR lumbosacral OR lower()back OR lower-

	<p>back)/ti,ab (2N)(pain OR ache? OR sprain? OR strain?)/de,ti,ab [EMTREE] OR sprains and strains/de [MeSH])</p> <p>AND</p> <p><i>(Search for systematic review articles)</i> meta-analysis/de OR dt=(review or review academic OR review literature OR meta analysis) OR review literature!/de [MeSH]</p> <p>OR</p> <p>(Meta-analysis OR review)/de [EMTREE]</p> <p>OR</p> <p>(review OR review articles OR literature review OR meta analysis)/de [BIOSIS]</p> <p>OR</p> <p>((quantitative ? OR systematic OR systematically OR methodologic OR methodologically)/ti,ab () (review? OR overview? OR synthesi? or syntheses))/ti,ab</p> <p>NOT</p> <p>DT=(letter OR review of reported cases OR historical article OR review multicase)</p> <p><i>Performed 09 Feb 2004. Regular alerts set up. Total hits 246 records</i></p> <p>AND (Search for randomized controlled trial articles)</p> <p>(controlled clinical trials! OR epidemiologic research design!)/de [MeSH] OR</p> <p>dt=(multicenter study OR randomized controlled trial OR controlled clinical trial) [MeSH] OR</p> <p>(multicenter study OR randomized controlled trial OR randomized clinical trial OR randomized trial OR evidence-based medicine)/de [BIOSIS]</p> <p>OR</p>
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	<p>(major clinical study OR multicenter study OR controlled study! OR randomized controlled trial OR evidence based medicine!)/de [EMTREE]</p> <p>OR</p> <p>(random? OR sham? OR placebo? OR RCT??)/ti,ab OR</p> <p>(singl? OR double OR tripl? OR treble)(blind? OR dumm? OR mask?)/ti,ab OR</p> <p>(control?)(study OR studies OR trial?)/ti,ab OR</p> <p>((multicent? OR multi()cent?)(study OR studies OR trial?)/ti,ab</p> <p><i>Date limit (2002 onwards) applied.</i> <i>Total hits=128 references</i></p> <p><i>AND (Search for non-randomized controlled trial articles using a soft study design filter)</i></p> <p>(cross-sectional studies OR cross-over studies OR epidemiologic studies! OR comparative study OR evaluation studies OR prospective studies OR cohort studies! or follow up studies OR multi-centre studies OR clinical trials!/de OR open-label study OR open label studies OR open label trial)/de [MeSH] OR</p> <p>DT=clinical trial OR DT=multicentre study [MeSH] OR</p> <p>(clinical study! OR clinical trial! OR case control study OR family study OR longitudinal study OR retrospective study OR prospective study OR cohort analysis)/de [EMTREE] OR</p> <p>OR</p> <p>(epidemiological studies OR comparative study OR prospective study OR case-control studies OR case-control study OR cohort study OR multicentre study OR longitudinal study OR prospective study OR retrospective study OR clinical study OR clinical studies OR clinical trial OR phase II study OR phase II trial)/de [BIOSIS]</p> <p>OR</p>
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		<p>OR</p> <p>((control? OR prospectiv?) () (study OR studies OR trial OR trials))/ti,ab OR</p> <p>OR</p> <p>((follow()up OR follow-up OR followup OR observational OR longitudinal OR retrospective OR cross-sectional OR cross()sectional OR multi-centre OR multicentre OR multi()centre OR evaluation OR cohort OR open-label OR epidemiologic?) (1n) (study OR studies OR trial OR trials))/ti,ab OR</p> <p><i>(RCTs and systematic reviews “not”ed out from the results as they were retrieved in earlier RCT and systematic review searches)</i></p> <p><i>Total hits 198 references</i></p>
The Cochrane Library (web version)		<p>Same MeSH headings and keywords as DIALOG Medline search.</p> <p><i>Performed 10 Feb 2004</i></p> <p><i>Without filters:</i></p> <p><i>Total Hits = 78 records</i></p> <p><i>CDSR Reviews = 2 records; CENTRAL = 64 records; DARE = 6 records; HTA = 3 records; NHS EED = 1 record</i></p> <p><i>With review filter:</i></p> <p><i>Total Hits = 8 records</i></p> <p><i>CDSR Reviews = 3 records; CENTRAL = 4 records; DARE = 1 record</i></p>
CINAHL		<p>[Chiropractic-Manipulation.MJX.MNX. OR Chiropractic. MJX.MNX OR</p> <p>(Spinal adj manipulation\$ OR spinal adj reposition\$ OR chiropractic adj adjustment\$ OR spinal adj adjustment\$ OR manual adj adjustment\$ OR vertebr\$ adj adjustment\$ OR manipul\$ adj therap\$.tw.)</p> <p>AND</p> <p>[(low adj back OR low-back OR lower adj back OR lumbo-sacral OR sacroiliac-joint OR sacroiliac).ti,ab</p> <p>AND</p>

		<p>Pain.MJX.MNX OR pain.ti.ab.tw</p> <p>OR</p> <p>Lumbago.ti.ab.tw.]</p> <p>AND Clinical (Reviews)</p> <p>Systematic-review.pt. OR Meta-analysis.MJX.MNX. OR <i>Same text words as DIALOG MEDLINE search</i> Performed 16 Feb 2004 <i>Total Hits = 9 records</i></p> <p>AND Clinical (RCTs)</p> <p>Clinical-trials.pt. OR random-assignment.mjx.mnx. OR placebos.mjx.mnx. OR quantitative-studies.mjx.mnx OR exp clinical-trials.mjx.mnx OR</p> <p>Random\$ allocat\$.tw. OR random?ed control\$ trial\$.tw. OR placebo\$.mjx.mnx. OR allocat\$ random\$.tw. OR singl\$ adj blind\$.tw. OR doubl\$ adj blind\$.tw. OR trebl\$ adj blind\$.tw. OR tripl\$ adj blind\$.tw.</p> <p><i>Performed 10 May 2004</i> <i>Total Hits = 49 records</i></p>
PubMed		<p>Same MeSH headings and keywords as DIALOG Medline search. PubMed's systematic review filter used. Appropriate syntax used.</p> <p><i>Performed 12 Feb 2004</i> <i>91 systematic reviews</i> <i>93 Non-RCTs</i> <i>44 RCTs (2002:2004 limit applied)</i></p>
PEDro		<p>Same keywords as the original DIALOG search excluding the filters. Systematic review and clinical trial limits applied.</p> <p><i>Performed 09 Feb 2004</i> <i>Total Hits = 42 records</i></p>
Websites of HTA and related agencies; clinical trial registries; other databases		<p>NICE; National Research Register; University of York NHS centre for Reviews and Dissemination – CRD databases;Google and Vivisimo search engines used to retrieve chiropractic related information.</p>

Appendix 2: Literature Search Strategies (economic)

DATABASES	LIMITS	SUBJECT HEADINGS/KEYWORDS
MEDLINE® 1966- EMBASE® 1974- BIOSIS Previews® 1969- Alternative and Complementary Medicine™ (AMED) 1984- MANTIS™ 1880- SPORTDiscus 1962- ExtraMED™ 2000- PASCAL 1973- CAB HEALTH 1983-	Human	Manipulation, Chiropractic/de OR Manipulation, Spinal [MeSH] OR Chiropractic Medicine/de [BIOSIS] OR Manipulative Medicine/de [EMBASE] OR Chiropractic/ti,ab OR (Springing(2N)spine? OR reliev?(2N)subluxation? OR manipulat?()therap? OR arthral()alignment? OR chiropractic()manipulat? OR chiropractic()adjustment? OR spinal()manipulat? OR manipulat?(2N)spine?)/ti,ab OR (Biokinetic()remediation OR manual()adjustment? OR manual()therap? OR spin?(1N)reposition? OR spin?()adjustment? OR vertebr?(1N)adjustment? OR reliev?(2N)spine? OR manual()treatment? OR corrective()spinal()care?)/ti,ab AND Low back pain/de (MeSH and BIOSIS) OR ((lower()back OR low()back OR low-back OR sacroiliac OR sacroiliac joint OR lumbar OR lumbo()sacral OR lumbosacral OR lumbosacral OR lower()back OR lower-back)/ti,ab,de (2N)(pain OR ache? OR sprain? OR strain? sprains and strains)/ti,ab,de [MeSH and EMBASE]
		AND (for economic evaluations) (Economics OR “costs and cost analysis”! OR value of life OR economics, medical OR economics, pharmaceutical or models, economic! OR markov chains OR monte carlo method OR decision trees OR quality of life OR patient satisfaction OR quality-adjusted life years OR economics (subheading))/de [MeSH] OR

	<p>(Health economics! OR economic evaluation! OR pharmacoeconomics! OR economic aspect OR phrmacoeconomics (subheading) OR quality- adjusted life year OR quality of life)/de [EMBASE]</p> <p>OR</p> <p>(Economic impact OR economic value OR pharmacoeconomics Or health care cost OR economic factors OR economics OR cost analysis OR cost OR economic analysis OR cost- effectiveness OR costs OR quality of life OR health care cost OR cost savings OR cost-benefit analysis OR hospital costs OR medical costs OR quality-of-life)/de [BIOSIS]</p> <p>OR</p> <p>(Economics OR economic model OR pharmacoeconomics OR cost benefit analysis OR cost utility analysis OR health care economics OR medical cost OR expenditure OR budget OR budgeting OR cost estimation OR cost evaluation OR cost lowering OR cost minimization OR cost savings OR cost utility analysis OR cost price)/de [PASCAL]</p> <p>OR</p> <p>(Econom? OR cost OR costly OR costing OR costed OR price OR prices OR pricing OR priced OR discount OR Discounts OR discounted OR discounting OR expenditure OR expenditures OR budget? OR afford? OR pharmacoeconomic? OR pharmaco(1N)economic?)/ti,ab OR</p> <p>((cost (1N) (utilit? OR effective? OR efficac? OR benefit? OR consequence? OR analy? OR minimi? OR allocation? OR control? OR sharing OR variable? OR breakdown OR lowering Or estimate?))/ti,ab OR</p> <p>(unit?(1n)cost? OR markov OR markow Or monte(carlo OR cost?()life OR cost?()lives OR cost?()affordabl? cost(1n)day?)/ti,ab OR</p> <p>(fee OR fees OR charge OR charges OR QOL OR QOLY OR QOLYs OR HRQOL OR QALY OR QALYs)/ti,ab OR</p>
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		<p>(quality())of()life OR willingness())to()pay OR quality(1N)adjusted(life()year?)/ti,ab</p> <p>AND</p> <p>Human? OR People? OR person?</p> <p><i>Performed 10 February 2004</i> <i>Total Hits = 234 records</i></p>
		<p>AND (for utilization of chiropractic services in Canada)</p> <p>Utilization [subheading] OR utilization review [MeSH] OR trends [subheading] OR statistics & numerical data [subheading] OR utilization/de,ti,ab OR office visits [MeSH] OR visits/ti,ab OR use/ti,ab OR usage/ti,ab OR Utili?ation/ti,ab OR statistics/de [EMTREE]</p> <p>AND</p> <p>(Canada OR prince()edward()island OR new()brunswick OR newfoundland OR manitoba OR alberta OR british()columbia OR nunavut OR north()west()territories OR saskatchewan OR ontario OR nova()scotia)/de, gn,</p> <p><i>Performed 13 May 2004</i> <i>Total Hits = 18 records</i></p>
PubMed		<p>Same MeSH headings and keywords as DIALOG Medline search. Appropriate syntax to be used.</p> <p><i>Performed 12 Feb 2004</i> <i>Total Hits = 93 records</i></p>
The Cochrane Library, 2004 (web version)		<p>Same MeSH headings and keywords as DIALOG Medline search excluding review filter. Appropriate syntax used.</p> <p><i>Performed 10 Feb 2004</i> <i>Total Hits = 24 records</i> <i>CENTRAL = 18 records; CDSR Reviews = 3 records; DARE abstracts = 2 records; NHS EED = 1 record</i></p>
©The Centralized Information Service for Complementary Medicine (CISCOM) database		<p>Same keywords as the DIALOG search excluding review and economic filters</p>

CINAHL		<p>[Chiropractic-Manipulation.MJX.MNX. OR Chiropractic. MJX.MNX OR</p> <p>(Spinal adj manipulation\$ OR spinal adj reposition\$ OR chiropractic adj adjustment\$ OR spinal adj adjustment\$ OR manual adj adjustment\$ OR vertebr\$ adj adjustment\$ OR manipul\$ adj therap\$).tw.]</p> <p>AND</p> <p>[(low adj back OR low-back OR lower adj back OR lumbo-sacral OR sacroiliac-joint OR sacroiliac).ti,ab</p> <p>AND</p> <p>Pain.MJX.MNX OR pain.ti.ab.tw</p> <p>OR</p> <p>Lumbago.ti.ab.tw.]</p> <p>AND</p> <p>Exp costs and cost analysis MJX, MNX OR health resource allocation.MJX.MNX. OR economics [subheading] OR <i>Same keywords as MEDLINE economic filter. Appropriate syntax used.</i></p> <p><i>Performed 16 Feb 2004</i> <i>Total Hits = 13 records</i></p>
Index to Chiropractic Literature (1985-)		MeSH and CHIROSH headings and keywords.
HEED:Health Economic Evaluations Database [CD ROM version] (Jan – June) 2004		<p>Chiropractic* OR chiropractors OR chiropractor OR chiropractitioner OR chiropractitioners OR manipulation OR manipulative OR manipulations [all data]</p> <p>AND</p> <p>Low-back OR lumbago OR backache OR sacroiliac OR lumbosciatic OR back pain [all data]</p> <p><i>Performed on 12 Feb 2004</i> <i>Total Hits = 19 records</i></p> <p><i>Additional intervention terms searched for broader search</i> physiotherapy OR complementary OR alternative</p>

		OR message [all data] <i>Performed on 25 May 2004</i> <i>Total Hits = 49 records</i>
Websites of HTA and related agencies; trial registries; specialized databases; Associations		NICE; National Research Register; University of York NHS Centre for Reviews and Dissemination – CRD databases; LILACS; World Federation of Chiropractic etc.

Appendix 3: Inclusion and Exclusion of Articles (clinical review)

Selection of systematic reviews

Abenheim <i>et al.</i> 1992 ⁸⁹ inappropriate study design
Anderson <i>et al.</i> 1992 ⁵⁹ included
Assendelft <i>et al.</i> 2003 ¹⁶ included
Assendelft <i>et al.</i> 2004 ¹⁵ included
Assendelft <i>et al.</i> 1995 ⁹⁰ inappropriate study design
Assendelft <i>et al.</i> 1993 ⁹¹ inappropriate study design, intervention and outcome measurement
Assendelft <i>et al.</i> 1992 ⁹² inappropriate study design
Assendelft <i>et al.</i> 1996 ⁶⁰ included
Bigos, 1998 ⁹³ inappropriate study design
Bronfort <i>et al.</i> 1999 ⁹⁴ inappropriate study design
Bronfort <i>et al.</i> 1999 ²² inappropriate study design
Bronfort <i>et al.</i> 2004 ⁶¹ included
Brox <i>et al.</i> 1999 ⁹⁵ inappropriate study design
Brunarski, 1984 ⁹⁶ inappropriate study design
Chaitow <i>et al.</i> 2004 ⁹⁷ inappropriate study design
Cherkin <i>et al.</i> 2003 ⁹⁸ inappropriate study design
Cooperstein <i>et al.</i> 2001 ⁹⁹ inappropriate intervention and outcome measurement
Côté <i>et al.</i> 1994 ¹⁰⁰ inappropriate study design
Coulter, 1993 ¹⁰¹ inappropriate study design
Coulter, 1999 ¹⁰² inappropriate study design
Curtis, 1988 ¹⁰³ inappropriate study design
Deyo, 1983 ¹⁰⁴ inappropriate study design
Di Fabio, 1992 ⁶² included
Ernst, 1998 ¹⁰⁵ inappropriate study design
Ernst, 1999 ¹⁰⁶ no details of the results
Ernst <i>et al.</i> 2001 ¹⁰⁷ inappropriate patient group
Ernst, 2003 ²³ inappropriate study design
Ernst, 2004 ¹⁰⁸ inappropriate study design
Fast, 1988 ¹⁰ inappropriate study design
Ferreira <i>et al.</i> 2002 ⁶⁴ included
Ferreira <i>et al.</i> 2003 ⁶³ included
Furlan <i>et al.</i> 2002 ⁶⁵ included
Furlan <i>et al.</i> 2002 ⁶⁶ included
Gemmell, 1992 ¹⁰⁹ inappropriate study design
Gerster, 2000 ¹¹⁰ inappropriate study design
Goldberg, 2003 ¹¹¹ inappropriate study design
Hüppe <i>et al.</i> 2003 ¹¹² inappropriate study design

Koes <i>et al.</i> 1991 ⁶⁸ included
Koes <i>et al.</i> 1995 ¹¹³ inappropriate outcome measurement
Koes <i>et al.</i> 1996 ¹¹⁴ inappropriate study design
Koes <i>et al.</i> 1996 ⁶⁷ included
Laban <i>et al.</i> 1992 ¹¹⁵ inappropriate study design
Malanga <i>et al.</i> 1999 ¹¹⁶ inappropriate study design
Manga <i>et al.</i> 1993 ¹¹ inappropriate study design (economic review)
Mein, 1996 ¹¹⁷ inappropriate study design
Mior, 2001 ¹¹⁸ inappropriate study design
Mohseni-Bandpei <i>et al.</i> 1998 ⁶⁹ included
Molero Garcia e <i>et al.</i> 1998 ¹¹⁹ inappropriate study design
Ottenbacher <i>et al.</i> 1985 ¹²⁰ inappropriate comparators
Pengel <i>et al.</i> 2002 ¹⁸ included
Philadelphia Panel, 2001 ¹⁷ inappropriate study design
Pustaver, 1994 ⁷ inappropriate study design
Reitman <i>et al.</i> 1995 ³ inappropriate study design
Scheer <i>et al.</i> 1997 ¹²¹ inappropriate intervention and outcome measurement
Shekelle <i>et al.</i> 1992 ³¹ included
Shekelle <i>et al.</i> 1998 ¹²² inappropriate study design
Sigg <i>et al.</i> 2000 ³³ inappropriate study design
Smith <i>et al.</i> 2002 ¹²³ inappropriate study design
Strickland, 2003 ¹²⁴ inappropriate study design
Troyanovich <i>et al.</i> 1999 ¹²⁵ inappropriate study design
Van der Weide <i>et al.</i> 1997 ¹²⁶ inappropriate outcome measurement
van Tulder <i>et al.</i> 1996 ⁷⁰ included
van Tulder <i>et al.</i> 1996 ⁷¹ included
van Tulder <i>et al.</i> 1997 ⁷² included
Verhagen <i>et al.</i> 2002 ¹²⁷ inappropriate study design
Vernon, 1999 ¹²⁸ inappropriate study design
Waddell <i>et al.</i> 1998 ¹²⁹ inappropriate study design
Waddell, 1999 ¹³⁰ inappropriate study design

Selection of RCTs since 2002

Aure <i>et al.</i> 2003 ¹³¹ inappropriate intervention
Conijn Frank, 2003 ¹³² inappropriate study design
Giles <i>et al.</i> 2003 ¹³³ inappropriate patient group
Godlstein <i>et al.</i> 2002 ¹³⁴ inappropriate intervention
Gröbli <i>et al.</i> 2003 ¹³⁵ inappropriate study design
Hsieh Chang-Yu <i>et al.</i> 2002 ²⁴ included
Hurwitz <i>et al.</i> 2002 ⁷³ included
Licciardone <i>et al.</i> 2003 ¹³⁶ included
Rasmussen Barr <i>et al.</i> 2003 ¹³⁷ inappropriate intervention

Selection of non-RCTs

Ann Intern Med 2003 ¹³⁸ inappropriate study design
Biering-Sorensen, 1983 ¹³⁹ inappropriate study design
Bronfort <i>et al.</i> 1985 ¹⁴⁰ inappropriate study design
Carey Timothy (reprint) <i>et al.</i> 2000 ¹⁴¹ inappropriate study design
Carey <i>et al.</i> 1995 ⁷⁴ included
Curtis <i>et al.</i> 2000 ¹⁴² inappropriate study design
Ebrall, 1992 ¹⁴³ inappropriate outcome measurement
Evans <i>et al.</i> 1978 ¹⁴⁴ inappropriate study design and intervention
Freeman <i>et al.</i> 2000 ¹⁴⁵ inappropriate study design
Gibson <i>et al.</i> 1985 ¹⁴⁶ inappropriate study design
Hansson <i>et al.</i> 2000 ¹⁴⁷ inappropriate study design and intervention
Harrison <i>et al.</i> 2002 ¹⁴⁸ inappropriate intervention
Hiemeyer <i>et al.</i> 1999 ¹⁴⁹ inappropriate study design
Hurley, 1994 ¹⁵⁰ inappropriate study design
Hurwitz <i>et al.</i> 1994 ⁷⁵ included
Lancet, 1990 ¹⁵¹ inappropriate study design
Lawrence, 1994 ¹⁵² inappropriate study design
Lemstra <i>et al.</i> 2003 ¹⁵³ inappropriate intervention and outcome measurement
Lowry, 1994 ¹⁵⁴ inappropriate study design
Mathews <i>et al.</i> 1987 ¹⁵⁵ inappropriate study design
Med Lett Drugs, 2002 ¹⁵⁶ inappropriate study design
Nyiendo <i>et al.</i> 2000 ¹⁵⁷ inappropriate intervention
Nyiendo <i>et al.</i> 2001 ¹⁵⁸ inappropriate intervention
Nyiendo <i>et al.</i> 2001 ¹⁵⁹ inappropriate intervention
Nyiendo <i>et al.</i> 2001 ¹⁶⁰ inappropriate intervention
Sheahan <i>et al.</i> 1999 ¹⁶¹ inappropriate study design
Sikorski, 1985 ¹⁶² inappropriate intervention
Sims-Williams <i>et al.</i> 1978 ¹⁶³ inappropriate study design
Stano <i>et al.</i> 2002 ⁸⁷ inappropriate intervention
Sundararajan <i>et al.</i> 1998 ¹⁶⁴ inappropriate intervention and outcome measurement

Appendix 4: Inclusion and Exclusion of Articles (economic review)

(Unknown author), 1991 ¹⁶⁵ inappropriate study type
(Unknown author), 1999 ¹⁶⁶ inappropriate study type
(Unknown author), 1999 ¹⁶⁷ inappropriate study type
(Unknown author), 1999 ¹⁶⁸ inappropriate study type
(Unknown author), 2003 ¹⁶⁹ inappropriate study type
Anderson <i>et al.</i> 2002 ¹⁷⁰ inappropriate intervention
Baldwin, 2004 ¹⁷¹ inappropriate study type
Barrett <i>et al.</i> 1996 ¹⁷² inappropriate study type
Bergemann and Cichoke, 1980 ⁸⁵ included
Bronfort <i>et al.</i> 1996 ¹⁷³ inappropriate study type
Bronfort <i>et al.</i> 2000 ¹⁷⁴ inappropriate study type
Brown <i>et al.</i> 1992 ¹⁷⁵ inappropriate intervention
Carey <i>et al.</i> 1995 ⁷⁴ included
Cherkin <i>et al.</i> 1998 ⁷⁸ included
Cherkin <i>et al.</i> 2001 ¹⁷⁶ inappropriate intervention
Dean <i>et al.</i> 1992 ¹⁷⁷ inappropriate study patients
Dillon, 1981 ⁸⁶ included
Faultrel <i>et al.</i> 2002 ¹⁷⁸ inappropriate patients
Fischbacher, 2002 ¹⁷⁹ inappropriate intervention
Frymoyer <i>et al.</i> 1991 ¹⁸⁰ inappropriate study type
Furlan <i>et al.</i> 2002 ⁶⁶ inappropriate intervention
Gatchel <i>et al.</i> 2003 ¹⁸¹ inappropriate intervention
Giles <i>et al.</i> 2002 ¹⁸² inappropriate study type
Goossens <i>et al.</i> 1997 ¹⁸³ inappropriate study type
Goossens <i>et al.</i> 1998 ¹⁸⁴ inappropriate patients
Goossens <i>et al.</i> 2000 ¹⁸⁵ inappropriate study type
Greenwood, 1985 ¹⁸⁶ inappropriate study patients
Greenwood <i>et al.</i> 1990 ¹⁸⁷ inappropriate intervention
Gyldmark <i>et al.</i> 1995 ¹⁸⁸ inappropriate study type
Hashemi <i>et al.</i> 1998 ¹⁸⁹ inappropriate study type
Jarvis <i>et al.</i> 1991 ⁸² included
Jay <i>et al.</i> 1998 ¹⁹⁰ inappropriate study type
Johnson <i>et al.</i> 1989 ¹⁹¹ inappropriate study patients
Johnson <i>et al.</i> 1999 ⁸⁸ included
Katz <i>et al.</i> 1997 ¹⁹² inappropriate study patients
Kilvaer <i>et al.</i> 1997 ¹⁹³ inappropriate study type
Kovacs <i>et al.</i> 2002 ¹⁹⁴ inappropriate intervention

Kumar <i>et al.</i> 2002 ¹⁹⁵ inappropriate intervention
Kumar <i>et al.</i> 2002 ¹⁹⁶ inappropriate intervention
Loisel <i>et al.</i> 2002 ¹⁹⁷ inappropriate intervention
Maetzel <i>et al.</i> 1998 ¹⁹⁸ inappropriate study patients
Malmivaara <i>et al.</i> 1995 ¹⁹⁹ inappropriate intervention
Malter <i>et al.</i> 1996 ²⁰⁰ inappropriate study patients
Manga <i>et al.</i> 1993 ²⁰ inappropriate study type
McGuirk <i>et al.</i> 2001 ²⁰¹ inappropriate intervention
McKinley <i>et al.</i> 1999 ²⁰² inappropriate study patients
Meade <i>et al.</i> 1990 ²⁰³ inappropriate study type
MGT of America, 2002 ²⁰⁴ inappropriate study type
Miller <i>et al.</i> 2002 ²⁰⁵ inappropriate intervention
Moffett <i>et al.</i> 1999 ²⁰⁶ inappropriate study type
Muse and Associates, 2001 ²⁰⁷ inappropriate study patients
Niemistö <i>et al.</i> 2003 ²⁰⁸ inappropriate intervention
Nyiendo, 1991 ⁸⁴ included
Nyiendo <i>et al.</i> 1991 ²⁰⁹ inappropriate study type
Pedigo <i>et al.</i> 1999 ²¹⁰ inappropriate study type
Preyde <i>et al.</i> 2000 ²¹¹ inappropriate study type
Professional association, 1994 ²¹² inappropriate study type
Rosner <i>et al.</i> 1995 ²¹³ inappropriate study type
Scheurmier <i>et al.</i> 1998 ²¹⁴ inappropriate intervention
Shekelle <i>et al.</i> 1995 ⁸³ included
Shekelle <i>et al.</i> 1995 ²¹⁵ inappropriate study type
Shi <i>et al.</i> 1993 ²¹⁶ inappropriate intervention
Skargren <i>et al.</i> 1998 ⁷⁹ inappropriate study patients
Skargren <i>et al.</i> 1997 ⁸⁰ inappropriate study patients
Skouen <i>et al.</i> 2002 ²¹⁷ inappropriate intervention
Smith <i>et al.</i> 1997 ²¹⁸ inappropriate patients
Solomon <i>et al.</i> 1997 ²¹⁹ inappropriate study type
Stano <i>et al.</i> 1993 ²²⁰ inappropriate study patients
Stano <i>et al.</i> 1993 ²²¹ inappropriate study type
Stano & Smith, 1996 ⁸¹ included
Stano <i>et al.</i> 2002 ⁸⁷ included
Sundararajan <i>et al.</i> 1998 ¹⁶⁴ inappropriate intervention
Timm <i>et al.</i> 1994 ²²² inappropriate intervention
Tuchin <i>et al.</i> 1995 ²²³ inappropriate patients
Waterworth <i>et al.</i> 1985 ²²⁴ inappropriate study type
Wildberg <i>et al.</i> 1996 ²²⁵ inappropriate study type

Wolk <i>et al.</i> 1988 ²²⁶ inappropriate study patients
Wolk <i>et al.</i> 1988 ²²⁷ inappropriate study patients
Wolk <i>et al.</i> 1988 ²²⁸ inappropriate study patients
Yassi <i>et al.</i> 1995 ²²⁹ inappropriate intervention

Appendix 5: Summary of Cochrane Systematic Review

Context and research question: The Cochrane review included data from 39 RCTs and compared the effectiveness of “spinal manipulative therapy” with other conservative treatments.¹⁶ The Cochrane review examines other interventions and comparators besides those described in the objectives of our study. The comparators were sham; conventional general practitioner care and analgesics; physical therapy and exercise; back school; and a group of therapies referred to as “ineffective.” (The term “sham” is the equivalent of placebo for spinal manipulation and it consists of a light touch without manipulation.)

Methods of the Cochrane review:

- Spinal manipulative therapy included both manipulation and mobilization, unless otherwise indicated.
- Conventional general practitioner care and analgesics were pooled into one group.
- Because exercise is often a key component of physical therapy for the patient with LBP, the Cochrane review analyzed physical therapy and exercise treatment together.
- Traction, use of a corset, bed rest, home care, topical gel, no treatment, diathermy and minimal massage were pooled and labeled “ineffective” as suggested by van Tulder *et al.*²³⁰
- Short-term follow-up was defined as <6 weeks and long-term follow-up as >6 weeks.

Study selection: The Cochrane review incorporated RCTs published as full reports before January 2001. The authors searched MEDLINE, EMBASE, CINAHL and the Cochrane Central Register of Controlled Trials. Patients with LBP were included, regardless of the duration or radiation pattern of the pain reported. Eligible studies measured at least one clinically relevant outcome (pain, global improvement, functional status specific to back pain or generic functional status) and followed up for at least one day.

Two reviewers independently selected the included RCTs and assessed the quality of studies.

Results: Thirty-nine trials with 5,486 patients met the Cochrane inclusion criteria. Most studies excluded patients with sciatica, while 12 comparisons were restricted to patients with sciatica.

Different checklists or scales (quality lists from the Cochrane Back Review Group, modified Jadad list and pure Jadad list) were used to assess the quality of the included studies. A modified Jadad scale (created by the Cochrane review authors) was designed for RCTs that were not double-blind. In general, the quality of the included studies was poor. Recently published studies tended to obtain higher scores. No publication bias was detected.

Pain [measured by using a visual analogue scale (VAS) or a similar scale] and functional status [measured by Roland-Morris Disability Questionnaire (RMDQ) or similar scales] were reported separately in the review. A 10 mm difference on the VAS and a ≥ 2 point difference in RMDQ were considered to be clinically relevant.

Stratified analyses were conducted to assess efficacy by type of intervention, length of follow-up, quality of trial, duration of condition (acute, sub-acute, chronic) and manipulation versus mobilization. The effect size and 95% confidence interval were extracted or calculated from the

comparisons between each treatment and spinal manipulative therapy. Random-effect meta-regression was used to compare the effect of spinal manipulative therapy with that of alternative therapies, while controlling for other variables. Adverse effects were assessed, but because of the low incidence of the most severe side effects such as vertebrobasilar accidents and cauda equina syndrome, the authors suggested that the most severe side effects were unlikely to occur in the study population.

Cochrane results for acute LBP: Spinal manipulative therapy was similar in effectiveness to conventional care and physical therapy at reducing pain or improving function.

The Cochrane study distinguished spinal manipulation from conventional general practitioner care and analgesics; and physical therapy and exercise. It is similar to the interventions in our objectives. The Cochrane study did not distinguish spinal manipulation as practised by different professions, i.e., chiropractors, osteopaths, medical doctors and physical therapists; and its results should be interpreted in that light. Spinal manipulation is the principal therapeutic procedure used by chiropractors for the management of LBP, but the same cannot be said of the other professions. The sensitivity analysis found that clinical consequences did not vary across different practitioners of spinal manipulation (chiropractors, physical therapists or medical doctors).

Results for chronic LBP:

- results for spinal manipulative therapy in the treatment of chronic LBP were similar to those reported for acute LBP
- compared with other therapies, such as analgesics, physical therapy, exercises and back school, similar benefits were identified for spinal manipulative therapy.

Sensitivity analysis: Sensitivity analyses were conducted for the type of treatment (manipulation versus manipulation and mobilization) and type of outcome (continuous versus dichotomous) using meta-regression. The results of the sensitivity analyses demonstrated that:

- the type of treatment did not affect the results presented in the primary analysis (i.e., spinal manipulation alone was not found to be more effective than the combination of spinal manipulation and spinal mobilization)
- the results were not dependent on the quality of the trial
- the results were not dependent on the type of professional who performed the spinal manipulation (i.e., chiropractic spinal manipulation, spinal manipulation by physical therapist or spinal manipulation by medical doctor)

Cochrane conclusions: Spinal manipulation presented similar clinical benefits to general practitioner care with the use of analgesics; physical therapy and exercise; and back school. The results for chronic LBP were similar to those for acute LBP. The sensitivity analyses demonstrated the robustness of the results. The results were found to be consistent regardless of the type of intervention (using manipulation alone or in combination with mobilization) or the study quality.

Appendix 6: Summary of Provincial Regulations Governing Chiropractic Services

In all provinces, the minimum licensure standards include:

- graduation from an accredited chiropractic college
- a minimum of three years pre-professional university or college studies
- passing scores on national examinations that are administered by the Canadian Chiropractic Examining Board
- passing scores in provincial licensing examinations.

Chiropractors who wish to practise in more than one province must pass the licensing examination for each one. Highlights of each provincial regulatory process are presented in the following pages.

Newfoundland and Labrador (Chiropractors Act, Chapter C-14²³¹): Chiropractors may provide professional services directed towards the diagnosis, examination and treatment (principally by hand and without the use of drugs or surgery) of the spinal column, pelvis, extremities and associated tissues. In Newfoundland and Labrador, chiropractors cannot prescribe a laboratory test; or maintain, use or have access to hospital or other laboratory services. They may, however, provide x-ray services by prescription to be conducted at a chiropractic clinic, hospital or other health care facility. Chiropractors cannot use, direct or prescribe the use of an anesthetic for any purpose; or give treatments for dislocations or fractures. Secondary adjunctive therapies such as electrotherapy, thermotherapy and counselling in relation to exercise, nutritional supplements and diet may be used by chiropractors as an aid to treatment.

Prince Edward Island (Chiropractic Act, Chapter C-7.1²³²): Chiropractors in Prince Edward Island may provide professional services that include the prevention, diagnosis and treatment of biomechanical disorders of the neuromusculoskeletal system by methods that include the use of imaging, laboratory and clinical diagnostic services; joint manipulation or other manual therapies; and exercise and patient education. Chiropractors are not authorized to prescribe or administer drugs for internal or external use; to direct or prescribe the use; of anesthetic for any purpose; or to practise medicine, surgery or midwifery or to use any method other than chiropractic in providing services to clients.

Nova Scotia (Chiropractic Act, S.N.S 1999, C.4²³³): Chiropractors in Nova Scotia are allowed to provide professional services that include diagnosis, examination and treatment of persons, principally by hand and without the use of drugs or surgery of the spinal column, pelvis, extremities and associated tissues. In the provision of such services, chiropractors may use x-rays and laboratory analysis; spinal manipulation and adjunctive therapies.

New Brunswick (An Act to Incorporate the New Brunswick Chiropractors Association,²³⁴ Ch. 69; and An Act Respecting the Practice of Chiropractic, Ch. 64)²³⁵: In New Brunswick (NB), the practice of chiropractic care is defined as a primary care, professional service, performed by a chiropractor for the diagnosis (including diagnostic imaging), examination and treatment, principally by hand and without the use of drugs or surgery, of the spinal column, pelvis, extremities and associated tissues. The NB Chiropractors Association Act applies strictly to

chiropractic care and does not cover osteopathy, nursing, provision of First Aid, temporary assistance in case of emergency or faith healing; and it does not authorize the use of anesthetic or the practice of medicine, surgery or midwifery.

Québec (Chiropractic Act, R.S.Q.C-16²³⁶): The practice of chiropractic care comprises corrections of the spinal column, pelvic bones or other joints of the human body, carried out by the hands. Chiropractors may determine by clinical and radiological examination of the spinal column, pelvic bones and other joints of the human body, the chiropractic treatment indicated. A chiropractor cannot conduct radiological examinations unless he or she holds a radiology permit issued in accordance with section 187 of the Professional Code.

Ontario (Chiropractic Act, 1991²³⁷): In Ontario, the practice of chiropractic care is considered to be the assessment of conditions related to the spine, nervous system and joints; and the diagnosis, prevention and treatment, primarily by the adjustment of:

- dysfunctions or disorders arising from the structures or functions of the spine and the effects of those dysfunctions or disorders or nervous system
- dysfunctions or disorders arising from the structures or functions of the joints.

Chiropractors are authorized to communicate a diagnosis, to move the joints of the spine beyond a person's usual physiological range of motion using a fast, low amplitude thrust and to put a finger beyond the anal verge for the purpose of manipulating the tailbone.

Manitoba (The Chiropractic Act²³⁸): In Manitoba, the practice of chiropractic means

- any professional service usually performed by a chiropractor, including the examination and treatment, principally by hand and without use of drugs or surgery, of the spinal column, pelvis and extremities and associated soft tissues
- such other services as may be approved by the regulations.

Chiropractors who are duly registered and licensed under the Manitoba Chiropractic Act may, in connection with their practice, use x-ray for diagnostic purposes if they are authorized by the board to do so.

Saskatchewan (Chiropractic Act, 1994²³⁹): Chiropractors in Saskatchewan are prohibited from prescribing or administering prescription drugs; from practising medicine, surgery or midwifery; and from using any method other than chiropractic in the treatment of disease. In addition to chiropractic practice by methods of adjustment by hand of one or more of the several articulations of the human body; and the diagnosis and provision of direction and advice in relation to any ailment, disease, defect or disability of the spinal column or any other part of the human body related to formal chiropractic practice; practising members may use x-rays and produce plain film radiographs.

Alberta (Chiropractic Profession Act, Revised Statutes of Alberta 2000,²⁴⁰ Ch. C-13):

A registered member may engage in the practice of chiropractic care on the condition that the analytical instruments, therapies and diagnostic procedures used are those that are taught in the curriculum as part of the clinical training of chiropractic at an approved faculty of chiropractic; and the practice involves the chiropractic adjustment or manipulation of the spinal column and other articulations of the body. No chiropractor is allowed to draw blood from a patient nor is a registered chiropractor allowed to be simultaneously registered as a naturopath. The Chiropractic Profession Act does not allow chiropractors to practise other professions or occupations. As of July 1, 1993, registered members are required to acquire 75 hours of continuing education within each consecutive three-year period.

British Columbia (Chiropractors Act, RSBC 1996, Chapter 48²⁴¹): In British Columbia, chiropractors are concerned with the restoration and maintenance of health through adjustment by hand or the use of devices directly related to the adjustment of the articulations of the human body. Chiropractors are primarily involved with the relationship of the spinal column to the nervous system. Registered chiropractors, in connection with their practice, may use x-ray shadow photographs of the articulations of the human body, if they first obtain a certificate of competency under the rules from the board. Chiropractors are not authorized to prescribe or administer drugs for use internally or externally; or to use, direct or prescribe anesthetics for any purpose; practise medicine, surgery or midwifery; or use a method other than chiropractic in the treatment of disease.

Appendix 7: Governance of Provincial Regulatory Bodies

Newfoundland and Labrador (Chiropractors Act, Chapter C-14²³¹): The Newfoundland and Labrador Chiropractic Board comprises five members, three of whom are licensed chiropractors in the province. The two remaining members are not chiropractors and are intended to represent the public interest. The primary functions of the board are to examine all degrees, diplomas, licenses and other credentials of individuals applying to practise chiropractic in the province; prescribe continuing education, examinations or other requirements; fix and collect fees; approve registration and issue licences to individuals meeting the regulations and requirements of the Chiropractors Act; and hear complaints against chiropractors and administer disciplinary actions.

Licences to practise chiropractic care in Newfoundland and Labrador are issued once the applicant has demonstrated that he or she holds a degree or diploma in chiropractic from the Canadian Memorial Chiropractic College or another university, college or learning institution recognized by the Canadian Council of Chiropractic Education; has passed the Canadian Chiropractic Examining Board examinations; has met other requirements prescribed by the regulations; and pays the prescribed fee.

Prince Edward Island (Chiropractic Act, Chapter C-7.1²³²): The Prince Edward Island Chiropractic Association council is composed of three members appointed by the Minister of Health. Two of the council members are part of the association and one is a layperson representing the interests of the public. The function of the council is to establish initial and continuing educational, proficiency and other requirements for licences; examine applicants and determine their entitlement to licences; approve applications for licences; establish professional ethical guidelines and standards of practice respecting chiropractic practice; and monitor adherence to established guidelines and standards, investigate complaints, and exercise disciplinary action or professional remediation.

Licences in Prince Edward Island are approved once the applicant has shown that he or she has obtained a degree in chiropractic from an institution approved by the Canadian Council or Chiropractic Education, or from an institution the council considers to be equivalent; is professionally competent as shown by a council-approved examination; has knowledge of the professional ethical guidelines and standards of practice established by the Council; has professional knowledge and skills that are current; provides proof of liability insurance coverage; and pays the prescribed licensing fee.

Nova Scotia (Chiropractic Act, S.N.S 1999, C.4²³³): The Nova Scotia College of Chiropractors Board comprises 10 members made up of six members of the college, the registrar, the immediate past chair of the board and two persons appointed by the Governor in Council who are not members of the college. The college's objectives are to regulate the practice of chiropractic and govern its members; establish, maintain and develop standards of knowledge and skill among its members; standards of qualification and practice for chiropractic; standards of professional ethics among its members; administer the Chiropractic Act; and perform such duties as prescribing and collecting fees.

Licences to practise chiropractic in Nova Scotia are issued once the applicant has provided the board with evidence of legal entitlement to work in Canada; completion of board-approved chiropractic educational program; successful completion of written and practical examinations prescribed (as per the Canadian Chiropractic Examining Board); evidence of good standing in prior jurisdictions of practice; evidence that professional conduct is not under investigation in any other jurisdiction; evidence of good character; and submission of other documents and fees prescribed in the board regulations.

New Brunswick (An Act to Incorporate the New Brunswick Chiropractors Association,²³⁴ Ch. 69; and An Act Respecting the Practice of Chiropractic, Ch. 64).²³⁵ The New Brunswick Chiropractors Association Board of Directors consists of the president, vice-president, past presidents, treasurer and one additional member. The board is elected by the membership of the association. One lay person, who is appointed by the Minister of Health and Community Services, is also on the board. The main objectives of the association are to:

- regulate the practice of chiropractic and govern its members
- establish, maintain, develop and enforce standards of qualification for the practice of chiropractic
- establish, maintain, develop and enforce standards of professional ethics
- encourage studies in chiropractic and provide assistance and facilities for special studies and research
- provide for the fees payable by a chiropractor on becoming a member or for annual renewal of membership.

To enable the objectives to be achieved, the board establishes the Admissions Committee, Examining Committee, Complaints Committee, and Discipline Committee. The Admissions Committee recommends registration to the board for an applicant who meets the following criteria:

- holds a degree or diploma in chiropractic from a university or college accredited by the Council on Chiropractic Education Canada, Inc.
- produces satisfactory evidence of good character
- attends a required program orientation
- passes the Canadian Chiropractic Examination Board testing or other Canadian examinations recognized by the board; and if required, passes a clinical and practical examination conducted by the examining committee
- provides satisfactory evidence of professional liability insurance
- is a Canadian citizen or is lawfully admitted to and entitled to work in Canada
- meets all other requirements in the by-laws.

Québec (Chiropractic Act, R.S.Q.C-16²³⁶): In Québec, the governing body for chiropractors is known as L'Ordre professionnel des chiropracticiens du Québec or L'Ordre des chiropracticiens du Québec. The order is governed by a bureau and in addition to an elected president, members are elected to represent each of the following seven regions: Montréal (four members), Québec (three), Trois-Rivières (two), Eastern (one), the Saguenay-Lac-Saint-Jean (one), Outaouais-Northwest (one) and Eastern Townships (one). The bureau of the order is responsible (within the Professional Code in Québec) for the regulation and governance of the practice of chiropractic; administration of all aspects of the Chiropractic Act; and setting and collecting fees. Subject to the provisions of the Chiropractic Act, the order and its members are governed by the Professional Code.

Ontario (Chiropractic Act, 1991²³⁷): The Council of the College of Chiropractors of Ontario comprises nine persons who are members elected in accordance with the college by-laws; seven persons are appointed by the Lieutenant Governor in council and are not members of the College of Chiropractors, or of a college or council as defined in the Regulated Health Professions Act 1991. The council is responsible for regulating the practice of chiropractic and governing members in accordance with the Regulated Health Professions Act of Ontario; developing, establishing and maintaining standards of qualification, practice, ethics and of knowledge, skills and programs to promote continuing competence; administering the Chiropractic Act as it relates to chiropractors and performing other duties and powers such as establishing and collecting fees.

Manitoba (The Chiropractic Act²³⁸): The Manitoba Chiropractors Association Board is composed of five persons from the association and two lay members, one of whom is appointed by Lieutenant Governor in Council and the other who is appointed by the elected members of the board. The board is responsible for regulating admission, registration, renewal of registration, suspension, expulsion and re-instatement of members; developing, establishing and maintaining standards of practice of chiropractic care and for chiropractic education; defining by education, experience or otherwise, general or specialized areas of chiropractic practice, including the use of x-rays; prescribing standards of voluntary continuing education for all members; defining professional misconduct and professional incompetence, unfitness or incapacity; establishing a code of ethics for the practice of chiropractic; and classifying annual fees to be paid by members and applicants upon registration.

Saskatchewan (The Chiropractic Act, 1994²³⁹): The Chiropractors Association of Saskatchewan Board comprises at least five members of the association and two non-association residents of Saskatchewan, appointed by the Lieutenant Governor in Council. The board is responsible for making regulations for the following purposes: prescribing the qualifications, standards, procedures and tests of competency for registration and the issuing of licenses; regulating the practice of chiropractic; setting the standards regarding the manner and method of practice (including continuing education); providing for a code of professional ethics; setting standards of professional conduct, competency and proficiency of chiropractors; prescribing procedures for reviews, investigation and discipline; providing for certification of practising members in the production of plain film radiographs and the use of x-rays; governing the quality assurance of the chiropractic practice; and establishing and collecting of fees.

Alberta (Chiropractic Profession Act, Revised Statutes of Alberta 2000,²⁴⁰ Ch. C-13): The College of Chiropractors of Alberta established a council to govern it. The Council consists of at least six registered members, each of whom are elected by and from registered members; and one member of the public appointed by the minister responsible for the Chiropractic Profession Act. The council manages and conducts the business affairs of the college, such as:

- establishing conditions, including character requirements and membership fees, with respect to registration of chiropractors
- providing for the evaluation of experience and training requirements for applicants for registration.
- prescribing standards for the practice of chiropractic

- prescribing restrictions, conditions or limitations on chiropractic practice by registered members
- respecting procedures for hearings, inquiries, reviews and preliminary investigations
- respecting reviews of the practice of a registered member
- respecting registration procedures, review of complaints and the general practice of chiropractic generally
- respecting establishment and operation of a compulsory continuing education program.

The Practice Review Board consists of no fewer than five persons; four of whom are registered members having a combination of suitable knowledge and experience; and one person from the public appointed by the minister. The council establishes the Discipline Committee, Registration Committee and Continuing Education Committee. The Registration Committee recommends registration for an individual to practise chiropractic care in Alberta if the applicant:

- provides a completed application form
- establishes Canadian citizenship or evidence of being lawfully admitted to and entitled to work in Canada
- provides satisfactory evidence of good character
- passes the Canadian Chiropractic Examining Board testing; and a clinical and practical examination required by the college
- attends a council-approved orientation program
- provides evidence of professional liability protection insurance
- submits any documents or information that may be required by the committee.

British Columbia (Chiropractors Act, RSBC 1996, Chapter 48²⁴¹): The British Columbia College of Chiropractors Board consists of eight elected members of the association and four non-members, appointed by the minister. Of the Association's eight members, six are from the lower mainland, one from Vancouver Island and one from the interior. The board is responsible for the registration of chiropractors as members of the college; admission of chiropractors to practise in British Columbia; establishing the qualifications of persons to be admitted and registered; establishing the discipline and control of registered chiropractors; investigation of complaints of misconduct, ignorance or incompetence of registered chiropractors; establishing and collecting fees for examination and registration of chiropractors; arranging for examinations and providing for the granting of certificates of competency in the use of x-rays; and respecting continuing education of chiropractors.

Appendix 8: Inclusion and Exclusion Form (economic review)

Author and title:

Reference number:

Reviewer:

Date:

1. Is it an economic study (either full or partial economic evaluation)?
 Yes No Can't tell

2. Are the study populations adult patients with low back pain (LBP) (chronic or acute)?
 Yes No Can't tell

3. Is chiropractic treatment the intervention that is examined?
 Yes No Can't tell

4. Is or are the comparator(s) standard conservative treatments (i.e., non-surgical treatment such as medical therapy, physical therapy or alternative medicine treatment like acupuncture)?
 Yes No Can't tell

5. Is the outcome presented as an incremental measure of the implication of moving from the comparator to the intervention (i.e., an incremental cost-effectiveness ratio or an incremental net benefit measure) or is the cost expressed in dollars or in terms of resources used for a partial economic evaluation?
 Yes No Can't tell

Appendix 9: Data Extraction Form (economic review)

Author and title:

Reference manager ID number:

Reviewer:

Date:

1. Type of intervention
 - What is the intervention in the study? This should relate to chiropractic spinal manipulation.
 - Definition of the intervention (if presented in the study).
 - Were any details provided on the chiropractic practitioners? How many practitioners took part in the intervention? What experience or qualifications did they have?
 - Frequency or duration of the intervention.

2. Co-intervention
 - Describe any treatments provided by the chiropractor other than chiropractic spinal manipulation (e.g., positive counselling, advice about diet or posture, aromatherapy, massage therapy, recommendations for exercise).
 - Provide definition, frequency and duration of co-intervention if described in the study.

3. Indication
 - Describe the medical condition of patients in the study.
 - If the study indication was low back injury; please mention.

4. Comparator
 - What comparator(s) was chiropractic measured against in the study? The paper may present several alternative treatments without identifying an intervention such as a primary treatment of interest in the study. In that case, the chiropractic option should be considered to be the intervention. The non-chiropractic intervention(s) should be considered to be the comparator(s).
 - Definition of the comparator treatment(s), if provided in the study.
 - Were any details provided on the practitioners for the comparator(s)? How many practitioners were involved in the comparator treatment? What experience or qualifications did they have? What was their professional designation (physical therapist, osteopath, massage therapist)?
 - Frequency or duration of the comparator treatment(s).

5. Study populations and size
 - Inclusion criteria for patients in the economic study.
 - Exclusion criteria for patients in the economic study.
 - Age and gender of included patients.
 - Geographic location of patients (i.e., country, province or state, city and type of health care institution).
 - Sample size.
6. Study design
 - Categorize the study design along these dimensions where appropriate:
 - RCT based study or non-RCT-based study. Was an economic study “piggy-backed” onto an RCT or was the analysis entirely model-based?
 - Was the economic study done alongside an observational study examining everyday practice?
 - Was the study a full economic evaluation or a cost comparison? If it was a full economic evaluation, what type was it (cost minimization, cost-effectiveness, cost utility or cost benefit analysis)?
7. Analytic horizon
 - Was the analytic horizon stated?
 - If so, how long was the horizon?
8. Perspective
 - Was the study perspective stated?
 - If so, what was the perspective?
9. Data sources for effects
 - Effects may be economic in nature (i.e., sick days avoided, days to return to work) or clinical outcomes (i.e., measures of pain reduction and enhanced mobility or function).
 - State the nature of the effects and their source (i.e., the name of the RCT, non-RCT based study, administrative database).
 - If available, state inclusion and exclusion criteria for the clinical outcomes evidence (patient selection).
10. Data sources for costs
 - Identify the included costs (broad categories, details not needed).
 - State the sources for the costs.
11. Discounting
 - Was discounting used?
 - If yes, what discount rate was used?
 - If not, was the time horizon short term (>1 year)? If it is, then exclusion of discounting is justified.

12. Health Related Quality of Life (HRQL)
 - Describe the use of HRQL, if applicable.
13. Currency and year
 - State country and year of currency used in the economic analysis.
14. Base Case Incremental Cost-Effectiveness Ratio (ICER) results
 - Item 14 should be in the form of a numerical result, not a narrative.
 - If the study was a full economic evaluation, state the ICER.
 - If the full economic study presented costs and effects in disaggregated form, state the key cost and clinical consequence results.
15. Cost comparison
 - If the study was a cost comparison, state the key cost comparison result. This should be a numerical result, not a narrative; items 14 and 15 should be mutually exclusive and exhaustive.
16. Sensitivity analysis
 - Was a sensitivity analysis performed?
 - If so, what method was used?
 - What were the key results of the sensitivity analysis? To what parameters, if any, are the conclusions of the study particularly sensitive?
17. Items for subgroup economic analysis
 - Record any results presented for particular subgroups; i.e., were subgroup results presented according to:
 - age
 - gender
 - acute or chronic back pain
 - long-term or short-term follow-up
 - geographic location or type of health care institution
 - other characteristics.
18. Conclusions
 - Record the key conclusions of the study.
 - This may be a combination of numerical results and narrative statements.