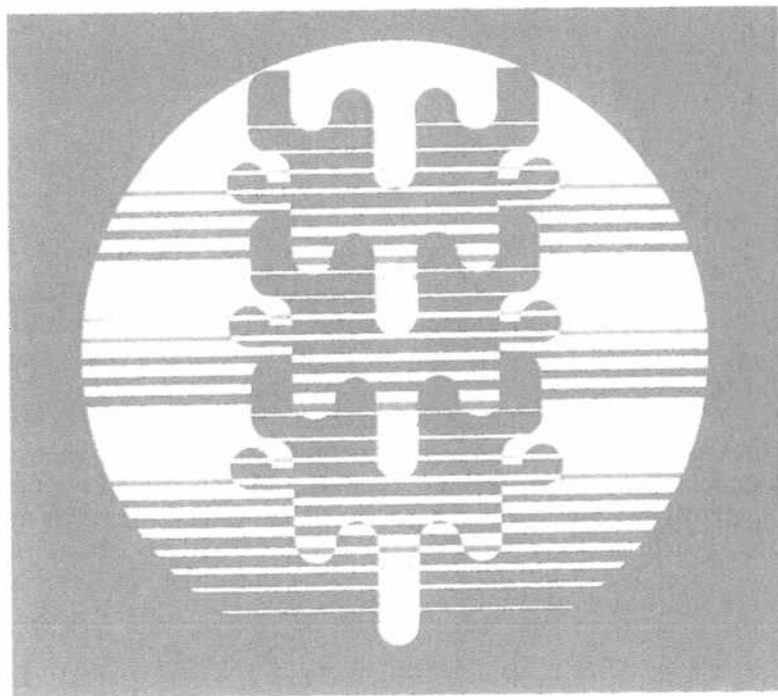


THE EFFECTIVENESS
AND COST-EFFECTIVENESS OF
CHIROPRACTIC
MANAGEMENT OF
LOW-BACK PAIN



PRAN MANGA, PH.D.
DOUG ANGUS, M.A.
COSTA PAPADOPOULOS, MHA
WILLIAM SWAN, B.A.

FUNDED BY THE ONTARIO MINISTRY OF HEALTH

Copyright © 1993 by Pran Manga & Associates Inc.
655 Richmond Road, Unit 12, Ottawa Ontario K2A 3Y3, Canada
All rights reserved

Pran Manga and Associates grant permission for photocopying for limited personal or internal use.
This consent does not extend to other kinds of copying, such as copying for general distribution, for
advertising or promotional purposes, for creating new collective works, or for resale. For information,
address Pran Manga, PhD., Faculty of Administration, University of Ottawa,
136 Jean-Jacques Lussier, Ottawa, Ontario K1N 6N5, Canada

ISBN: 0-9697615-0-3

Printed in Canada by Kenilworth Publishing, 80 West Beaver Creek Road, Suite 18
Richmond Hill, Ontario L4B 1H3, Canada

PRAN MANGA & ASSOCIATES INC.

*655 Richmond Road, Unit 12
Ottawa, Ontario K2A 3Y3. Canada
(613)729-6077*

August 17, 1993

The Honourable Ruth Grier
Minister of Health
Ministry of Health
Government of Ontario
80 Grosvenor Street, Room 1003
Toronto, Ontario
M7A 1R3

Dear Ms. Grier:

We are very pleased to enclose our final report on the "The Effectiveness and Cost-Effectiveness of Chiropractic Management of Low-Back Pain". It is rather voluminous, testimony to the extensive and growing literature and clinical research in this area. To assure that the busy reader will glean the major points of the study, we have included an Executive Summary. The report is organized in chapters with subject headings that reflect each of the terms of reference for the study.

In these times of severe fiscal constraints, we commend the Ministry of Health for funding much needed research in this increasingly important area, and we encourage further research pertinent to the consumer and provider surveys we recommend in the report. The potential for major gains in effectiveness and cost-savings is very significant. Our recommended reforms are all consistent with and promote the health care objectives of the Government of Ontario.

Yours sincerely,



Pran Manga, Ph.D.
President

A Study to Examine the Effectiveness and Cost-Effectiveness of Chiropractic Management of Low-Back Pain

by

**Pran Manga, Ph.D.¹
Douglas E. Angus, M.A.²
Costa Papadopoulos, MHA³
William R. Swan, B.Comm.⁴**

August 1993

- 1 *Professor and Director, Masters in Health Administration Program, University of Ottawa; and President, Pran Manga and Associates Inc., Ottawa.*
- 2 *Adjunct Professor, University of Ottawa and Project Director, The Cost-Effectiveness of the Canadian Health Care System, Queen's - University of Ottawa Economic Projects.*
- 3 *Health Care Consultant and Associate of Pran Manga and Associates, Inc.*
- 4 *Consultant in Health Care Economics.*

The support of the Ministry of Health, Government of Ontario, which solely funded the project, is gratefully acknowledged. The views and opinions expressed in this report are those of the authors only, and should not be attributed to the MHA Program, University of Ottawa, the Ministry of Health or the Ontario Chiropractic Association.

TABLE OF CONTENTS

TERMS OF REFERENCE	9
EXECUTIVE SUMMARY	11
CHAPTER 1 – Introduction: The Need for Health Care Reform	14
CHAPTER 2 – The Incidence, Prevalence and Economic Costs of Low-Back Pain: An Overview	17
The Epidemiology of Low-Back Pain.....	17
Data Issues in the Estimation of Low-Back Pain.....	20
The Situation in Ontario.....	21
The High Cost of Low-Back Pain.....	23
Conclusions.....	24
CHAPTER 3 – A Brief Description of Chiropractic, Medical, Physiotherapeutic and Other Management of Low-Back Pain	27
Management of Low-Back Pain.....	27
Chiropractic Management of Low-Back Pain.....	27
Medical Management of Low-Back Pain.....	30
Management of Low-Back Pain by Physiotherapy.....	32
Other Management of Low-Back Pain.....	33
Service Billing and Out-of-Pocket Costs.....	33
CHAPTER 4 – The Effectiveness of Chiropractic and Other Management of Low-Back Pain	35
Criteria for Scientifically Valid Clinical Trials.....	35
Randomized Controlled Trials (RCT's) of Spinal Manipulation.....	36
Case-Control / Cohort Studies.....	48
Descriptive Studies.....	49
Meta-Analysis / Literature Reviews.....	50
Medical and Other Treatment.....	53
Safety Issues.....	56
Summary of Conclusions.....	57
CHAPTER 5 – The Cost-Effectiveness of Chiropractic and Medical Management of Low-Back Pain	59
Introduction.....	59
Worker's Compensation Studies on Cost-Effectiveness.....	60
Lower Cost of Chiropractic - Other Evidence.....	63
Summary Conclusions.....	64

CHAPTER 6 – Evidence of Patient Satisfaction with Chiropractic and Other Professions in the Management of Low-Back Pain.....	65
Introduction.....	65
Recent Studies of Patient Satisfaction with Chiropractic Care.....	65
Patient Satisfaction with Physician Care for Low-Back Pain.....	67
Comparison of Chiropractic and Physician Management of Low-Back Pain.....	68
Canadian Studies of Patient Satisfaction.....	69
Revealed Preference: The Market Test of Patient Satisfaction.....	70
CHAPTER 7 – Survey Research of Users, Non-Users and the Professions.....	71
Introduction.....	71
The Survey Approach.....	71
Preliminary Research Questions.....	72
Data Collection Methods.....	74
Sampling Methodology.....	74
Non-Response Error.....	75
Confidentiality of Information.....	76
Work Plan Considerations.....	76
CHAPTER 8 – Summary Conclusions and Recommendations.....	79
Policy Recommendations and Reform.....	80
Implications for the Principal Professions.....	83
<i>Appendices.....</i>	<i>85</i>
<i>Bibliography.....</i>	<i>89</i>

TERMS OF REFERENCE

PREAMBLE

The Government of Ontario is placing increasing emphasis on allocating public funds for services that are relatively more cost-effective and appropriate. Since health care services are labour intensive, the appropriate use of health human resources is of paramount significance. The appropriate numbers, distribution and mix of health professionals, and their interrelationships and roles in the provision of health services is an important part of the Government's health reform agenda.

The Government of Ontario is also keenly interested in reducing the incidence of work-related disability and injury and to improve the rehabilitation of disabled and injured workers. The Ontario Worker's Compensation Institute (OWCI) has just proposed a research agenda focusing on "soft-tissue sprains and strains, particularly low back strain". The OWCI notes that "low back pain is ubiquitous. Twelve to thirty percent of people in modern industrialized societies reported low back pain in the past year". It also notes that "if treatments of unproven worth or with major side effects are used in those with low-back pain, there is a potential for both iatrogenic disability and wasted resources".

In light of these objectives and concerns of the Government of Ontario, the proposed study will examine the effectiveness and cost-effectiveness of chiropractic management of low-back pain.

TERMS OF REFERENCE

The study shall include reports on six components as follows:

1. **Overview of Cost of Low-Back Pain.** An overview of the incidence, prevalence and economic costs of low-back pain in Ontario. The analysis will involve a review of the epidemiological and health economics literature, data from the Workers' Compensation Boards in Ontario and other jurisdictions, and Statistics Canada. Information from other countries will also be assessed. (*See Chapter Two*)
2. **Description of Services.** A general description of chiropractic, medical and other management of low-back pain in Ontario and how these services are billed for by the various professions who treat low-back pain. (*See Chapter Three*)
3. **Evidence of Effectiveness.** A critical review and assessment of the current scientific evidence of the safety, efficacy and effectiveness of chiropractic and other professional management of low-back pain. (*See Chapter Four*)
4. **Evidence of Cost-Effectiveness.** A critical review and evaluation of empirical studies reflecting on the cost-effectiveness of chiropractic and other professional management of low-back pain. The analysis will include a review of pertinent studies of the Workers' Compensation system. (*See Chapter Five*)
5. **Evidence of Patient Satisfaction.** Assessment of evidence of patient satisfaction with chiropractic and other profession of management of low-back pain. (*See Chapter Six*)
6. **Survey Design** Sample design of questionnaires for separate surveys of patients, chiropractors and medical practitioners concerning the treatment and management of low-back pain. The scope and content of these surveys should be informed by the literature review and analysis undertaken for the five preceding components of the study. (*See Chapter Seven*).

EXECUTIVE SUMMARY

INTRODUCTION

The serious fiscal crisis of all governments in Canada is compelling them to contain and reduce health care costs. It has brought a new and unprecedented emphasis on evidence-based allocation of resources, with an overriding objective of improving the cost-effectiveness of health care services.

The area of low-back pain (LBP) offers governments and the private sector an excellent opportunity to attain the twin goals of greater cost-effectiveness and a major reduction in health care costs. Today LBP has become one of the most costly causes of illness and disability in Canada - a phenomenon which does not appear to be generally appreciated or understood in medical and government circles in Canada. Studies on the prevalence and incidence of LBP suggest that it is ubiquitous, probably the leading cause of disability and morbidity in middle-aged persons, and by far the most expensive source of workers' compensation costs in Ontario - as indeed in most other jurisdictions.

Much of the treatment of LBP appears to be inefficient. Evidence from Canada, the USA, the UK and elsewhere shows that there are conflicting methods of treatment, many with little - if any - scientific evidence of effectiveness, and very high costs of treatment. Despite this, levels of disability from LBP are increasing.

In the Province of Ontario LBP is managed mostly by physicians and chiropractors, with physiotherapists also playing a significant role. While medical services are fully insured under Medicare, chiropractic care services are only partially covered. LBP patients incur the highest out-of-pocket expenses for chiropractic services. Virtually no out-of-pocket expenses are incurred for medical treatment, with the exception of drugs, and out-of-pocket expenses incurred for physiotherapy services fall somewhere in between the two.

Physicians, chiropractors, physiotherapists and an assortment of other professionals together offer about thirty-six therapeutic modalities for the treatment of LBP. In this study we focused principally on the effectiveness and cost-effectiveness of chiropractic and medical management of LBP.

FINDINGS

- F1. On the evidence, particularly the most scientifically valid clinical studies, spinal manipulation applied by chiropractors is shown to be more effective than alternative treatments for LBP. Many medical therapies are of questionable validity or are clearly inadequate.
- F2. There is no clinical or case-control study that demonstrates or even implies that chiropractic spinal manipulation is unsafe in the treatment of low-back pain. Some medical treatments are equally safe, but others are unsafe and generate iatrogenic complications for LBP patients. Our reading of the literature suggests that chiropractic manipulation is safer than medical management of low-back pain.
- F3. While it is prudent to call for even further clinical evidence of the effectiveness and efficacy of chiropractic management of LBP, what the literature revealed to us is the much greater need for clinical evidence of the validity of medical management of LBP. Indeed, several existing medical therapies of LBP are generally contraindicated on the basis of the existing clinical trials. There is also some evidence in the literature to suggest that spinal manipulations are less safe and less effective when performed by non-chiropractic professionals.
- F4. There is an overwhelming body of evidence indicating that chiropractic management of low-back pain is more cost-effective than medical management. We reviewed numerous studies that range from very persuasive to convincing in support of this conclusion. The lack of any convincing argument or evidence to the contrary must be noted and is significant to us in forming our conclusions and recommendations. The evidence includes studies showing lower chiropractic costs for the same diagnosis and episodic need for care.
- F5. There would be highly significant cost savings if more management of LBP was transferred from physicians to chiropractors. Evidence from Canada and other countries suggests potential savings of many hundreds

of millions annually. The literature clearly and consistently shows that the major savings from chiropractic management come from fewer and lower costs of auxiliary services, much fewer hospitalizations, and a highly significant reduction in chronic problems, as well as in levels and duration of disability. Workers' compensation studies report that injured workers with the same specific diagnosis of LBP returned to work much sooner when treated by chiropractors than by physicians. This leads to very significant reductions in direct and indirect costs.

- F6. There is good empirical evidence that patients are very satisfied with chiropractic management of LBP and considerably less satisfied with physician management. Patient satisfaction is an important health outcome indicator and adds further weight to the clinical and health economic results favouring chiropractic management of LBP.
- F7. Despite official medical disapproval and economic disincentive to patients (higher private out-of-pocket cost), the use of chiropractic has grown steadily over the years. Chiropractors are now accepted as a legitimate healing profession by the public and an increasing number of physicians.
- F8. In our view, the constellation of the evidence of:
 - (a) the effectiveness and cost-effectiveness of chiropractic management of low-back pain.
 - (b) the untested, questionable or harmful nature of many current medical therapies.
 - (c) the economic efficiency of chiropractic care for low-back pain compared with medical care.
 - (d) the safety of chiropractic care.
 - (e) the higher satisfaction levels expressed by patients of chiropractors, together offers an overwhelming case in favour of much greater use of chiropractic services in the management of low-back pain.
- F9. The government will have to instigate and monitor the reform called for by our overall conclusions, and take appropriate steps to see that the savings are captured. The greater use of chiropractic services in the health care delivery system will not occur by itself, by accommodation between the

professions, or by actions on the part of the Workers' Compensation Board and the private sector generally.

RECOMMENDATIONS

Our recommendations for reform include the following:

- R1. Current policy discourages the utilization of chiropractic services for the management of LBP. There should be a shift in policy to encourage and prefer chiropractic services for most patients with LBP.
- R2. Chiropractic services should be fully insured under the Ontario Health Insurance Plan, removing the economic disincentive for patients and referring health providers. This one step will bring a shift from medical to chiropractic management that can be expected to lead to very significant savings in health care expenditure, and even larger savings if a more comprehensive view of the economic costs of low-back pain is taken.
- R3. Chiropractic services should be fully integrated into the health care system. Because of the high incidence and cost of LBP, hospitals, managed health care groups (community health centres, comprehensive health organizations, and health service organizations) and long-term care facilities should employ chiropractors on a full-time and/or part-time basis. Additionally such organizations should be encouraged to refer patients to chiropractors.
- R4. Chiropractors should be employed by tertiary hospitals in Ontario. Hospitals already employ chiropractic in the United States with good effect. Similar recommendations have been made recently by government inquiries in Australia and Sweden, and following government funded research in the U.K. and other countries. Unnecessary or failed surgery is not only costly but also represents low quality care. The opportunity for consultation, second opinion and wider treatment options are significant advantages we foresee from this initiative which has been employed with success in a clinical research setting at the University Hospital, Saskatoon.
- R5. Hospital privileges should be extended to all chiropractors for the purposes of treatment of their own patients who have been

- hospitalized for other reasons, and for access to diagnostic facilities relevant to their scope of practice and patients' needs.
- R6. Chiropractors should have access to all pertinent patient records and tests from hospitals, physicians, and other health care professionals upon the consent of their patients. Access should be given upon the request of chiropractors or their patients.
- R7. Since low-back pain is of such significant concern to workers' compensation, chiropractors should be engaged at a senior level by Workers' Compensation Board to assess policy, procedures and treatment of workers with back injuries. This should be on an interdisciplinary basis with other professional, technical and managerial staff so that there is early development of more constructive relationships between chiropractors, physicians, physiotherapists and Board staff and consultants. A very good case can be made for making chiropractors the gatekeepers for management of low-back pain in the workers' compensation system in Ontario.
- R8. The government should make the requisite research funds and resources available for further clinical evaluation of chiropractic management of LBP, and for further socio-economic and policy research concerning the management of LBP generally. Such research should include surveys to obtain a better understanding of patients' choices, attitudes and knowledge of treatments with respect to LBP. The objective of these surveys should be better information for health policy, programme planning and consumer education purposes.
- R9. Chiropractic education in Ontario should be in the multidisciplinary atmosphere of a university with appropriate public funding. Chiropractic is the only regulated health profession in Ontario without public funding for education at present, and it works against the best interests of the health care system for chiropractors to be educated in relative isolation from other health science students.
- R10. Finally, the government should take all reasonable steps to actively encourage cooperation between providers, particularly the chiropractic, medical and physiotherapy professions. Lack of cooperation has been a major factor in the current inefficient management of LBP. Better cooperation is important if the government is to capture the large potential savings in question and, it should be noted, is desired by an increasing number of individuals within each of the professions.
-

CHAPTER 1

INTRODUCTION: THE NEED FOR HEALTH CARE REFORM

“...[for] low-back pain, which has substantial direct and indirect cost implications to the private sector, the challenges for both government and the private sector are virtually the same.”

1. There is a rapidly emerging consensus that neatly epitomizes the current health care crisis in Canada - namely that we can preserve our much cherished Medicare program only if we succeed in controlling the rapid rise in health care expenditure.

2. In these anxious times of recession, dismal prospects of economic growth, persistent deficits and crippling debt burdens, the spectacle of Conservative, Liberal and even New Democratic Party governments cutting back on a variety of welfare state programs is not very surprising. Cost containment, in its various forms, has become the touchstone of virtually all health care policy decisions. It dominates the health care reform agenda of all the provinces. The frantic actions to contain or reduce health care expenditure over the past few years stand in marked contrast to the benign neglect of earlier times.

3. Health care expenditures of \$66.8 billion in 1991 constituted 10.2% of our gross national product (Health and Welfare Canada, 1993, Table 1). There are many pertinent trends that characterize health care expenditure in Canada and Ontario but the most notable for the purposes of this study are the following. The Federal share of gross health care expenditure is declining rapidly, from about 33% in 1980 to 24% in 1991. Provincial and local governments now account for 47% of the aggregate expenditure compared to 41% in 1980. Health care costs consume about 34% of the provincial budgets in Canada, up from 25% in 1980. Private expenditure has increased from 25% of total health care expenditure in 1980 to about 28% in 1991. Health care policy and financing is increasingly and irreversibly a provincial matter. The trend of a greater private burden in paying for health care is also likely to continue.

4. A decade ago, Weller and Manga (1983, p.242) argued “that the provincialization of health is going to affect markedly the nature of the health policy process in Canada, and thereby the nature of the analyses that will have to be made. The ...

ideological and pressure-group ... determination of policy within the provincial context will become more important”. It is now apparent that the provincialization of health care will continue and battles over health care policy and financing will be fought and determined at the provincial levels of government.

5. Our habit of comparing ourselves to an obviously inferior American system has made us somewhat complacent about the shortcomings of our own system. Canadians take great pride and comfort in the knowledge that compared to the Americans they have achieved greater and more equitable access to health services, with equal or better health status in terms of infant mortality rates and life expectancy, and still spend significantly less on health care. However, worldwide and in per capita terms, Canada was second only to the United States in 1989 (The Economist, 1991). As for health status, there are several countries that have a better record than Canada's but at considerably lower levels of health care expenditure and with a relatively older population. Such wider international comparison should compel us to search for ways to improve the overall performance of our health care system (Schieber and Poullier, 1990). At the very least, having the most expensive system in the world other than the USA should give us pause when we incline to declare we have the “best” health care system in the world.

6. The health care systems of all industrialized countries are facing quite similar problems (McPherson, 1990). These include rapidly increasing health care costs and expenditure; the need for regional, national and indeed, international institutions for the management of biomedical technology; the challenges posed by changing demography, particularly the rapidly aging population; the need to have a functionally integrated and operationally effective organization of the health care system; more cost-effective use of the many health care professionals and others that provide health care

services; the introduction of incentives, guidelines, and controls to encourage optimal and efficient use of health care technology; improving access to services for those socio-economic groups which hitherto have been inadequately served; and the development of information systems allowing for the better decisions required to address these and related problems. The approaches and solutions to these problems attempted by different countries constitutes a veritable laboratory of ideas and experiences. There is much that we can learn from others.

7. In the Canadian situation, there are innumerable studies and proposals for reform. This study exemplifies several strategies of reform that are vitally important for Canada's effort to contain health care costs including: the more efficient use of our health human resources; identifying the inefficiency or ineffectiveness of some of our medical services; reducing the growth in pharmaceutical costs, the fastest growing component of our health care expenditure; and eliminating unnecessary use of costly hospital facilities.

8. "The causes of greater economic efficiency and equity are both more likely to be served by having the state take back increasing amounts of the power it earlier delegated to the dominant professionals, and to use that power to effect a shift toward less expensive forms of delivery, and away from doctor-dominated, technology-oriented, high-cost medicine. This shift would be achieved by action on the supply side of the medical marketplace through such policies as manpower substitution" (Manga and Weller, 1983, p.515).

9. There are numerous empirical studies, trials and experiments in many countries that underscore the tremendous potential of manpower substitution for improving the technical efficiency in the production of a wide range of health care services. Such substitutions may occur within professions (for example, general practitioners for specialists, registered nursing assistants for registered nurses) and between professions (for example, between nurses and physicians, midwives and obstetricians, dental hygienists or nurses for dentists). There are very significant economic benefits from such manpower substitution (Manga and Campbell, 1993).

10. The health care sector is highly labour intensive. About three-quarters of health care expenditure is made up in wages, salaries and fees. Therefore the efficient use of health personnel is obviously of vital importance in assuring that

services are produced and developed in a cost-effective manner. Except for a very limited use of nurse practitioners and the introduction of midwives in Ontario in 1989, manpower substitution as a strategy to improve efficiency and contain costs has not been seriously attempted despite considerable evidence of its cost saving potential (Cassels, 1981; Fulop and Roemer, 1982, Manga and Campbell, 1993).

11. The boundaries between health care professions have and will continue to change because of changes in educational systems, medical technologies, information systems, insurance coverage, and the organization of health care services. Keeping service boundaries intact is an illusory and unwise goal and is counterproductive to the objective of improving the efficiency of our health care system. Turf is money - it is important to understand that battles over professional turf will shape to a considerable extent the nature and design of the new health care system. It also determines the efficiency of the system. Suffice it to say, there is great scope for professions other than medical doctors to assume greater responsibilities in delivering services and caring for patients, in institutional and especially in non-institutional settings.

12. It is widely known that about seventy percent or more of existing medical technology and procedures have not been subjected to adequate cost-effectiveness analysis. At least 30% of hospital admissions are thought to be inappropriate (Rachlis and Kushner, 1989). The development and proliferation of consensus reports, technology assessments, practice guidelines, appropriateness ratings, treatment protocols and task force reports, is evidence of the need to define and encourage more appropriate treatment of most conditions. Some of these developments are concerned mainly with questions of efficacy, while others have a more extended concern and include questions of cost-effectiveness. Some of these studies are motivated by the burgeoning evidence of sizable variations in medical practice, inappropriate provision of care, and doubtful effectiveness of treatment or services (Lomas, 1990). There is no question that many of these studies are motivated by concerns about the very sizeable cost and the economic waste of inappropriate care. Other concerns are the quality of care, and the desire by patients and public generally for more informed decisions about health care treatment.

13. Maynard explains why the role of the medical profession is significant but not dominant in this new research. "The stock of knowledge to

inform ... choices is very small and it is up to the research community to remedy this. This will be a multi-disciplinary activity involving statistics, epidemiology, psychology, sociology, economics and other disciplines. The role of medicine in this work will be significant but it must not dominate: after all it is due to the absence of scientific rigour in medicine that we are so ignorant about appropriateness and cost-effectiveness today! The clinical model of research (trials with inadequate outcome end points and no consideration of cost) must be improved and recognized as only one part of the health services research armoury” (Maynard, 1993, p.1).

14. With respect to controlling hospital costs, a study published in 1991 (Sheps et al, 1991) reveals that Canadian hospitals have not implemented widely utilization management in order to measure and reduce inappropriate use of hospitals. However, this is changing, and “the trend to more utilization analysis will continue as governments, hospitals and physicians come under increasing political pressure to stretch scarce health care dollars” (Rachlis and Fooks, 1988). Hospital admission protocols and discharge planning are also ways of controlling the inappropriate use of hospital services and major improvements in the management of hospitals are possible in both of these areas. The use of second opinion programs and refinements to the peer review process are yet other ways of controlling and ensuring appropriate use of hospital resources (Rachlis and Kushner, 1989).

15. High among the reasons for rising health care costs in Canada is the rapid increase in use of auxiliary services, specialty drugs and laboratory services. In Ontario, for example, the cost of the Drug Benefit Plan has increased by over 700% in just eleven years, this despite the implementation of a generic drug substitution scheme. The benefits under Pharmacare programs have been reduced in many provinces (eg. Ontario, Quebec, New Brunswick) in recent years. However, the implementation of Bill C-22 in 1987 and the recent GATT negotiations give pharmaceutical firms increased patent protection, with the very likely result of higher drug prices, putting upward pressure on drug expenditure under Pharmacare and Medicare. A recent detailed study of prescription drug use has found a “dramatic” increase in the proportion of prescriptions with physicians indicating “no substitution” (Government of Saskatchewan, 1989), thus frustrating government attempts to contain expenditure on drugs through generic substitution. Laboratory services per capita have increased at

about 10% per year or about 30% per physician over the last 10 years (Woodward and Stoddart, 1989). It is clear that the rising expenditures on prescription drugs and laboratory services have yet to be tackled successfully in Canada. Expenditure on prescription drugs constitutes about 14% of aggregate health expenditure in 1991 in contrast to 9% in 1980.

16. It is hardly surprising that, presently, the overriding health care objectives of governments are:

- (a) cost containment;
- (b) emphasis on outcomes of health care services, and;
- (c) the allocation of health care resources and budgets to services of proven cost-effectiveness.

17. This report on the effectiveness and cost-effectiveness of chiropractic and medical management of low-back pain is highly pertinent to all of the above objectives. We hasten to add that these objectives are shared by the private sector as well. With rising tax burdens and a more open economy, the need to gain or maintain a competitive edge is now felt more acutely than before. There is a rapidly emerging congruence of public and private sector objectives on health, social and economic policy. Public sector waste and inefficiency has higher cost implications for the private sector. In the present study on low-back pain, which has substantial direct and indirect cost implications to the private sector, the challenges for both the government and the private sector are virtually the same.

18. In the balance of this Report, one chapter is devoted to each of the six terms of reference. Finally, Chapter 8 provides a summary of the findings and the major policy recommendations that flow from them.

CHAPTER 2

THE INCIDENCE, PREVALENCE AND ECONOMIC COSTS OF LOW-BACK PAIN: AN OVERVIEW

"...[Low-back pain] is one of the most - if not the most - costly diseases or disabilities in Canada, a phenomena which is not generally appreciated or understood in medical and governmental circles."

1. The extensive literature surrounding low back pain (LBP) belies a fundamental underlying inconsistency. Despite constant attention and calls for change from academia and sectors directly involved with the management and care of LBP, health policy surrounding this problem has remained virtually stagnant. It is unfortunate that some conflict in the data and disparate conclusions have continued to fuel debate rather than action in an area with great potential for cost savings and improved care. This chapter will present an overview of the basic epidemiology of LBP. This includes a brief summary of the incidence and prevalence of LBP in many different jurisdictions, a more specific look at the situation in Ontario, and a general discussion of the overall economic costs of LBP to society.

THE EPIDEMIOLOGY OF LOW-BACK PAIN

2. LBP, in its many manifestations, is a pervasive medical, social and economic problem, afflicting about 80% of all people at some time in their life (Hult, 1954; Horal, 1969; Hasue and Fujiwara, 1979; Svensson and Andersson, 1982; Biering-Sorenson, 1982; Biering-Sorenson, 1983; Frymoyer et al, 1983; Harris and Brigham, 1990). Estimates of point prevalence, that is, the number of people actually suffering from LBP at the time of a survey, range from a low of 5% to a high of 30% (Nagi et al, 1973; Kelsey et al, 1979; Biering-Sorenson, 1982; Svensson and Andersson, 1982; Cunningham and Kelsey, 1984; Reisbord and Greenland, 1985; Deyo and Tsui-Wu, 1987; Leigh and Sheetz, 1989; Ontario Ministry of Health, 1993). In a Danish general population, Biering-Sorenson (1982) found a 6% overall one-year incidence with a high of 11% among those in their 30s. Gyntelberg (1974) reported an overall one year incidence rate of 27%, but used self-reports rather than interviews to gather data. Hasue and Fujiwara (1979) in a study of a population aged 60 and over, established an incidence of LBP of 55.8% and an incidence of LBP persisting longer than 3 months of 7.5%. While this rather wide range of estimates reflects, among other things, the varying

concepts and definitions of LBP, it underscores the ubiquitous nature of the problem.

• General Correlates of Low Back Pain

3. The potential causes of LBP are extensive. Unlike most other diseases, however, the causes of LBP can be enigmatic, with pain often occurring for no clear reason or not occurring at all despite the existence of many potential correlates. However, there are a number of overall characteristics and findings established by a number of population studies that can guide and shape health policies pertinent to LBP.

4. LBP is most common between the ages of 25 and 55 (Hult, 1954a; Horal, 1969; Biering-Sorenson, 1983; Deyo and Tsui-Wu, 1987; Harris and Brigham, 1990), while the average age for filing a workers' compensation claim falls between 33 and 35 in both Canada and the United States (Abenheim and Suissa, 1987; Harris and Brigham, 1990). Although some studies have reported a substantial difference in the occurrence of back pain between males and females (Biering-Sorenson, 1982; Abenheim and Suissa, 1987; Harris and Brigham, 1990), still others have found little overall difference between sexes (Frymoyer et al, 1980; Biering-Sorenson, 1983; Ontario Ministry of Health, 1993). There is an historical trend to the gender incidence of LBP which is most evident in workers' compensation statistics. In earlier analyses the incidence and prevalence of LBP was much higher among men than women. However, with the constant increase in the labour force participation rate for females since World War Two, the difference in rates between men and women has narrowed substantially. Variations in the occurrence of LBP have also been found based on age, race, region and educational status (Deyo and Tsui-Wu, 1987a). Prevalence has been shown to be higher for people who smoke (Nagi et al, 1973; Frymoyer et al, 1983; Reisbord and Greenland, 1985; Harris and Brigham, 1990; Garrett et al, 1992), for people with lower levels of education (Deyo and Tsui-Wu, 1987; Leigh and

Sheetz, 1989) and for people who have had previous back problems (Yu et al, 1984). Additionally, there is some support for the inclusion of anxiety, stress, pregnancy, being separated, divorced or widowed, and sports activities as correlates of LBP (Frymoyer et al, 1980; Frymoyer et al, 1983; Reisbord and Greenland, 1985).

• Low Back Pain and the Workplace

5. Many occupational elements have a bearing on the prevalence of LBP. Activities such as truck driving, lifting, carrying, pulling, pushing, twisting and non-driving vibration have been suggested as potential causes of low back problems (Frymoyer et al, 1983; Harris and Brigham, 1990). Thus, any job with a greater occurrence of these activities is more likely to have a higher incidence of LBP. The literature reveals considerable intra-industry and inter-industry variation in the incidence and prevalence of LBP. For example, a study of a Nova Scotia teaching hospital reported an incidence rate for LBP of 18% for nurses, compared with a total hospital population incidence of 10% (Hubley-Kozey et al, 1985). Cust et al (1972) found a LBP prevalence among female nurses of 34.6%. Nurses perform many of the occupational tasks listed above, and several analyses suggest that nursing is one of the most hazardous professions for LBP outcomes (Statistics Canada, 1991a; Ontario Workers' Compensation, 1991; Garrett et al, 1992; Wilkinson et al, 1992). However, as suggested by Kaplan and Deyo (1988, p 63), "it is possible that higher back injury rates are reported in the health care industry simply because health care workers are particularly alert to symptoms or because health care providers are unusually accessible in this setting." We presume that the word "higher" does not mean higher than the true figure. It may be that back injury rates are being under-reported in other sectors of the economy.

6. It is quite obvious that, unlike the etiology of many other diseases and conditions, the causes of LBP are numerous, diverse and not that well understood. Although most cases of LBP do not have a clear anatomical cause they tend to be attributed to work related factors. As previously alluded, there are a multitude of factors associated with the symptomatic presentation of LBP, which can be identified with simple work-related factors such as bending, stretching or lifting and the use of equipment which causes excessive jarring and vibration or static loading. One of the greatest single causes of LBP appears to be extended driving. As well, the use of poorly designed

equipment and/or tasks, which increase the potential for factors associated with the occurrence of LBP, can exaggerate the back injuring effect of apparently innocuous jobs.

• The Recurrence of Low Back Pain

7. The impact that the recurrence of LBP has on the economy is important as well. However, the lack of clinical evidence to distinguish between recurrence and new episodes makes it difficult to provide strong data on the rate of recurrence (QTFSD, 1987), and hence, the rates which are found in the literature tend to vary substantially. In Quebec, the risk of recurrence was estimated to be 20% within one year and 36.3% at 3 years. This was associated with a risk of 38.0% for men and 27.5% for women and was highest for the group aged 25 to 44 at 38.3%. Drivers had the highest recurrence rate of 42.1% (Abenhaim et al, 1988). Horal (1969) found that 92% of patients with back pain had at least one previous episode, while Bergquist-Ullman (1977) reported a recurrence rate of 31%. Finally, Gyntelberg (1974) found that 54.3% had previously experienced back pain. However, one view of recurrence is that previous episodes and recurrence may not be as useful as other factors for predicting LBP, and may in fact cause more confusion, since recurrence is subject to a number of different definitions (Abenhaim et al, 1988). In our view, however, while recurrence is problematic in terms of its definition and measurement, it is nevertheless, an important and useful concept. Recurrence indicates the potential scope for prevention and health promotion, and just as importantly, the effective treatment of LBP. It appears that the cost-effective reduction of the rate of recurrence is one way to contain health care costs and to reduce disability.

8. Understanding the underlying reasons for LBP, and in particular, the increase in disability due to LBP is extremely important. A wide range of diagnostic and treatment procedures have been introduced to cure or reduce the symptoms of LBP. Discussed in more depth in later chapters, they range from surgical techniques, bed rest, pharmaceutical control, to non-medical forms of care such as chiropractic manipulation, acupuncture, and psychological interventions.

9. In recent years there has been increased emphasis on prevention and health promotion in order to reduce the incidence of LBP. Increasingly, jobs are analyzed and redesigned using ergonomic equipment or altered job specification, thereby decreasing the potential for low-back injury. For example, work schedules may be re-evaluated to

**Table 1 - Back Related Hospital Separations,
by Province, 1980-81 to 1989-90**

	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90
NFLD	449	426	554	485	550	635	730	748	649	668
PEI	236	221	188	223	210	232	285	351	322	325
NS	943	936	841	951	1005	1015	1021	1003	1031	965
NB	636	729	810	917	975	962	991	1007	872	888
QUE	2472	2553	2754	2873	2865	2954	3178	3255	2900	2699
ONT	5772	5878	6249	6473	6172	6689	6488	6923	6740	6656
MAN	512	607	626	650	706	683	726	772	708	775
SASK	1184	1227	1154	1228	1144	1201	1241	1262	1235	1346
ALTA	1725	1749	2169	2470	2733	2916	3084	3044	3094	3042
BC	2059	2210	2287	2813	2894	2823	2990	2778	2867	2710
CAN	15988	16536	17632	19083	19254	20110	20734	21143	20418	20074

Source: Statistics Canada, Morbidity on Diskette.

**Table 2 - Back Related Hospital Separations/100,000,
by Province, 1980-81 to 1989-90**

	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90
NFLD	94.8	87.8	112.6	97.4	107.3	122.9	140.2	143.7	120.9	123.9
PEI	216.2	194.4	161.9	191.0	176.3	192.8	234.5	282.0	255.4	251.8
NS	121.9	119.3	104.7	116.6	120.2	119.1	118.4	114.3	115.2	106.6
NB	102.1	115.0	125.9	139.8	146.3	142.3	144.5	144.7	123.6	123.7
QUE	40.8	41.3	43.8	45.1	44.4	45.2	47.8	48.2	42.2	38.6
ONT	69.8	69.9	73.0	74.2	69.3	73.6	70.0	72.8	69.2	66.8
MAN	53.2	61.4	62.8	63.8	68.1	64.5	67.5	70.8	63.7	68.7
SASK	132.4	134.1	124.6	131.1	119.5	123.4	126.1	125.6	121.0	129.5
ALTA	93.5	91.0	109.2	120.1	131.0	137.8	143.3	138.4	139.5	134.2
BC	79.5	82.2	83.1	99.7	100.3	95.9	99.5	90.2	90.4	83.1
CAN	70.7	71.5	74.9	79.6	78.9	80.9	82.0	82.0	77.5	74.6

Source: Statistics Canada, Morbidity on Diskette.

Table 3 - Days in the Hospital, by Province, 1980-81 to 1989-90

	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90
NFLD	3516	3744	4474	3958	4233	4504	4493	5311	4179	4202
PEI	2042	2020	2056	1895	1975	2083	1891	2307	1822	2104
NS	9916	9721	8476	9215	9144	9021	9202	8396	8777	8400
NB	6252	6862	7354	8910	8836	8980	9336	8417	6327	6804
QUE	25694	23395	24947	28994	27094	27690	30311	33393	29860	27107
ONT	64439	63377	67360	67564	63257	66935	66903	65678	61459	56663
MAN	5722	5862	5911	6048	7464	7799	6711	6620	10433	6633
SASK	9005	9521	7701	8594	7999	8109	8525	9074	8982	9589
ALTA	14426	15710	18530	19894	22930	22970	24739	21527	20860	22053
BC	16056	17787	16584	22179	24051	20607	24888	21812	21791	19137
CAN	157068	157999	163393	177251	176983	178698	186999	182535	174490	162692

Source: Statistics Canada, Morbidity on Diskette.

prevalence of LBP simply due to the use of such a diverse set of definitions. Perhaps most frustrating is the confusion regarding the exact meaning of incidence and prevalence used in the literature. Authors variously report point prevalence (eg. Nagi et al, 1973; Biering-Sorenson, 1982; Ontario Ministry of Health, 1992), annual incidence (eg. Gynzelberg, 1974), lifetime incidence (eg. Svensson and Andersson, 1982), lifetime prevalence (eg. Biering-Sorenson, 1982), and cumulative lifetime prevalence (eg. Deyo and Tsui-Wu, 1987b), among others. Thus, the comparability of intra- and international studies is limited and direct conclusions from these data must be treated accordingly.

15. Despite the data inconsistencies and accompanying conceptual problems, many researchers have probably underestimated the true underlying occurrence of LBP and its cost, largely due to the sources of their data. For example, in workers' compensation data, several peculiarities have been identified which lead to inconsistency and under-reporting. In many cases these programs do not cover federal employees, farmers, the self-employed, the unemployed or housewives, thus limiting the generalizability of any analysis. Individuals who are not absent long enough to claim compensation are not included in the tabulations and workers may also be reassigned to a less demanding job, thus underestimating the overall prevalence and impact of back pain. Finally, most estimates of the economic costs of LBP do not include indirect costs such as productivity loss, training costs of replacement workers, and retraining of permanently injured workers for new positions (Frymoyer and Cats-Baril, 1991; Lawrence et al, 1992).

16. The use of insurance data also leads to problems of under-reporting of costs. For instance, total costs are generally unknown until a claim is finalized. Insured costs are only part of total cost and insured disability benefits do not include all workers or all back disorders. Additionally, other costs such as imaging, prescription and over-the-counter pharmaceuticals, meals, mileage, and related expenses frequently go unreported as they are often the responsibility of the individual rather than third party payers (Snook, 1988). In short, much of the private cost of back injuries is overlooked in the existing cost estimates.

THE SITUATION IN ONTARIO

17. The most prevalent problems reported in the recent Ontario Health Survey were musculoskeletal problems. Of these, the survey reported that 7% of the respondents had "serious trouble with back pain" (Ontario Ministry of Health, 1992). This is relatively higher than the prevalence reported in the Canada Health Survey (1981), where 4.4% of the study population reported "serious back trouble". Applying this 7% figure to the population of Ontario suggests that about 700,000 people were suffering from serious LBP at the time of the survey.

18. Analysis of morbidity data indicates that in 1989-90 there were 6,656 hospital separations (Table 1) for "other and unspecified disorders of the back" (ICD-9 #724) in Ontario. This corresponds to an age-standardized rate of 66.8 per 100,000 persons (Table 2). This rate has been consistently below the national average rate, and was the second lowest rate in Canada during 1989-90. Analysis by sex, shown in Appendix 1, indicates negligible differences between men and women over the ten years, although occasional small differences on a year by year basis are evident. Age specific rates (Appendix 2) show an increasing morbidity with age.

19. The total number of hospital days (Table 3) for back problems in Ontario (1989-90) was 56,663, which corresponded to an age-standardized rate of 563.7 days per 100,000 persons. (Table 4). This was the third lowest rate after Quebec and Manitoba. The rates for age groups (Appendix 4) showed nothing beyond what would be expected, that is, an increase in hospital days as age increases. The differences between sexes is substantial (Appendix 3). Women have spent more days in the hospital than men for back related problems throughout the last decade.

20. Work-related and compensable injury occurrence derived from Statistics Canada data reveals a rate for Ontario of 1% of the employed population (see Table 5). According to information from the Ontario Workers' Compensation Board (1993), in 1991 there were 51,253 lost time back claims, of which men accounted for over 70%. The average compensation claim was \$6,486. There was a mean of 69 lost days per claim with one quarter of the back claims lasting longer than 66 days.

Table 4 - Days in the Hospital/100,000, by Province, 1980-81 to 1989-90

	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90
NFLD	755.6	780.2	928.8	809.3	840.7	886.8	876.0	1036.0	789.6	790.5
PEI	1834.4	1758.6	1719.9	1580.4	1629.5	1659.3	1533.5	1805.7	1428.0	1574.1
NS	1278.0	1237.1	1051.2	1126.8	1089.9	1047.9	1054.3	944.2	966.2	916.1
NB	1010.0	1087.9	1144.1	1364.8	1326.8	1330.2	1349.1	1201.7	885.6	933.3
QUE	433.4	386.9	404.0	466.2	428.0	430.4	465.1	503.4	439.0	391.6
ONT	782.0	757.5	787.5	774.5	709.2	734.5	718.1	687.1	626.7	563.7
MAN	582.5	583.5	590.7	588.0	707.6	717.9	604.7	580.8	826.8	559.5
SASK	984.4	995.8	807.0	882.5	816.9	805.4	834.5	865.0	831.9	861.6
ALTA	811.5	861.4	978.6	1023.6	1151.8	1135.2	1202.4	1022.1	972.1	1006.9
BC	619.2	658.7	600.4	781.1	823.4	690.7	809.4	689.9	668.5	570.2
CAN	700.6	689.5	698.4	743.2	728.2	720.1	739.0	705.3	658.3	600.2

Source: Statistics Canada, Morbidity on Diskette.

The five occupations in Ontario with the greatest percentage of back claims were service occupations; product fabricating, assembling and repairing; transport equipment operation; medicine and health; and the construction trades. This corresponds quite well to rates derived from Statistics Canada data which indicates the top five industries by back problems in Canada as: transportation and storage; logging and forestry; manufacturing; health and social services; and construction (see Table 6).

(Verbugge and Ascione, 1987). In a study of Ontario Workmen's Compensation data by White (1966), 10% of compensation patients with LBP were disabled more than 6 weeks. As well, Kertesz and Kormos (1976), in a study of workers' compensation claims in London, found that workers seemed to have LBP that was significantly different in some aspect from that of non-workers, suggestive of more severe conditions in those covered by workers' compensation. However, a number of authors (Frymoyer et al, 1983; Andersson, 1981; White, 1969) suggest that such a

Table 5 - % of Employed with Work Injury

Employed	Injuries		
TOTAL	12,340,000	148,898	1.21%
NFLD	197,000	2,925	1.48%
PEI	53,000	742	1.40%
NS	371,000	4,330	1.17%
NB	286,000	3,079	1.08%
QUE	2,987,000	48,323	1.62%
ONT	4,770,000	47,637	1.00%
MAN	494,000	5,242	1.06%
SASK	449,000	3,833	0.85%
ALTA	1,246,000	11,092	0.89%
BC	1,489,000	21,353	1.43%

Source: Statistics Canada, Work Injuries (1992).

21. Other studies undertaken in Ontario in the past three decades reported a number of interesting findings. Gibson et al (1980) found a work related incidence rate of low-back injury of 1.3% among steelworkers in Hamilton. Interestingly, only 25% of those respondents sought medical treatment (Spitzer et al, 1976). This is similar to a study in Detroit which found that one-half of all working adults experience LBP 1 week in 6, yet most do not seek medical care

conclusion should be viewed with caution as workers with low back pain whose jobs require heavy lifting may tend to both aggravate their symptoms and complain more frequently because of the incentive for benefits under workers' compensation. This is an allegation or suspicion that has not been conclusively resolved in a formal, methodologically sound study.

Table 6 - % of Employed with Work Injury by Industry

	Injuries	Employed	
TOTAL	148,898	12,340,000	1.21%
Agriculture	1,146	448,000	0.26%
Fishing & Trapping	303	44,000	0.69%
Logging & Forestry	1,310	62,000	2.11%
Mining	2,182	174,000	1.25%
Manufacturing	38,565	1,865,000	2.07%
Construction	12,102	695,000	1.74%
Transportation & Storage	10,779	507,000	2.13%
Communication & Other Utilities	3,537	409,000	0.86%
Wholesale Trade	8,740	561,000	1.56%
Retail Trade	16,853	1,607,000	1.05%
Finance & Insurance	458	501,000	0.09%
Real Estate & Insurance Agencies	782	259,000	0.30%
Business Services	2,605	711,000	0.37%
Government Services	10,806	832,000	1.30%
Educational Services	4,171	865,000	0.48%
Health & Social Services	21,492	1,205,000	1.78%
Accommodation & Food & Beverages Services	6,092	766,000	0.80%
Other Service Industries	4,839	837,000	0.58%

Source: Statistics Canada, Work Injuries (1992).

22. The estimated 1% occupational back injury rate in Ontario is lower than the one year incidence of occupational back pain in Quebec of 1.37%, which ranged from 1.9% for men and 0.5% for women (Abenheim et al, 1985). This rate is also lower than the occupational rates of 2% (Horal, 1969), and 1.3% found in Sweden (Svensson & Andersson, 1982). Whether the Ontario rate of 1% is an underestimate is, however, difficult to tell. Ontario's industrial structure and the age and sex composition is different from other jurisdictions and the figures represent different years. As well, occupational statistics are influenced by a number of features of the Workers' Compensation Board's policies and procedures.

THE HIGH COST OF LOW-BACK PAIN

23. There are many costs attributed to LBP divisible into direct and indirect costs. Direct costs consist primarily of medical costs, worker compensation, legal expenses, indemnity payments, and property damage arising as a result of the accident (Snook, 1988; Webster and Snook, 1990; Shults, 1991). Estimates of the overall cost of back pain tend to be limited to these direct costs. As noted earlier, studies usually overlook the direct costs of back injury borne by individuals themselves and tend to focus on the direct cost to insurers and workers' compensation programs.

Indirect costs include personal suffering, production losses and related costs borne by industry. While the costing of personal suffering is subjective and hence difficult to estimate, production losses can potentially be identified and measured. It would seem, however, that a thorough costing of such indirect costs is rare. These costs have been identified by many authors (eg. Snook, 1988; Shults, 1991) and consist of medical treatment and rehabilitation at the injury site, lost time of workers who give first aid, the loss of wages paid to other workers during interruption, wages paid to injured workers until workers' compensation is extended, wages paid to the supervisor for the time spent on filing a report and providing assistance, the cost of replacement workers and training, decreased production from temporary workers or from working short-handed and wages paid to clerks to prepare and process a claim. Additionally, there is a loss of tax revenue and community service, the cost to the legal system if litigation is involved and decreased employee morale.

24. There are nevertheless several estimates of the cost of LBP to society. Akesson and Murphy (1977) judged the cost of back pain in the U.S. to be at least \$14 billion per annum in the mid-1970s. As well, the cost of medical care alone was estimated at \$17.9 billion in 1988 (Deyo et al 1991).

1989 estimates in the U.K. were that back pain accounted for 33.3 million lost working days and cost the British Health Service £156 million a year and British industry £1018 million per year (Crocker 1989). In Quebec, the cost of back pain in terms of annual compensation days alone (2,120,000 workers' compensation days) was \$173 million (Abenhaim and Suissa, 1987). One of the most comprehensive estimates of the cost of back pain to society in the U.S. was attempted by Holbrook et al (1984) and updated by Frymoyer and Cats-Baril (1991). Frymoyer and Cats-Baril estimated direct costs in 1990 of \$24.3 billion and total costs of between \$50 to 100 billion per year (Frymoyer and Cats-Baril 1991). Simple extrapolation of this to the Canadian situation suggests that back pain may cost Canadians from \$6 to \$12 billion per year. Thus, LBP is one of the most - if not the most - costly diseases or disabilities in Canada, a phenomenon which is not generally appreciated or understood in medical and governmental circles. Back injury does not attract nearly the kind of attention received by heart disease, cancer or AIDS. One of the reasons for this is, no doubt, that chronic health problems generate less "interest and enthusiasm" than many of the high profile acute illnesses and injuries which result in institutional morbidity or death.

25. Many studies have analyzed the costs of workers' compensation and insurance claim data to determine the mean cost of back pain to those systems (Leavitt et al, 1971; Klein et al, 1984; Abenhaim et al, 1985; Spengler et al, 1986; Abenhaim and Suissa, 1987; Webster and Snook, 1990; Ontario Workers' Compensation, 1991; Nyiendo and Lamm, 1991). For example, the mean cost of workers' compensation back pain claims in Quebec was \$4650, made up of \$650 in medical costs and \$4000 in compensation (Abenhaim and Suissa, 1987). Similarly, the mean cost in a US study was \$3533 which was made up of \$470 in medical costs and \$3063 in indemnity costs (Klein et al, 1984). The average cost in Ontario for workers' compensation claims resulting from back injuries in 1991 was \$6486 (Ontario workers' compensation, 1991). Unfortunately, the differences in time frames and data do not allow for direct comparison.

26. There are two further observations to be made regarding the economic costs of LBP. First, medical costs covered by workers' compensation represent only a small percentage of the total direct cost of LBP, ranging from 14 to 25% of direct costs. (Leavitt et al, 1971; QTFS, 1987). It would seem, then, that the private sector should exhibit much greater concern for a reduction in the incidence

and costs of LBP, and not regard this as an issue mainly for the government and workers' compensation.

27. Second, the median cost for LBP far lower than the average cost. This skewing of costs means that there are a number of extremely high cost claims which account for a substantial amount of the total cost. Hult (1954) reported that 4% of those with back problems were incapacitated more than 6 months, and in a Swedish study 6% of those off work with a back injury remained off work longer than 6 months (Bergquist-Ullman, 1977). Similar distributions are also evident in the United States and Canada. For workers in Quebec, 7.4% of injured workers absent for over 6 months were responsible for 73.2% of medical costs and 76% of compensation costs (Abenhaim and Suissa, 1987). Frymoyer and Cats-Baril (1991) determined that 75% of costs could be attributed to 5% of people who become temporarily or permanently disabled from back pain. A study of workers compensation claims for Boeing Corporation found that 10% of all back claims were responsible for 79% of total back injury claims (Spengler et al, 1986). Finally, 90% of costs for low back injuries were incurred by 34% of the claimants in a study of Oregon workers' compensation claims (Nyiendo, 1991b). Therefore, it is clear that, "the small percentage of claimants who receive permanent total or partial disability payments are responsible for a disproportionate amount of the total costs associated with back pain or injury" (Spengler et al, 1986, p 241). Perhaps most importantly, back injuries were found to be three times more costly than other non-back injuries, and back injury claimants tended to have multiple claims compared with non-back injury claimants (Spengler et al, 1986).

CONCLUSIONS

28. It is evident that estimates of the incidence and cost of LBP vary considerably, as do the estimates of direct, indirect and total economic costs of LBP. Reasons for this variance have been presented. What is obvious, however, is that LBP is ubiquitous and very costly. The problem is most likely understated but even with the existing estimates the problem deserves far greater attention from both the government and the private sector.

29. There is some evidence that the incidence of LBP may indeed be growing. What is clear, however, is that the incidence of disability from LBP is certainly increasing. It is this phenomenon that has led to the rapidly rising economic and social burden of LBP. Waddell, a world-renowned

authority on LBP declares in the UK that it is “the second most common cause of physical disability after cardiovascular disease. Moreover, it is increasing faster than any other form of chronic disability ... we are now facing an epidemic of lower back disability in all western societies” (Waddell, 1993, p. 317- 318).

30. We have suggested that health care resource allocation has largely been driven by mortality related disease and illness and less so by disability or non-institutional morbidity and the attendant economic burden. LBP is a “sleeper” issue, because responsibility for it is dissipated between various ministries of government and the private sector. The literature on the incidence, prevalence, economic costs and the epidemiology of LBP makes it very apparent to us that this is one area where there is a great potential for the improvement of health care and a highly significant reduction of costs - not merely cost-containment. This can be achieved via the prevention of injury, disability and disease as well as more cost-effective management of LBP. This study is primarily concerned with the latter strategy.

CHAPTER 3

A BRIEF DESCRIPTION OF CHIROPRACTIC, MEDICAL, PHYSIOTHERAPEUTIC, AND OTHER MANAGEMENT OF LOW BACK PAIN

“Since [low-back pain] is probably the leading cause of disability and morbidity in middle-aged persons, it is hardly surprising that the management of this ubiquitous ailment involves a variety of professionals offering a multitude of therapies.”

MANAGEMENT OF LOW-BACK PAIN

1. It is typically assumed that “most patients with low-back pain have some form of lumbar spine disease, involving the lumbar disk as well as surrounding skeletal components, muscles, or ligaments. Common pathological processes include degeneration within the disk (with or without herniation); osteoarthritic proliferation of the facet joint; infolding of the interlaminar ligament leading to stenosis; osteoporosis; and instability of the intervertebral segments” (Curd and Thorne, 1989, p.135).

2. Since low-back pain (LBP) is probably the leading cause of disability and morbidity in middle-aged persons, it is hardly surprising that the management of this ubiquitous ailment involves a variety of professionals offering a multitude of therapies. “Approaches to the treatment of low-back pain in western society range from a wide variety of self-help techniques and prescriptions, through an equally wide variety of practitioners providing conservative clinical care, characterized as medical, or nonmedical, to the most aggressive medical treatments and surgery” (Vernon, 1991, p.379). Ryan further elaborates on this point by stating that “just as there are many causes of persistent low-back pain, there are many therapeutic options available for its treatment...The primary care physician should not hesitate to consult other specialists such as a manipulator or acupuncturist to aid in pain management” (Ryan, 1993, p.49).

3. LBP is managed mostly by physicians and chiropractors, with physiotherapists also playing an important role. These professionals together with others provide an extensive number of treatments for LBP. Indeed, the Quebec Task Force on Spinal Disorders (QTFSD) (1987) identified thirty-six therapeutic modalities for the treatment of activity-related spinal disorders. It is important to point out that although each type of treatment is most often associated with a specific practitioner, it is

not uncommon for certain therapeutic modalities to be performed by others. For example, chiropractors manage LBP principally by spinal manipulation; however some physicians also use spinal manipulation to manage LBP, even though this is not a treatment modality typically associated with the medical profession. A growing number of physicians have recognized the value of manipulation, and some have adopted techniques in their own practices for treating low and other back pain calling it “manual medicine”, “manipulative medicine” or “chirotherapy”. Medical doctors have formed organizations such as, the International Federation of Manual Medicine, the North American Academy of Manipulative Medicine, and the British Association of Manipulative Medicine. Similar organizations have been established in Austria, Czechoslovakia, Denmark, Italy, Germany, Norway, Sweden and Switzerland (Bachop, 1980).

CHIROPRACTIC MANAGEMENT OF LOW-BACK PAIN

4. 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”. For LBP disorders, chiropractic offers a primary contact source of management “which emphasizes an interventional, but participatory, multi-modal approach to functional recovery and restoration in an ambulatory office setting. Inherent principles of care involve thorough diagnosis, individualized treatment which is built around manual techniques, evaluation based on achievement of functional objectives, and a keen interest in after-care and prevention” (Vernon, 1991, p.379).

5. Chiropractic treatment of LBP emphasizes spinal adjustment, known also as spinal manipulation. The primary objective of manipulation is to restore movement in the locomotor system. The chiropractic management

Table 7 - Therapeutic Procedures used in Chiropractic Treatment

Therapeutic procedure	% of Chiropractors
Corrective/Therap. Exercises	95.8
Ice Pack/Cryotherapy	92.6
Bracing	90.8
Nutritional Counselling, etc.	83.5
Bedrest	82.0
Orthotics/Lifts	79.2
Hot Pack/Moist Heat	78.5
Traction	73.2
Electrical Stimulation	73.2
Massage Therapy	73.0
Ultrasound	68.8
Acupressure/Meridian Therapy	65.5
Casting/Taping, Strapping	48.2
Vibratory Therapy	42.0
Homeopathic Remedies	36.9
Interferential Current	36.7
Direct Current, etc.	26.9
Diathermy	26.7
Infrared Baker, etc.	19.0
Whirlpool/Hydrotherapy	12.7
Acupuncture	11.8
Other	9.6

Source: National Board of Chiropractic Examiners (1993)

of LBP stresses the participation of the practitioner in restoring movement into the affected lower back. The chiropractic "management pathway" for LBP is essentially unique in that "the entire management pathway is delivered and supervised by a single practitioner who tailors it to the needs of the patient. It combines ongoing assessments, formal or informal, of critical progress thresholds of recovery of function. A flexible, individualized treatment plan is designed to incorporate corrective, practitioner-delivered therapy and patient participation in home care" (Vernon, 1991, p.384).

6. Vernon outlines four stages in the management of LBP patients which he believes exists in the practice of chiropractic (Vernon, 1991, p.384). The first stage consists of decreasing pain, by attempting to reduce entry-level pain, inflammation, muscle spasm and compression on joints or nerve roots. Treatments offered to accomplish this objective include recommending rest, ice or heat therapy, low force manual soft tissue therapy and passive joint mobilization. Patients are also taught to improve their illness behaviours and are encouraged to do at home treatments (Vernon, 1991, p.385).

7. The second stage in the management of LBP patients deals with the recovery of function, such as the convalescence of normal muscle tone and extensibility, of normal joint flexibility and joint play and the promotion of nerve root healing. To meet these ends, chiropractors will perform spinal adjustive manipulation, extremity mobilization and manipulation, and use modality treatments and passive motion apparatus. Additionally, they may prescribe home treatments such as low-level exercise, and stress to the patient the need to reduce abnormal illness behaviours (Vernon, 1991, p. 385).

8. Rehabilitation is the third stage of the management of LBP, whereby the chiropractor attempts to recondition the patient's muscle tone and strength, and fully restore active range of motion and joint play and the patient's overall dynamic functional harmony. The treatments used to meet these objectives include spinal adjustive manipulation, conditioning, flexibility and aerobic exercises, postural retraining, ergonomic awareness and orthotic therapy, and continued educational intervention to reduce the patient's abnormal illness behaviour (Vernon, 1991, p. 385,386).

9. The final stage of management for LBP, reinforcement, consists of initiating a full-scale preventative program and discharging the patient from active care. The chiropractor continues to encourage wellness behaviours by the patient after a full recovery has been made. (Vernon, 1991, p.386).

10. In the U.S.A. the National Board of Chiropractic Examiners has recently published a detailed national survey analysis of the practice of chiropractic (NBCE, 1993). A companion survey of Canadian chiropractic practice is to be published soon. The U.S. survey reports that, other than spinal manipulation or adjustment, chiropractors use many other therapeutic procedures in the management of low-back pain and other neuromusculoskeletal disorders (see Table 7).

11. In a British study on chiropractors and the treatment of back pain, it was found that the therapeutic procedure most used for the management of patients with LBP was joint manipulation (Breen, 1977). In fact, almost 70% of patients presenting with LBP received lumbar manipulation as a principal treatment, and over 50% received sacroiliac manipulation. Soft-tissue and pressure techniques were used on almost 17% of the patients. All other physical procedures were very rarely used (ie. treatment for less than 5% of patients), and included traction, electrical treatment, heat and cold applications, postural supports, exercises and vitamins (Breen, 1977, p.50). In summary, for the management of LBP, modern chiropractors use a "holistic approach that encompasses manipulation, education, and regard for environmental, nutritional, and psychotherapeutic factors" (Raftis and Warfield, 1989, p.90).

• Spinal Manipulation

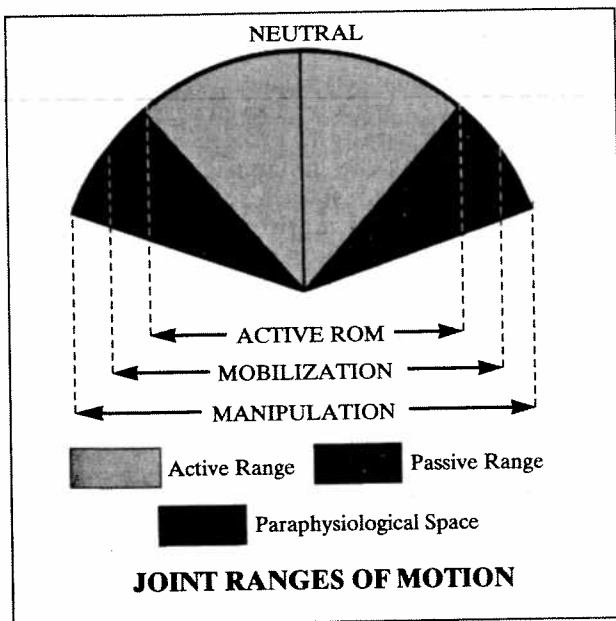
12. As already mentioned, spinal manipulation is the principal therapeutic procedure employed by chiropractors for the management of LBP. "For chiropractors, manipulative therapy is the art of restoring a full and pain-free range of motion to joints" (Curtis and Bove, 1992, p. 553). The term "spinal manipulation" has been used and defined broadly in the past, to include, for example, "all procedures where the hands are used to mobilize, adjust, stimulate or otherwise influence the spinal and paraspinal tissues with the aim of influencing the patient's health" (Haldeman, 1983, p. 63). There is a great multitude and variety of descriptions for manipulation throughout both the medical and non-medical literature (Kirkaldy-Willis and Cassidy, 1985; Cassidy et al., 1985;

Haldeman, 1983; Raftis and Warfield, 1989; Cassidy and Kirkaldy-Willis, 1988; LaBan and Taylor, 1992; Paris, 1983; Kuo and Loh, 1987). However, "manipulation" now tends to be used more specifically, and in contrast to the term "mobilisation". The Quebec Task Force on Spinal Disorders (QTFSD) defines manipulation as the "abrupt high-velocity and short-amplitude passive movement of a vertebra beyond its physiological range but within its anatomic range" and mobilization as "a vertebral mobilization technique of low velocity and large amplitude, carried out with patient control within normal limits of articular amplitude" (McKenzie, 1989, p.441). In the chiropractic management of LBP, the terms mobilization and manipulation refer to different techniques, and the term "adjustment" is generally used to include both. (Raftis and Warfield, 1989, p.89).

13. Today the evidence supports and sustains a distinct difference between manipulation and mobilization. The best evidence in Canada is found in the writings of Cassidy and Kirkaldy-Willis (1988; 1985). Their definition of manipulation is a "passive manoeuvre during which the three-joint complex is suddenly carried beyond the normal physiological range of movement without exceeding the boundaries of anatomical integrity. The usual characteristic is a thrust - a brief, sudden, and carefully administered 'impulsion' that is given at the end of the normal passive range of movement. It is usually accompanied by a cracking noise" (Cassidy and Kirkaldy-Willis, 1988). Their description of the spinal manipulation process is summarized in point form below. (Kirkaldy-Willis and Cassidy, 1985 p.536).

- Spinal manipulation is essentially an assisted passive motion applied to the spinal apophyseal and sacroiliac joints.
- Beyond the end of the active range of motion (ROM) of any synovial joint, there is a small buffer zone of passive mobility; a joint can be only passively assisted into this ROM; this is **mobilization**.
- At the end of the passive ROM, an elastic barrier of resistance, which has a spring-like end-feel, is encountered.
- If the separation of articular (joint) surfaces is forced beyond this elastic barrier into the paraphysiological ROM, the joint surfaces suddenly move apart with a cracking noise (caused by the sudden liberation of synovial gases); this is **manipulation**.
- During a following period of about twenty minutes, the elastic barrier of resistance

- between the passive and paraphysiological zones is absent, and there is an increase in joint space.
- Synovial gases are the reabsorbed, joint space narrows, and the elastic barrier of resistance is re-established between the passive and paraphysiological zones.
- At the end of the paraphysiological ROM, the limit of anatomical integrity is encountered; movement beyond this limit results in damage to the capsular ligaments.
- During manipulation, a carefully graded and directed thrust is applied across the joint space at the end of the passive ROM; this force must be great enough to overcome the elastic barrier of resistance, but not so great as to separate the joint surfaces beyond their limit of anatomical integrity.
- This requires precise positioning of the joint at the end of the passive ROM and the proper degree of force to cause joint cavitation.



14. "To begin the process of mobilization and manipulation, the patient's upper body is twisted to introduce an element of rotation and lateral flexion into the lumbar spine. In this position, there is a counter-rotation of the upper torso on the pelvis, and the posterior facet joints are at, or near, their limit of active ROM. During the next step, the manipulator must try to localize the point of counter-rotation to the motion segment to be manipulated, by varying the degree of flexion in the upper knee and hip...Once the force of the manipulation has been localized, the process of mobilization and then manipulation can begin...An

experienced manipulator can overcome the elastic barrier of resistance with a carefully applied, high-velocity, short-amplitude thrust. Less experienced clinicians should master the art of mobilization before attempting to manipulate the spine" (Kirkaldy-Willis and Cassidy, 1985, p.536).

15. This last point emphasizes the considerable skill and expertise required to perform manipulation for LBP. "The treatment of back pain by spinal manipulation is not a simple matter. It is an art that requires considerable experience and dexterity. Like other spinal treatments, it is not a panacea, but when applied skilfully to the appropriate spinal level, the results are often rewarding" (Cassidy et al., 1985, p.145). "Manipulation requires much practice to acquire the necessary skills and competence. It is a fulltime vocation: few medical practitioners have the time or inclination to study it" (Kirkaldy-Willis and Cassidy, 1985, p.539). A review of educational programs suggests that chiropractors are not only the practitioners best qualified to perform spinal manipulation, but they are also the only ones who generally receive adequate training to do so.

MEDICAL MANAGEMENT OF LOW-BACK PAIN

• Conservative Treatment

16. In 1955 it was reported that the usual conservative treatment for LBP was rest, support, rehabilitation exercises and time. Manipulation was just beginning to emerge as a therapeutic procedure (Mensor, 1955, p.925). In a 1958 medical publication, it was reported that "the standard medical treatment for lumbago and other acute backache is bed rest and sedation, counter-irritation and heat, possibly supplemented by massage and injections of procaine" (Parsons and Cumming, 1958, p.103). Interestingly enough, not much had changed thirty years later in terms of medical management for low back pain; a 1987 medical publication reads that "restriction of activity, rest and even bed rest is now the treatment most commonly prescribed by physicians for low back pain apart from symptomatic analgesics. Bed rest is now unanimously taught in all standard textbooks as the first line of treatment for acute attacks" (Waddell, 1987, p.639). In a survey of five hundred patients attending orthopaedic clinics, analgesics was the treatment prescribed the most, followed by bed rest, corset, physiotherapy and manipulation, which was the therapy used only 5% of the time (Waddell, 1987, p.639). "The majority of (medical) patients with acute symptoms (of

LBP) need only a nonspecific short-term treatment regimen, which may include bed rest, analgesic medications, exercises and education" (Frymoyer, 1988, p.292). Described below are the major therapeutic modalities prescribed by physicians for the management of LBP.

• Bed Rest

17. "Modern treatment for low-back disorders is closely linked to the evolution of orthopaedics and the key orthopaedic principle of rest" (Allan and Waddell, 1989, p.4). The most commonly prescribed medical treatment for LBP is bed rest and medication (Miller, 1990, p.11) and bed rest is the safest and simplest conservative medical treatment available (Burton, 1981, p.178). One rationale for bed rest is that the "supine posture reduces intradiscal pressure and thus may benefit persons with a clinical presentation suggesting acute disc herniation" (Deyo, 1988, p.26). However, "many (if not most) patients with LBP have disorders affecting muscles, ligaments, nerves, or facet joints rather than acute disc herniations", therefore for these persons "any physiologic rationale for bed rest is less clear" (Deyo, 1988, p.26). In fact, Waddell has stated that "there is no evidence that rest has any beneficial effect on the natural history of LBP. On the contrary, there is strongly suggestive evidence that rest, particularly prolonged bed rest, may be the most harmful treatment ever devised and a potent cause of iatrogenic disability" (Waddell, 1987, p.640). The effectiveness of bed rest will be discussed further in the next chapter.

• Prescription Drugs

18. For the purposes of treating spinal disorders, the QTFSD has defined medication as "any substance, other than food, that is used to relieve symptoms and to treat or prevent disease. Medications are the most frequently prescribed treatment for patients with spinal disorders" (QTFSD, 1987, p.S28). "Innumerable analgesics, anti-inflammatory agents, sedative-hypnotics, and muscle relaxants have been recommended for the immediate relief of LBP" (Quinet and Hadler, 1979, p.270). Pharmacologic management of LBP includes the use of analgesics (such as acetylsalicylic acid), tricyclic antidepressants, and opiates, such as morphine which may be required for relief of more severe pain (Ryan, 1993, p.54,55). Nerve and epidural blocks delivered by anaesthesiologists are also used to relieve symptoms for "weeks or months by blocking the pain-spasm-pain cycle" (Ryan, 1993, p.56).

• Exercise, Education and Functional Restoration

19. Back school, pain clinics, functional training, postural information and work cessation are also methods used for the management of LBP (QTFSD, 1987, p.S23,S24,S29,S30). Multidisciplinary approaches (Newman et al., 1977) and functional restoration rehabilitation programs (Fredrickson et al., 1988; Gatchel et al., 1992) are also growing in popularity.

• Surgical Intervention

20. In general, for the treatment of LBP, the primary physician "should exhaust the possibilities of conservative management ... before referring to a neurosurgeon (or orthopaedic surgeon)" (Ryan, 1993, p.58). Surgery should be considered only when "conservative treatment modalities have failed to reverse significant functional impairment... As new and more effective methods of conservative treatment are introduced, the need for surgery decreases... Surgery not only must adequately address the immediate problem, but it also should be directed toward preventing future problems and avoiding iatrogenic disease" (Burton, 1981, p.182,183). An important point to be made here is that there is very little consensus within the medical community on the appropriateness and efficacy of performing surgery for LBP. Surgery rates for LBP vary considerably between and within regions (Volinn et al., 1991, p.575). The efficacy and effectiveness of surgery and other specialist medical therapies will be discussed in greater detail in the next chapter. Nevertheless, there are several surgical interventions which are used for the treatment of persistent LBP, the most popular of which are described below.

• Chemonucleolysis

21. Chemonucleolysis is the "intradiscal injection of enzyme to dissolve herniated nucleus pulposus" (Burton, 1981, p.179). Chymopapain is the proteolytic enzyme injected into disc herniations in the lumbar region (Camp, 1988, p.86). The concept behind this treatment is that the enzyme will hasten the resolution of a "biochemically stimulated inflammatory reaction" (Quinet and Hadler, 1979, p.275). Although this therapy was originally considered as being conservative, it is now considered as being an invasive procedure (Frymoyer, 1988, p.295). The QTFSD has defined chemonucleolysis as a "semi-conservative approach used in patients suffering from radicular pain sufficiently intense to raise the possibility of surgery" (QTFSD, 1987, p.S23). This same Task Force concluded that this treatment is

not useful in recurring LBP, and can in fact be contraindicated if a first injection fails.

- **Spinal Fusion**

22. "Spinal fusion is performed to address instability or abnormal motion in the spine... There are a number different kinds of fusions, but generally two adjacent vertebrae are fused together with transplanted bone or surgical hardware and the joint is rendered motionless... Fusion surgery is inherently more complicated, more painful, and riskier than procedures such as discectomy and laminectomy. Even when the operation goes well, the patient spends over a week in the hospital and requires a recuperation period of several months" (Deyo, 1992, p.1).

- **Lumbar Laminectomy**

23. According to the QTFSD, a laminectomy is the "total surgical excision of one or several vertebral arches to decompress or visualize nervous structures of the medullary canal" (QTFSD, 1987, p.S28). This procedure is performed through a four to six inch incision without the aid of magnification (Camp, 1988, p.86). "A standard lumbar laminectomy is quite uncomfortable, requiring average hospitalizations in excess of five days. Rehabilitation is often delayed by postoperative discomfort" (Camp, 1988, p.86). The Task Force defines a laminotomy as "the partial excision of one or several vertebral arches" (QTFSD, 1987, p.S28).

- **Discectomy**

24. The QTFSD defines a discectomy as being the "complete surgical removal of the intervertebral disc" (QTFSD, 1987, p.S28). "The sole objective of discectomy is to decompress the nerve root... Microsurgical discectomy involves the use of small incisions, magnification and intense illumination of the operative field" (Frymoyer, 1988, p.292). This operation must be reserved for "patients with a proven discal hernia who have not responded to conservative treatment" whereas a discectomy is a "partial surgical removal of the intervertebral disc" (QTFSD, 1987, p.S28).

- **Denervation**

25. Denervation is a neurosurgical technique which attempts to alter neurological structures, and is defined by the QTFSD as the "destruction of a nervous structure through various techniques" (QTFSD, 1987, p.S23).

MANAGEMENT OF LOW-BACK PAIN BY PHYSIOTHERAPY

26. "Physical therapy (physiotherapy) is a generally accepted and applied mode of treatment for low-back pain" which includes a "variety of therapeutic techniques" (Lidstrom and Zachrisson, 1970, p.37). "Exercise programs, traction, diathermy, application of heat or cold, ultrasonography, and transcutaneous electrical stimulation (TENS)" (Frymoyer, 1988, p.292) are all common forms of treatment in the management of LBP. These treatments are provided by physiotherapists, who are "specially trained in musculoskeletal physiology, biomechanics, and rehabilitation. They provide 'hands-on' care that is accepted widely and viewed by patients as important in back pain treatment" (Overman et al., 1988, p.199). It has been proposed that there are four important independent objectives in the management of LBP by physiotherapists (DeRosa and Porterfield, 1992): modification of pain or promotion of analgesia accomplished by electromodalities, thermomodalities or medications; the introduction of "nondestructive forces into the injured anatomical region of the body in order to promote movement or to increase the patient's physical activity", such as massage and traction; enhancement of neuromuscular performance using a variety of exercise programs; and the biomechanical counselling of patients (DeRosa and Porterfield, 1992, p.266,267). Outlined below are the therapeutic modalities most often associated with the management of LBP by physiotherapists.

- **Exercises**

27. Exercise programs are nearly "universally prescribed" by physiotherapists for low-back patients with "chronic symptoms" or for patients who are in the "resolving phase of any acute episode" of LBP (Quinet and Hadler, 1979, p.274). "Generally, exercises are done in a specialized center for a limited time only, mainly to instruct the patient, and are then continued at home by the patient" (QTFSD, 1987, p.S28). Strengthening exercises are done to "increase muscular strength, generally making use of enough external resistance to bring a maximal contraction", whereas stretching exercises "improve the extensibility of muscles and other soft tissues to reestablish a normal articular range of motion" (QTFSD, 1987, p.S29). The most frequently prescribed exercises for the management of LBP aim at "strengthening both the lumbar and abdominal musculature and creating a 'corset of muscles' to support the spine.

The exercises are purported to reduce pain by relaxing muscles in spasm" (Quinet and Hadler, 1979, p.274). This is based on the theory that the "discs, ligaments or other structures responsible for pain are exonerated" (Lidstrom and Zachrisson, 1970, p.37).

• Traction

28. Traction is an "intermittent or continuous longitudinal elongation of the spine, either mechanical or manual" (QTFSD, 1987, p.S30). It has been "utilized for the treatment of LBP since ancient times, using various apparatuses and varying weights" (Quinet and Hadler, 1979, p.269) and can be achieved by means of "autotraction, gravity reduction, and motorized techniques" (Frymoyer, 1988, p.292). Burton has stated that "gravity traction is an innovative treatment that can be highly effective in non-obese, previously un-operated patients with acute contained disc herniations" (Burton, 1981, p.178).

• TENS

29. TENS is a "reasonable symptomatic treatment that is most effective for pain limited to the low back" (Burton, 1981, p.178). TENS, also known as electroanalgesia, aims at "reducing the physiologic perception of pain through the use of an electrical stimulator and electrodes applied to the skin" (QTFSD, 1987, p.S29).

• Other

30. Other popular therapies used by physiotherapists for the management of LBP include thermotherapy, which is a "local application of superficial or deep heat, with the use of diathermy, ultrasound, infrared rays, warm fomentations, heating pads or hydrotherapy" and cryotherapy, which is a "local application of ice or water, with ice wrappings or compresses" (QTFSD, 1987, p.S23,S30). Soft tissue massage, corsets and braces are also therapeutic modalities used in the management of LBP by physiotherapists.

31. In recent years some Canadian physiotherapists have begun to use mobilisation and manipulation in the treatment of LBP. Manual therapy is only taught at an introductory level in undergraduate physiotherapy programs in Canada, and the great majority of physiotherapy graduates go on to hospital appointments and private practice where they never use manual therapy (mobilization or manipulation) at all. During the past 10 years there has been an Orthopaedic Division of the Canadian Physiotherapy Association which has

been developing postgraduate courses for physiotherapists in the field. These are series of long-weekend courses that lead to an examination, and the aims have been to build up numbers, improve the educational programs, then create a specialty or certification in orthopaedics. The very existence of these field courses, running from preliminary to more advanced levels, underscores the tentative nature of training in this area at undergraduate level (Canadian Physiotherapy Association, 1990).

OTHER MANAGEMENT OF LOW-BACK PAIN

• Acupuncture

32. Acupuncture is the process of inserting needles "at predetermined sites in cutaneous and subcutaneous tissues, with therapeutic goals" and studies show that it can "lessen pain in a cumulative manner during a series of treatments" (QTFSD, 1987, p.S22). "Needles of from three to four inches in length are thrust into the lumbar muscles at the seat of the pain and withdrawn after five-ten minutes" (Quinet and Hadler, 1979, p.273). Ryan is of the opinion that "myofascial trigger points are an extremely common and...eminently treatable source of low back pain" (Ryan, 1993, p.56). He believes that acupuncture is more likely to succeed in patients with predominant back pain and myofascial trigger points in the "paravertebral or gluteal muscles" (Ryan, 1993, p.50).

• Biofeedback and Psychotherapy

33. Biofeedback is a "training technique that includes transposing the physiologic activity of a patient's muscular response into a visual or auditory signal, enabling the patient to control his response", the objective being to facilitate or inhibit muscular activity (QTFSD, 1987, p.S23). Psychotherapy is a "planned therapeutic and diagnostic effort to identify and modify basic personality traits, the influence of previous experiences, expectations, and strategies of adaptive behaviour in an attempt to reduce the effect of subconscious and conscious factors that increase the patient's handicap" (QTFSD, 1987, p.S29).

SERVICE BILLING AND OUT-OF-POCKET COSTS

34. As discussed, the three major groups of professionals who treat LBP in Ontario are chiropractors, physicians and physiotherapists.

35. Under OHIP, physician services are fully insured under a fee-for-service system. LBP

patients do not incur any out-of-pocket expenses for treatment; they are fully covered for medical care. However, these patients pick up the tab for any medications that are prescribed to them for their back pain. Medications are usually privately insured or covered through employment insurance policies.

36. Chiropractic care is not fully insured under OHIP. As of December, 1990, OHIP reimbursed these practitioners \$9.65 for each patient visit, and the LBP patients picked up the rest of the tag. The median rate charged per visit to a chiropractor was \$22.65, therefore the patient's contribution amounted to \$13.00, or approximately 58% in out-of-pocket expenses.

37. Physiotherapy services are mixed; some are publicly funded and some are private. In many cases, services are billed partly to OHIP and partly to the individual patient. For most physiotherapy services which are not covered by OHIP, patients are privately insured.

38. In summary, LBP patients incur the highest out-of-pocket expenses for chiropractic services. Virtually no out-of-pocket expenses are incurred for medical treatment (with the exception of drugs) and out-of-pocket expenses incurred for physiotherapy services fall somewhere in between the two.

CHAPTER 4

THE EFFECTIVENESS OF CHIROPRACTIC AND OTHER MANAGEMENT OF LOW-BACK PAIN

"On the evidence, particularly the most scientifically valid clinical studies, spinal manipulation applied by chiropractors is shown to be more effective than alternative treatments for low-back pain."

CRITERIA FOR SCIENTIFICALLY VALID CLINICAL TRIALS

1. Although there have been many clinical trials conducted on the efficacy of manipulation and other treatments for low-back pain (LBP), many authors and critics have questioned the validity of these trials. There are certain criteria which have been identified as being very important when interpreting the results of a given trial. Most studies and trials on manipulation and other therapies for LBP have been criticized for the poor methodology, inadequate data and related analytical issues, and thus the appropriateness of any conclusions drawn. "Clinical trials of manipulation are difficult at best to compare one with the other because the manipulation treatment itself is not standardized, patient selection is highly variable with regard to factors of age, sex, duration of pain, number of treatments and relationship to the etiology of pain, as well as difficulties inherent in analyzing the results" (LaBan and Taylor, 1992, p.457). "In most cases (of manipulation trials) the method of manipulation is not described; many of these trials utilized mobilization rather than manipulation. In a majority of the studies, very few treatments were given, and the training and expertise of the manipulators are impossible to judge. In some, there are obvious design errors and experimental bias is likely. In others, the numbers are probably too small to show significance" (Kirkaldy-Willis and Cassidy, 1985, p.538). Hoehler and Tobis (1987) point out that "clinical trials of spinal manipulation for back pain are problematic for a variety of reasons including difficulties in standardization of treatment, selection of appropriate patients and assessment of the results...there is as yet no generally accepted measure of the extent of back pain" (Hoehler and Tobis, 1987, p.409). Cassidy et al (1985) note that if the technique of manipulation under investigation is not adequately described, and the criteria used to direct the level and direction of manipulation are not stated clearly, then it is not possible to draw any definitive conclusions from a particular study

(Cassidy et al., 1985, p. 143,144). Valid comparisons of the effect of treatment is also very difficult to make across studies (Moritz, 1979).

2. Several criteria which should be used in evaluating the validity and applicability of therapeutic trials are listed below (Deyo, 1983, p.1057,1058):

- Randomization
- Minimal patient attrition
- Blind outcome assessment
- Equivalent co-interventions
- Compliance
- Minimal contamination
- Adequate statistical power
- Adequate demographic description of patients
- Adequate clinical description of patients
- Adequate description of intervention
- Reporting of relevant outcomes

3. As far as assessing the effectiveness of a given therapeutic procedure, "the strongest and only conclusive evidence of effectiveness is the randomized, controlled trial, which in the ordinary clinical situation is difficult to perform" (Nachemson, 1992, p.13). Case control, cohort and descriptive studies carry a lower level of proof of effectiveness (Nachemson, 1992, p.13). In assessing the studies in the scientific literature on spinal disorders, the Quebec Task Force on Spinal Disorders classified each study according to the type of methodology used. In decreasing order, the strength of scientific proof was classified according to the following types of studies (QTFSD, 1987, p.S10,S11):

- Randomized controlled trials
- Well-conducted cohort or case-control studies
- Descriptive studies
- Literature reviews (and meta-analyses)

4. This is the order in which the review of studies on the effectiveness of manipulation for LBP will be presented. The randomized controlled trials will be summarized, as these studies provide the most scientifically valid results on the effectiveness of manipulation for LBP. We note that the ranking of the studies adopted here is quite common in the clinical literature on health technology assessment. However, the ranking does not imply that meta-analyses, for example, or descriptive studies have no validity for purposes of assessing the relative cost-effectiveness of therapeutic intervention or making health care policy decisions. The evidence they provide is of lesser weight, but is still relevant and of value.

RANDOMIZED CONTROLLED TRIALS (RCT'S) OF SPINAL MANIPULATION

5. Our overall summary and rating of the trials is presented in Table 1 at the end of this section summarizing individual trials.

6. Glover et al (1974) conducted the first randomized controlled clinical trial of spinal manipulation for back pain on record. The subjects in this British trial were 84 pre-screened employees reporting to an engineering medical center with LBP. The patients were randomly allocated to two treatment groups: those receiving manipulation and those receiving de-tuned short-wave diathermy (placebo), both provided by a trained physiotherapist. The manipulation treatment consisted of one lumbar rotational manipulation session of 15 minutes or less followed by four daily diathermy (placebo) sessions of 15 minutes. The placebo group received five 15 minute daily sessions of diathermy only. The patients' own subjective assessment of relief from pain was used to assess the efficacy of the treatments, at 15 minutes, 3 days and seven days after treatment. There was no demonstrable difference between the two groups except at the 15 minute stage, where the relief from pain in the manipulated group was always greater than in the controls (placebo group). The authors concluded that "apart from a slight immediate improvement after treatment there appeared to be no other benefit from manipulation in this trial" (Glover et al., 1974, p.63).

7. Doran and Newell (1975) undertook a British multicentre trial in which 456 patients were selected and randomly allocated to one of four treatment groups for LBP: manipulation, definitive physiotherapy, corset or analgesic tablets. Two assessing doctors, an 'experienced' manipulator

and a relief, and a co-ordinating physiotherapist participated in the study. In the manipulation treatment group, the technique used was at the discretion of the manipulator. The efficacy of the treatments was assessed by both doctors and patients themselves (through self-reported changes in their low-back pain), at three weeks, six weeks, three months and one year. At three weeks, the patients' and doctors' assessments concurred closely and both showed manipulation to be marginally but insignificantly better. There were no significant differences among the four groups of patients for the remainder of the assessments. Thus none of the four methods for treating LBP in this trial showed any superiority. The authors concluded that "manipulation produced an early response in a few cases, but our results suggest that there is little point in continuing to manipulate patients who show no early improvement" (Doran and Newell, 1975, p.164). They also did not find any strong reason to recommend manipulation over the other treatments for the management of LBP.

8. Bergquist-Ullman and Larsson (1977) conducted a one-year prospective investigation of 217 patients who consulted a Swedish Medical Department for LBP. The patients were randomly allocated into one of four groups consisting of (a) combined physiotherapy; (b) mainly manual therapy (ie. manipulation); (c) the Back School (ergonomic advice) or (d) a placebo treatment comprised of low intensity short-wave diathermy. Patients in the combined physiotherapy group were treated by registered physiotherapists 'specially trained in manual therapy'. An important point to make is that patients in this group received a variety of physical therapy treatments, therefore the effect of manipulation per se was not specifically assessed. The efficacy of the three treatments was measured by the duration of symptoms following the first treatment, the length of absence from work, the change of pain, and the number and length and duration of sick leaves owing to recurrences of pain during the year. Results of this study showed that Back School and combined physiotherapy were superior to the placebo treatment in acute LBP, the Back School program also reduced absence from work, and no significant differences were observed in any other measures of the effect of treatment. The authors concluded that "Back School, teaching several patients at a time, must be regarded as an advantageous mode of therapy as relatively small resources are needed to achieve the same effects as with physiotherapy" (Bergquist-Ullman and Larsson, 1977, p.103).

9. Evans et al (1978) conducted a cross-over trial of two three-week periods to assess the effectiveness of manipulation. 32 patients with chronic LBP were allocated into one of two groups: the first group received manipulation on days 1, 7, and 14 (and analgesics if necessary) and on the second three-week period they were given analgesics only; the second group received this same treatment, but in reverse (ie. received manipulation on days 21, 28, and 35). Therefore, the comparison was between manipulation plus analgesics and analgesics alone, and each patient served as his own control. The manipulations were given by an "experienced medically qualified manipulator using a rotational thrust with distraction both to the right and to the left" (Evans et al., 1978, p.48). In order to assess the effect of treatment, the following measures were used: lumbar spine anterior flexions; daily pain scores recorded by the patients; the number of analgesics consumed; patient assessment of the efficacy of treatment at the end of each three-week period; patient preference at the end of the trial as to the best three-week period; and the patients' overall assessment comparing their condition at the end versus the beginning of the trial. The results of this trial showed that pain relief was obtained more quickly with manipulation than without it. Flexion medians of patients in both groups increased during their respective manipulative treatment periods and decreased during the corresponding control periods. One important point to note is that the manipulative treatments were associated with better assessments than control in the first treatment period but not in the second, and this can be explained by a carry-over effect in the first group from the manipulation period of the first three weeks to the control period. In other words, patients in the first group who got 'cured' by manipulation in the first three weeks would still be 'cured' after the placebo in the last three week period.

10. Sims-Williams et al (1978) conducted a trial in which 94 patients with non-specific lumbar pain were seen by their general practitioners. This was a double-blind trial, and the patients were randomly allocated into one of two groups: one group received mobilization and manipulation and the other placebo physiotherapy. Both were provided by a physiotherapist. Assessments of the treatments were made by a physician without knowledge of which treatment was given. Measurements used to determine effectiveness of treatment were extension, flexion, and lateral flexion of the lumbar spine, straight-leg raising, radiographs to observe changes in the intervertebral disc spaces, development of

osteophytes and apophysial joint changes, and in addition subjective assessments of pain, return to normal activity and opinions of the value of treatment were given by the patients (at one month, three months, and one year). Most patients showed improvements immediately after either treatment, however after several treatments improvements were more pronounced in the manipulated group (at one month). At three months, the differences between the two groups had disappeared and at one year the groups were identical. The authors concluded that LBP has a high rate of spontaneous resolution, and that "a course of mobilisation and manipulation may hasten improvement but does not affect the long-term prognosis" (Sims-Williams et al., 1978, p.1318).

11. In an identical study by the same authors (Sims-Williams et al, 1979), 94 patients with non-specific lumbar pain referred to hospital rheumatology and orthopaedic clinics participated in a double-blind controlled trial comparing mobilisation and manipulation with placebo physiotherapy. Contrary to the previous trial, in this case there was no real advantage of mobilisation and manipulation at any stage for patients. The authors concluded that patients whose severity and duration of LBP symptoms warrant specialist referral are less likely to benefit from manipulation. "Our failure to show any benefit from mobilisation and manipulation in this series was probably due to the patients likely to benefit being those most likely to improve spontaneously and being selected out by the delay being seen" (Sims-Williams et al., 1979, p.1320). In a 1981 publication which combines these two trials, the same authors (Jayson et al, 1981) state that "the differing results between the two series emphasize the importance of defining the population of patients in conducting trials of any form of treatment. It seems probable that mobilization and manipulation will hasten improvements that are likely to occur anyway...Overall the results suggest that most sufferers from nonspecific back pain obtain relief without mobilization and manipulation. However, this form of treatment may hasten improvement, particularly in patients with the shorter length of history of symptoms" (Jayson et al., 1981, p.415).

12. Rasmussen (1979) conducted a controlled trial in which 24 patients were randomized into one of two groups: patients in one group received short wave diathermy three times a week for 14 days and the other group of patients was treated by rotational manipulation in the pain free direction three times a week for 14 days. The manipulation

was given either by a physiotherapist or a physician. Total subjective and objective restoration and change in the mobility of the spine were the measurements used to assess effectiveness of treatment. Results showed that within 14 days, 92% of the manipulated patients were free of symptoms, whereas the number was 25% in the other (control) group, this being a significant difference. With respect to changes in mobility of the spine, all patients in the manipulated group improved whereas only half of the diathermy patients did so (significant difference). The author concluded that "contrary to other studies it is demonstrated that manipulative treatment does have some effect on lumbar pain" (Rasmussen, 1979, p.10).

13. Coxhead et al (1981) conducted a multicentre study in which four 'physiotherapy' treatments for sciatic symptoms (manipulation, exercises, traction and corset) were assessed in a randomized controlled trial with 322 patients. All the treatments were provided by physiotherapists who had experience in each of the four methods. The design was factorial, which meant that there were sixteen treatment groups altogether, which would enable a comparison of combinations of methods as well as individual methods of treatment. Treatments lasted for four weeks and all patients received short-wave diathermy and a half-hour back school lecture. In order to assess the effect of treatment, patient self-evaluation was used whereby progress was measured by the patient's account of symptomatic improvement or deterioration, and by return to work or normal activities. Assessments were made at four weeks and at four and sixteen months after the beginning of the trial. Results showed that improvements (decreased pain) at four weeks tended to be greater in those receiving than not receiving a particular treatment, and in the case of manipulation the improvement was statistically significant. Patients who reported feeling better at four weeks tended to be those who received a greater number of types of treatment and not any one treatment in particular. Thus the extent of improvement was a direct function of the number of different treatments employed. At four and sixteen months, there were no trends which suggested any long-term benefits of single treatments or combinations of types of treatments. The authors concluded that "there was no conclusive evidence that any of the four individual treatments was effective, but it is possible that each conferred some benefit, particularly manipulation" (Coxhead et al., 1981, p.1067).

14. Buerger (1980) and Hoehler et al (1981)

reported separately the first randomized controlled trial of spinal manipulation for LBP in the United States. After a pre-selection, 95 patients with LBP were randomly allocated into one of two groups: an experimental group which received rotational manipulation of the lumbosacral spine by a 'qualified practitioner' (an osteopath) or a control group which received only soft-tissue massage of the lumbosacral areas (ie. placebo manual treatment). The number of treatments received was at the discretion of the treating physicians. Assessment of the treatments was made both subjectively by the patients and by objective measures such as straight leg raising and maximum forward flexion. Results of the immediate effects of the first manipulative treatment showed that the group receiving manipulation improved more than the control group in four of six subjective measures, and this group also reported significantly more relief from pain. However, manipulation did not appear to be significantly better than soft-tissue massage over the longer period of time. The authors concluded that "patients who received manipulative treatment were much more likely to report immediate relief after the first treatment", but at discharge "there was no significant difference between the two groups" (Hoehler et al., 1981, p.1835). Therefore, although manipulation appeared to facilitate recovery, there was no evidence that it affected the long-term prognosis. Buerger (1980) stated that "these results are the first to suggest that rotational manipulation is superior to a control treatment involving manual contact between the treating physicians and the control patients. However, the effects we have described are rather short-term" (Buerger, 1980, p.25). Of interest, Buerger (1980) also concluded that the data in this study indicated that patients with no knowledge of spinal manipulation probably cannot distinguish manipulative therapy from placebo soft-tissue massage. Therefore soft-tissue massage could act as a good control or placebo in a trial of manipulation.

15. In a Canadian study by Zylbergold and Piper (1981), a randomized prospective clinical trial was conducted to evaluate the efficacy of three physical therapy approaches in the treatment of lumbar disc disease. Twenty-eight patients were assessed, taught back care and proper body mechanics, and randomly assigned to one of the three treatment groups: lumbar flexion exercises, manual therapy, or home care (control), all provided by physical therapists. The manual therapy treatment consisted of a 15-minute session of "posterior-anterior pressures, rotational mobilizations, and manual traction" (Zylbergold and Piper, 1981, p.177). Each patient, with the

exception of home care patients, received the appropriate treatment twice a week for a one-month period. Patients were assessed on 5 outcome variables: pain, forward flexion, right side flexion, left side flexion, and level of functional activity. No statistically significant differences in any of these variables were found between the three groups. The authors concluded that the "absence of significant results is in itself a major finding in that patient outcome is similar regardless of the treatment approach. Whereas the 3 groups of patients did indeed improve on all 5 variables during the 1-month period, the statistical chance for improvement was equal for all 3 approaches" (Zylbergold and Piper, 1981, p.178).

16. In an Australian study, Farrell and Twomey (1982) compared the effectiveness of passive mobilization and manipulation of the lumbar spine to that of a standard physical therapy treatment consisting of microwave diathermy, isometric abdominal exercises and ergonomic instructions. Treatments and assessments were given by registered physiotherapists. In total, 48 patients were randomly allocated into one of the two groups and treatments were done three times a week for up to three weeks. The effectiveness of the two treatment approaches was assessed by patients based on the severity of their back pain and by evaluating their active lumbar movements and straight leg raising. Results showed that the duration of LBP symptoms was significantly shorter for subjects receiving mobilisation and manipulation and that they achieved symptom-free status with fewer treatment sessions. The authors also concluded that "patients who received passive mobilisation and manipulation demonstrated a larger range of lumbar extension movements on the final day of treatment compared to those who had undergone an alternative conservative treatment" (Farrell and Twomey, 1982, p.164).

17. Nwuga (1982) conducted a clinical trial in Nigeria in order to compare the relative therapeutic efficacy of vertebral manipulation versus conventional treatment in back pain management. A total of 51 female patients with acute LBP were randomly allocated into one of the two groups. The conventional treatment consisted of shortwave diathermy followed by gentle isometric exercises, and proper mechanics of lifting and postural education was part of the treatment program. Manipulative treatment consisted of lumbar oscillatory rotation and these patients also received the education. All patients were treated by the same physical therapist. Ranges of motion of total flexion and extension, total side-flexion and total rotation of the lumbar spine and the straight-

leg-raising test were used to assess the efficacy of treatment, six weeks after the beginning of treatment. The results showed (highly) significant differences between the two groups with regards to post-treatment differences in total flexion and extension, total side flexion, total rotation and straight-leg-raising in favour of the manipulated patients. The mean treatment times between the two groups were also significantly different, in favour of the manipulated group. The author concluded that "manipulation therapy as shown by this study was superior to the conventional method in the treatment of the type of patient described" (Nwuga, 1982, p.278).

18. In a Canadian study, Godfrey et al (1984) conducted a randomized controlled clinical trial of manipulation in which a total of 81 patients, with back pain of less than 14 days duration, participated. Upon entry into the study, patients were randomized into one of four groups: manipulation and soft-tissue massage alone, manipulation and placebo electro-stimulation, massage alone (control), or electro-stimulation alone (control). The manipulation consisted of a brisk rotational thrust in the direction away from the greatest restriction. It was performed by a physican and a chiropractor, after agreeing on a standardized technique. The efficacy of the various treatments were measured on scales quantifying symptoms, activities of daily life, mobility, tenderness to palpation, aggravation of pain by coughing or sneezing, limitation of motion on testing, and forward flexion. Patients were assessed at the beginning of the trial and again after a maximum of five treatments for these outcomes. Both treated and control patients improved rapidly in the two to three week observation period. However there was no statistically significant difference between the improvement scores of the two on any of the scales. The authors concluded that "manipulation in a population with acute low-back pain without any specific organic cause is not clearly superior to two physiotherapeutic manoeuvres that we considered unlikely to have any effect" (Godfrey et al., 1984, p.304).

19. Gibson et al (1985) compared the effectiveness of spinal manipulation carried out by a non-medical qualified osteopath to that of short-wave diathermy and also to a placebo (detuned diathermy). Altogether, 109 patients were randomly allocated into one of the three treatment groups. Patient assessments were carried out immediately before and then two and four weeks after the start of the treatment by indices of pain and spinal examination. Results indicated that the number of patients who reported an immediate

benefit of treatment and complete pain relief, as well as a reduction of daytime pain and an improvement of spinal flexion, was very similar in each treatment group, which signified that neither manipulation nor diathermy was superior to placebo treatment. Significant improvements were observed in the three groups at the end of two weeks' treatment, and these were still apparent at 12 weeks. The authors concluded that the active treatments, including manipulation, were no more effective than placebo.

20. Waterworth and Hunter (1985) conducted a clinical trial in New Zealand in which 112 patients with acute mechanical LBP were randomly divided into three treatment groups, all receiving ergonomic advice and one of either: non-steroidal anti-inflammatory drugs; conservative physiotherapy, consisting of local heat and active flexion and extension spinal exercises; or specialist techniques of manipulation of the lumbar spine and mechanical therapy as practised by physiotherapists experienced in these techniques. Some patients in the last group were only manipulated while others received mechanical therapy with or without additional spinal manipulation. All patients were seen by general practitioners on three occasions: an initial pretreatment visit, after three to four days, and after ten to twelve days of therapy. Assessment of the treatments was made on all three occasions in accordance with a series of clinical parameters for pain and spinal mobility, and after ten days of treatment both patients and general medical practitioners made an overall evaluation of therapy. Results showed similar response rates in all three treatment groups and no significant difference between therapies. Overall improvement ratings, time off work, and economic cost favoured the group treated with drugs. However it was found that this group had a better range of spinal flexion at the onset. Nevertheless, the authors concluded that "the lack of a faster recovery rate in spinal mobility in the patient group receiving techniques of modern physiotherapy (ie. manipulation) questions whether these methods do influence intervertebral lumbar disc mechanics" (Waterworth and Hunter, 1985, p.374).

21. The first true controlled efficacy study of chiropractic therapy for LBP was conducted by Waagen et al in 1986. The authors stated that prior to this study "any efficacy of chiropractic therapy can only be inferred from the studies of manipulative therapy for the treatment of low-back pain which have been performed utilizing medical, osteopathic or physiotherapy-trained practitioners of manipulation" (Waagen et al., 1986, p.63).

However, because chiropractors specialize in the delivery of specific spinal adjustments and receive a longer period of formal training than other manipulators, the authors of this study believe that it is not possible to extrapolate the results of previous trials in manipulative therapy directly to chiropractic. Nineteen patients undertook this trial which lasted two weeks. They were randomly allocated to one of two groups: one received a series of chiropractic adjustments (experimental), and the other received a comparable series of sham manual interventions (control), both provided by chiropractors. Blinded assessment of treatment effects was performed after the first treatment and at the conclusion of the two-week treatment period. Eight objective tests of function and a subjective rating of pain (Visual Analogue Scale) were used. Results showed that the experimental patients had significantly more relief from pain than control patients immediately after the first treatment and after two weeks of treatment. Experimental patients also showed significantly better improvement on the objective measurements of spinal mobility than the control patients. Therefore, on the first occasion that chiropractic manipulation was assessed by formal trial, it was found both subjectively and objectively to be effective at relieving LBP when measured against a manual placebo treatment. A major limitation of this study was the small sample. It was a pilot for a larger trial, now completed but yet to be published. (Para 32).

22. Hadler et al (1987) conducted a prospective randomized controlled trial contrasting spinal manipulation with spinal mobilization in two strata of patients: those whose backache had been present for less than two weeks and those who had suffered for two to four weeks. Treating physicians performing the spinal manipulation or mobilization were randomly assigned for each of the 54 patients in the trial. Treatment was given once only. Treatment effectiveness was measured by using a patient questionnaire assessing functional impairment immediately after the treatment and every three days thereafter. Results showed that there were no significant differences between the two treatment modalities shown at any follow-up point, with the exception that those patients who had suffered low-back pain for two to four weeks prior to entry and who received spinal manipulation improved more rapidly during the first week after treatment.

23. Mathews et al (1987) conducted controlled trials of manipulation, traction, sclerosant and epidural injections for back pain and sciatica. Two manipulation trials were conducted, one for

patients with limitation of straight-leg raising and the other for those patients without limitation. Patients were randomly allocated to treatment or to control groups according to their symptoms and signs and were stratified by age and by sex. A total of 58 patients participated in the first manipulation trial and 233 in the second. The control for the two manipulation trials was heat treatment to the low-back area for 15 minutes three times weekly. Manipulation was given for up to two weeks at the discretion of the physiotherapist providing the treatments. The technique utilized overpressure at the extremities of range. Percentage of patients 'recovered' was the outcome measure. Results showed that in the group of patients with limited straight-leg raising, manipulation had a significantly beneficial effect in hastening pain relief. In the other group, the effect of manipulation was of borderline significance.

24. Ongley et al (1987) randomized 81 patients with chronic LBP into two groups: one group received forceful spinal manipulation and injections of a proliferant solution into soft-tissue structures in order to decrease pain and disability (experimental); the other group (placebo) received less extensive manipulation and initial local anaesthesia, and substitution of saline for proliferant. Both treatments were carried out by physicians. Effectiveness of treatments was measured by the patients' subjective assessment of pain and disability, as well as by an independent objective evaluation of physical signs. Measurements were made upon entry, and at one, three and six months. Results showed that the experimental group had significantly greater improvement than the control group at one, three, and six months, and visual analogue pain scores and pain diagrams also showed significantly superior results. The authors concluded that the experimental regimen "is a safe and effective treatment for chronic low-back pain that has not responded to other conservative forms of treatment" (Ongley et al., 1987, p.146).

25. An Italian study (Postacchini et al, 1988) compared the efficacy of various forms of conservative treatment in LBP. Altogether, 398 patients were studied and were divided into those with LBP only (Group 1) and those with back pain radiating to the buttocks and or thighs and no neurological deficit (Group 2). Group 1 patients were subgrouped according to the type of low-back syndrome: acute, chronic, or acute with a chronic history of pain. Group 2 patients were also subgrouped into either acute or chronic LBP syndromes. Patients in each subgroup were then randomly assigned to the following treatments:

manipulation, drug therapy, physiotherapy, placebo, bed rest (in acute syndromes) and back school (in chronic syndromes). Manipulation was carried out by trained chiropractors with a 'standardized technique': patients were treated daily for the first week and twice a week for three weeks in acute cases and six weeks in chronic cases. Patients were assessed at three weeks, two months and six months after the onset of treatment, based on two subjective and four objective outcome measures. Results for Group 1 patients (LBP only) showed that at three weeks follow-up the greatest mean improvement was observed in the patients treated with manipulation and the lowest in those who received placebo: the difference between the two was significant. The highest subjective and objective scores were also obtained in the manipulated group. However, in the long-term follow up, there was no significant difference between the various treatment groups.

26. Kinalski et al (1989) compared manual therapy and physiotherapy in the treatment of patients with LBP. In total, 111 patients with LBP were randomly assigned into one of two groups. One group received manual therapy, which included manipulation, the other group a combination of physiotherapeutic procedures "routinely used" for patients with LBP syndromes. Treatments were performed by physiotherapists. Treatment outcomes were assessed by pain intensity, muscle strength and the 'Thomayer sign'. Results of this study did not demonstrate a clear superiority for either treatment. The authors concluded that manual therapy is an efficacious alternative method of conservative treatment for some LBP conditions, and it reduces symptoms more quickly when intervertebral disc lesions are not advanced.

27. In a recent Dutch study, Koes et al (1991b) conducted a randomized clinical trial on the effectiveness of manual therapy, physiotherapy, and treatment by the general practitioner for nonspecific back and neck complaints. They also reported on the results of a one year follow up of the trial (Koes et al, 1992b). In total, 256 patients were allocated into one of the three treatment groups or a placebo group. In total, 256 patients (who had nonspecific back and neck complaints lasting for at least 6 weeks) were pre-stratified and randomly allocated in blocks of eight to either their general practitioner, a physiotherapist or to a manual therapist. Manual therapy consisted of manipulation and mobilization of the spine. Physiotherapy consisted of exercises, massage and physical therapy modalities (but did not include manipulative techniques). The general practitioner

treatment consisted of prescription medication, home exercises, bed rest and other modalities. The placebo treatment (provided by a physiotherapist) consisted of detuned short-wave diathermy and detuned ultrasound. The principal outcome measures were severity of the main complaint, global perceived effect, pain and functional status. Assessments were carried out at three, six and 12 weeks after the onset of the trial (Koes et al, 1991b). Results of this study indicated a more favourable outcome for treatment with manual therapy or physiotherapy as opposed to medical treatment. The former two treatments decreased the severity of complaints more and had a higher global perceived effect compared to continued treatment by the general practitioner. There were no significant differences, however, between the results of physiotherapy and manual therapy treatments. The basic trend was that all four groups showed an increasing improvement at all three follow-up periods. At the three and six week follow-up, the medical treatment was least effective, even more so than the placebo. By the 12 week follow-up, all four study groups showed the largest improvement, but the differences among them had almost disappeared entirely. The authors concluded that "it seems useful to refer patients with nonspecific back (and neck) complaints lasting for at least six weeks for treatment with physiotherapy or manual therapy" (Koes et al., 1991b, p.35). In the results of the one year follow-up of this study (Koes et al, 1992b), it was concluded that manipulative therapy and physiotherapy are better than general practitioner and placebo treatment. Furthermore, manipulative therapy was slightly better than physiotherapy after one year.

28. Rupert et al (1985) conducted a randomized controlled trial to evaluate the efficacy of chiropractic adjustments in the treatment of LBP among Egyptian workers. Three treatments were compared: chiropractic adjustments (given by two experienced chiropractors); drugs and bed rest (given by a team of medical orthopaedic specialists); and placebo (sham manipulation comprising non-therapeutic massage). In total, 148 preselected patients were randomly allocated into of these treatment groups. In order to assess efficacy of treatment, four outcome measures were used: pain evaluations using a visual analog scale, forward flexion, and active and passive straight leg raises. Chiropractic/medical teams evaluated the treatments. Results showed that pain relief resulting from chiropractic adjustments was greater than that resulting from the other two treatments. (Rupert et al, 1985, p.58).

29. Brontfort (1989) conducted a pilot randomized trial to compare the effectiveness of

chiropractic versus general medical treatment of LBP. Nineteen patients participated in the study, all of whom were suffering from LBP of various duration with or without radiating pain to one or both lower extremities. The patients were randomly allocated to either medical or chiropractic treatment. Medical treatment consisted mostly of analgesics, injections, bedrest and physiotherapy. Chiropractic treatment, provided by a chiropractor, consisted of manipulative procedures. Assessments, using patient questionnaires and objective measures, were made after one, three and six months. Results did not indicate any outcome differences between the two treatments after one month. However after three and six months the chiropractic treatment group reported greater subjective improvement than the general medical treatment group. The author was cautious about over-interpretation of results and concluded that "given the small number of patients in this study resulting in low statistical power..., there is no basis for drawing any conclusions yet as to the effectiveness of chiropractic spinal manipulative therapy compared to medical treatment for low back pain" (Brontfort, 1989, p.148).

30. Sanders et al (1990) conducted a study to evaluate pain scores and plasma beta-endorphin levels in subjects with LBP following a single spinal manipulation. 18 patients were randomly assigned to either a control group (no treatment, light physical contact only) or the experimental group (manipulation by a chiropractor). Pain scores and beta-endorphin levels were taken 5 and 30 minutes after the treatment. There was a significant reduction in perceived pain in patients in the manipulated group, but not in the others. There were no changes in plasma beta-endorphin levels.

31. In the U.S.A., Hsieh et al, (1991), undertook a randomized controlled trial of four treatments for LBP. A total of 85 patients were randomly allocated into one of four groups, receiving either chiropractic manipulation, stroking massage, use of a corset, or transcutaneous muscular stimulation (TMS). All treatments lasted for three weeks. Outcome measures used were objected (e.g. straight leg raising) and subjected (a revised Oswestry Low Back Pain Questionnaire and Roland-Morris Activity Scale, which were under comparison). Results showed that the patients receiving chiropractic manipulation improved significantly more than those in the massage and TMS groups. The manipulated group also showed somewhat better scores than the corset group. It was concluded that, in the short-term, chiropractic manipulation was superior to the laying on of hands or applying TMS in the treatment of patients with subacute LBP.

Table 8 - Summary of Clinical Trials

AUTHOR/YEAR	COMPARISON TREATMENT(S)	MANIPULATION PERFORMED BY:	NO. SUBJECT	CONCLUSION FOR MANIPULATED PATIENTS	r = RATING
Glover et al(1974)	1. Detuned shortwave diathermy	P.T. (Physiotherapist)	84	Slight immediate improvement only	5
Doran and Newell (1975)	1. Definite physiotherapy 2. Corset 3. Analgesics	"Experienced manipulator" physiotherapist	456	Marginal improvement at 3 week only, long term benefits doubted	5
Bergquist-Ullman and Larsson (1977)	1. Back School 2. Short wave diathermy	P.T. "Specially trained in manual therapy"	217	Better than placebo, same as Back School	5
Evans (1978)	Manipulation and analgesics vs. analgesics only	"Experienced medically qualified manipulator"	32	Got pain relief quicker	4
Sims-Williams et al (1978)	1. Placebo physiotherapy	P.T.	94	Hastens improvement, but doesn't affect long-term prognosis	4
Sims-Williams et al (1979)	1. Placebo physiotherapy	P.T.	94	No difference	7
Rasmussen (1979)	1. Short wave diathermy	P.T. or M.D.	24	Significant short-term improvement	4
Coxhead et al (1981)	1. Exercises 2. Traction 3. Corset	P.T.	322	Possible short-term benefit only	4
Buerger (1980) and Hoehler et al (1981)	1. Soft tissue massage	Osteopath	95	Significant immediate improvement	4
Zylbergold and Piper (1981)	1. Flexion exercises 2. Home Care	P.T.	28	No significant difference	6
Farrell and Twomey (1982)	1. Diathermy, exercises and ergonomics	P.T.	48	Significantly less short-term pain, improved function	4
Nwuga (1982)	1. Diathermy, exercises and education	P.T.	51	Significantly superior (short-term)	4
Godfrey et al (1984)	1. Massage 2. Electro stimulation	M.D. and chiro.	81	Not superior	6
Gibson et al (1985)	1. Short-term diathermy 2. Detuned diathermy	Non-medical osteopath	109	No more effective than placebo	6

Table 8 - Summary of Clinical Trials (Continued)

AUTHOR/YEAR	COMPARISON TREATMENT(S)	MANIPULATION PERFORMED BY:	NO. SUBJECT	CONCLUSION FOR MANIPULATED PATIENTS	r = RATING
Waterworth and Hunter (1985)	1. Anti-inflammatory drugs 2. Heat and exercises	P.T.	112	No difference	6
Waagen et al (1986)	1. Non-manipulative manual interventions	Chiro.	19	Significant improvement (short-term)	2
Hadler et al (1987)	1. Spinal mobilization	M.D.	54	No general difference; immediate improvement <u>only</u> for patients who had suffered a backache for 2-4 weeks before	4
Mathews et al (1987)	1. Heat treatment	P.T.	291	Significant short-term benefit for patients with limited straight leg raising; not for those without limitation	4
Ongley et al (1987)	1. Less extensive manipulation	M.D.	81	Significant improvement (short- and long-term)	1
Postacchini et al (1988)	1. Drug therapy 2. Physiotherapy 3. Bed rest 4. Back School 5. Placebo	Chiro.	398	Significant short-term improvement	2
Kinalski et al (1989)	1. Routine physiotherapy	P.T.	111	No clearly demonstrated superiority	6
Koes et al (1991, 1992)	1. Exercises, massage, physical therapy 2. General Practitioner (Drugs, exercises, bed rest) 3. Placebo	"Manual therapist"	256	Manipulation and physiotherapy better than medial treatment (short-term); manipulation best at long-term)	2

Table 8 - Summary of Clinical Trials (Continued)

AUTHOR/YEAR	COMPARISON TREATMENT(S)	MANIPULATION PERFORMED BY:	NO. SUBJECT	CONCLUSION FOR MANIPULATED PATIENTS	R = RATING
Rupert et al (1985)	1. Drugs and bed rest 2. Sham manipulation	Chiro.	148	Greater improvement	2
Brontfort (1989)	1. Analgesics, bed rest, injections, physiotherapy	Chiro.	19	No short-term difference; greater long-term improvement	3
Sanders et al (1990)	1. No treatment 2. Light physical contact (sham)	Chiro.	18	Significant short-term improvements	2
Hsieh et al (1992)	1. Stroking massage 2. Corset 3. TMS	Chiro.	85	Superior short-term improvements	4
Waagen et al 1991)	1. General practice medical care 2. Sham manipulations	Chiro.	68	Chiropractic manipulation significantly better than sham	2
Meade et al (1990)	Discretionary, but mainly Maitland mobilization and manipulation	Chiro.	741	Chiropractic manipulation significantly better in short and long-term	1

32. In a new U.S. trial Waagen et al (publication pending) compared medical and chiropractic management of patients with LBP by randomly assigning 68 patients with chronic or repetitive LBP to one of three groups: general medical care, chiropractic manipulative therapy, and sham manipulation. Assessment of treatment was by functional questionnaire and by visual analog scale at three months, with follow-up at one and two years after cessation of the treatment. Patients assigned to the active care groups, both medical and chiropractic, improved more than those in the control group (sham manipulation). However the improvement was statistically significant only for those in the chiropractic group, and this improvement was seen both initially and on long-term follow-up.

33. In 1977, the British Chiropractors' Association, citing the results and controversy over studies of the time in the U.S.A. appealed to the Medical Research Council to explore the question

of chiropractic efficacy. In response the MRC set out plans for what became the longest and largest clinical trial of chiropractic effectiveness to date.

34. The Medical Research Council study was published in the British Medical Journal in 1990 (Meade et al, 1990). The study is a prospective randomized controlled trial in which 741 patients aged 18-65 were randomly assigned to chiropractic and hospital outpatient clinics in 11 centres. The treatment alternatives were discretionary but chiropractors used manipulation on virtually all patients and the hospital staff (usually physiotherapists) used mostly Maitland mobilization or manipulation or both. The principal outcome measures were changes in the score on the Oswestry Pain Disability Questionnaire and in the results of tests of straight leg raising and lumbar flexion. Patients were tracked for two years. The characteristics of patients under hospital outpatient care and chiropractic care were very similar (Meade et al, 1990, Table III, p.1433). Outcome measures were

Table 9 - Summary of Case-Control Studies

AUTHOR(S) & YEAR	COMPARISON TREATMENT	NO. OF SUBJECTS	RESULTS & FINDINGS
Coyer & Curwin (1955)	Bed rest and analgesics	152 low back pain	Manipulation more effective immediately and short-term
Chrisman et al (1964)	Medical therapy, heat, analgesics, muscle relaxations, traction and best rest	39 cases ruptured intervertebral disc	Manipulation better results than medical therapy
Edwards (1969)	Heat, massage and exercise	184	Manipulation yielded more satisfactory outcomes for low back pain
Mathews & Yates (1969)	Same except half received manipulation	10 lumbar disc prolapse	Manipulation relieved symptoms and reduced prolapses
Fisk (1979)	Same except manipulation	20 low back pain	Manipulation achieved significantly better results
Arkuszewski (1986)	Drugs, physiotherapy	100 sciaica and lumbosacral pain	At 1 and 6 months, the manipulated group better able to continue employment

taken at recruitment, weekly intervals for six weeks, at six months, and then at one and two years after entry. A notable feature of the study is its full and candid discussion of its design and possible weaknesses.

35. The results of this randomized clinical trial are (a) chiropractic care confers significantly long term benefit in comparison with hospital outpatient treatment (b) the advantages of chiropractic management starts soon after treatment begins (c) the effects of chiropractic treatment is long-term whereas for those treated by hospital staff the benefits deteriorate after six months or a year (d) the longer term benefits of chiropractic care are not due to further chiropractic treatment since between year one and year two only 17% of those initially treated by chiropractors had further chiropractic care, while 24% of the hospital group had further hospital treatment (e) the benefit is seen mainly in those patients with chronic or severe LBP.

36. Meade restated the conclusions of this study in a Canadian Broadcasting Corporation radio interview in October 1990:

“Our trial showed that chiropractic is a very effective treatment, more effective than conventional hospital

out-patient treatment for low-back pain, particularly in patients who had back pain in the past and who got severe problems. So, in other words, it is most effective in precisely the group of patients that you would like to be able to treat ... The improvements in the patients who were treated by chiropractors was between three quarters and twice as great as it was for patients who had been treated in hospital... and one of the unexpected findings was that the treatment difference - the benefit of chiropractic over hospital treatment - actually persists for the whole of that three year period... it looks as though the treatment that the chiropractors give does something that results in a very long-term benefit”.

37. There are the inevitable commentaries on the clinical trial both positive and critical. The criticisms were largely minor and included (a) alleged restraints on busy hospital physiotherapists (b) limiting the comparison to physiotherapists (c) some back pain disappears spontaneously (d) the adequacy of the Oswestry Scale as an outcome measure and (e) variables other than treatment

Table 10: Comparison of Two Data Collection Approaches

Performance Characteristics	Method	
	Mail Survey	Telephone Survey
<p><u>I. Obtaining a representative sample</u></p> <p>A. Known opportunity for all members of populations to be included in sample.</p> <ol style="list-style-type: none"> 1. Completely listed populations 2. Populations which are not completely listed <p>B. Control over selection of respondents within sampling units</p> <p>C. Likelihood that selected respondents will be located</p> <p>D. Insensitivity to substitution of respondents and households</p> <p>E. Response rates:</p> <ol style="list-style-type: none"> 1. Heterogeneous samples 2. Homogeneous, specialized samples <p>F. Likelihood that unknown bias from refusals will be avoided</p>	<p>High</p> <p>Medium</p> <p>Medium</p> <p>High</p> <p>Low</p> <p>Medium</p> <p>High</p> <p>Low</p>	<p>High</p> <p>Medium</p> <p>High</p> <p>High</p> <p>Low</p> <p>High</p> <p>High</p> <p>High</p>
<p><u>II. Questionnaire Construction and Question Design</u></p> <p>A. Allowable length of questionnaire</p> <p>B. Type of question</p> <ol style="list-style-type: none"> 1. Allowable complexity 2. Success with open-ended questions 3. Success with screen questions 4. Success with controlling sequence 5. Success with tedious or boring questions <p>C. Success in avoiding item non-response</p> <p>D. Insensitivity to questionnaire construction procedures</p>	<p>Medium</p> <p>Medium</p> <p>Low</p> <p>Medium</p> <p>Low</p> <p>Low</p> <p>Medium</p> <p>Low</p>	<p>Medium</p> <p>Low</p> <p>High</p> <p>High</p> <p>High</p> <p>Medium</p> <p>High</p> <p>Medium</p>
<p><u>III. Obtaining Accurate Answers</u></p> <p>A. Likelihood that social desirability can be avoided</p> <p>B. Likelihood that interviewer distortion and subversion can be avoided</p> <p>C. Likelihood that contamination by others can be avoided</p> <p>D. Likelihood that consultation will be obtained when needed</p>	<p>High</p> <p>High</p> <p>High</p> <p>Medium</p>	<p>Medium</p> <p>Medium</p> <p>Medium</p> <p>Low</p>
<p><u>IV. Administrative Requirements</u></p> <p>A. Likelihood that personnel requirements can be met</p> <p>B. Potential speed of implementation</p> <p>C. Keeping costs low</p> <ol style="list-style-type: none"> 1. Overall potential for low per interview costs 2. Insensitivity of costs to increasing geographical dispersion 	<p>High</p> <p>Low</p> <p>High</p> <p>High</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>Medium</p>

Source: Dillman, D. (1978), Mail & Telephone Surveys: The Total Design Method, John Wiley & Sons: N.Y.

modalities may have affected outcomes. These criticisms are relatively easily rebutted and none seriously challenges the principal findings of the trial. Medical reviewers have proclaimed the trial "to be one of the better trials in this field" (Assendelft, 1991, p.446).

38. A summary of the above studies is presented in Table 8. The final column, "rating", is our summary assessment of the results of the study in those instances in which we thought the study had a reasonable and valid basis for its findings.

r = rating, as follows:

1. Manipulation significantly and clearly

more effective, both short and long-term

2. Manipulation significantly more effective short-term and somewhat more effective long-term

3. Manipulation more effective in the long-term but not in the short-term

4. Manipulation more effective immediately or in the short-term

5. Manipulation more effective than placebo only

6. Manipulation no more effective than alternative treatment

7. Manipulation less effective than placebo

8. Manipulation actually harms patients compared to placebo or alternative treatment

Case-Control / Cohort Studies

39. In what follows we review very briefly several useful case-control studies and then in Table 9 offer a summary presentation of this review. There are several cost-effectiveness studies which come close to being case-control studies but are retrospective in design. These will be presented along with other similar studies in the next chapter. Most of these studies use worker's compensation data and do not conform to the usual definition and design of a case-control study.

40. In one of the earliest studies on manipulative therapy for low-back pain (Coyer and Curwen, 1955), 152 patients presenting with LBP were divided into two groups, one being treated by manipulation and the other by bed rest and analgesics (control). Results showed that of the patients manipulated, half were free of signs and symptoms at the end of one week as compared with 27% in the control group. At the end of six weeks only 12% of the manipulated group were still suffering as opposed to 28% of the control group. It was concluded that manipulation of the lumbar spine results in freedom from symptoms and disability more quickly than does rest.

41. Chrisman et al (1964) conducted a study assessing the effects of manipulative treatment in 39 cases of ruptured intervertebral disc in which conservative medical treatment was unsuccessful. The medical treatment consisted of various forms of heat, analgesics, muscle relaxants, traction, back support, flexion exercises, and bed rest for at least one week. For purposes of comparison, 22 patients who received the same conservative care without manipulation were also studied. Both treatments were provided by physicians. Results showed that 51% of the patients unrelieved by conservative medical care had improved to a good or excellent degree with rotatory manipulation.

42. Edwards (1969) compared two types of 'physiotherapy' for the treatment of LBP: heat, massage and exercise; and passive movement techniques of mobilization and manipulation (both provided by physiotherapists). In total, 184 patients were first divided into four subgroups according to pain distribution and then each subgroup was divided equally into the two treatment groups. Differences in the number of improved patients between the two treatment groups significantly favoured those treated with mobilization and manipulation. Overall, the author concluded that "the results do seem to indicate that treatment of low-back pain and pain resulting from low back conditions by passive movement techniques of

mobilization and manipulation is a more satisfactory method than by standard physiotherapy of heat massage and exercise, as regards to both results and number of treatments required" (Edwards, 1969, p.109).

43. Mathews and Yates (1969) studied the effect of manipulation on the reduction of lumbar disc prolapses. Five patients with lumbar spine disorders characterized by small disc prolapses received manipulation. Five patients with similar symptoms were used as a control; they did not receive the thrust of manipulation. Results of this study suggested that small disc protrusions were diminished in size when patients manipulation as a treatment (this was not the case in the controls). Therefore, the authors concluded that "treatment by manipulation relieved the symptoms of lumbago, and repeat epidurography showed that the prolapses were reduced in size" (Mathews and Yates, 1969, p.692).

44. Fisk (1979) conducted a controlled trial of manipulation in a selected group of patients with low back pain favouring one side. This was an interesting study because the effect of manipulation was compared on the two sides of the same patient. In all, 10 patients with LBP on one side received manipulation, as did another 10 subjects who did not have any back pain and thus acted as controls. Results showed a statistically significant alteration in the tension measurements after manipulation of the painful side as compared with the change after manipulation of the controls.

45. Lewith and Turner (1982) undertook a retrospective analysis of the management of acute LBP. A retrospective data search on medical records was done to select patients who had experienced LBP during a certain period and to gather the following information on them: certified sick leave required during the episode of acute LBP; treatment received (analgesia, manipulation, rest, advice); the presence of neurological symptoms and signs in the lower limbs; pain referred from the low-back down the lower limbs; whether the patient had suffered from recurrent LBP. Results indicated significant outcomes between manipulated versus non-manipulated patients. The authors commented that "general practitioners tend to work on the basis that most acute low-back pain will resolve in about four weeks, irrespective of treatment. The results described support the hypothesis that patients suffering from acute low-back pain will return to work more swiftly if they receive spinal manipulation" (LeWITH and Turner, 1982, p.1618).

46. Arkuszewski (1986) conducted a clinical trial to assess the efficacy of manual treatment in LBP. One hundred patients with sciatica or lumbosacral pain were divided into two groups. Both received a standard treatment of drugs and physiotherapy and manual examination twice a week. However, in one group (experimental) manual treatment was also applied, in the form of traction, mobilization and manipulation. To assess efficacy of treatment, six outcomes were measured: posture, mobility of the spine, severity of pain, gait, manual and neurological examinations (after treatment and at six months). Results showed that after the first week of treatment, improvement was significantly greater in the experimental group, up to the day of discharge. Even at six months, improvement of all symptoms was significantly greater in the manipulated group. In addition, "a comparison of the two groups six months after discharge showed... a greater ability to continue professional employment in the group of patients given manual treatment. In this group, in addition, the percentage of those pensioned off for disability was lower" (Arkuszewski, 1986, p.68).

DESCRIPTIVE STUDIES

47. The oldest study on manipulation of the back was conducted by Riches (1930) in England. During an 8 year period, records of a certain clinic indicated that 113 patients had undergone manipulation of the back. Manipulation consisted of "a forcible flexion of the spine, a rotatory movement of the pelvis first to one side and then to the other, and finally forcible hyperextension of the whole spinal column" (Riches, 1930, p.957,958). A questionnaire was sent to all these patients asking them whether, as the result of manipulation, the condition of the back was cured, improved, unchanged, or worse. Other questions asked about the length of time they had taken off work, and whether there had been any return of pain. Results of the study indicated that in cases of chronic back strain and sacroiliac strain manipulation was successful in about 90 percent of the cases, and success was seen in almost all cases where there was evidence of trauma; manipulation did not permanently improve lumbosacral strain; manipulation improved about half the cases of spinal arthritis; cases of neurotic spine do not respond to manipulation unless there is an underlying strain; and that manipulation of the back should not be confined to cases where mechanical displacement exists (Riches, 1930). Thus, even as early as over 60 years ago, there is evidence in the literature of the efficacy of manipulation for LBP.

48. In a 1955 study, Mensor evaluated the efficacy of manipulation in the treatment of lumbar intervertebral disc syndrome. The effectiveness of manipulation was found to be extremely positive. The author's conclusions were that (Mensor, 1955, p.936):

- "A conservative regimen which includes manipulative treatment of lower lumbar intervertebral disc syndrome under anaesthesia eventuates in a sufficiently high percentage of satisfactory results to warrant its use as an essential part of conservative therapy."
- "Treatment by manipulation should be given precedence over surgical intervention, except in those cases in which there is a definite contra-indication."
- "Satisfactory results, if obtainable, are to be expected after one or, at the most, two manipulations; repeated manipulation is not justified."
- "Failure to respond to an organized regimen of conservative treatment, including manipulation under anaesthesia, warrants the recommendation for prompt surgical intervention, provided the incapacity is sufficiently pronounced."
- "This series reveals a higher percentage of complete symptomatic relief following manipulation and its accompanying regimen than that following surgery, with a lesser amount of permanent disability in those cases in which residual disability persists."

49. Parsons and Cumming (1958) also undertook a very early study assessing the effectiveness of spinal manipulation in the treatment of back pain. The results were very much in favour of manipulation, since almost 75% of patients treated obtained relief. The authors stated "it is our belief, based on long experience, that manipulation is no more beset by hazards than many other recognized procedures in therapy, while its results are often more dramatic and sure... In our hands this approach to backache has proved most gratifying and, more important, has brought comfort to a large group of patients who have not been able to achieve it before" (Parsons and Cumming, 1958, p.109).

50. In a Canadian study (Potter, 1977), 744 cases of neck and back pain treated with spinal manipulation by a chiropractor were examined.

The results were 'very impressive' in demonstrating the efficacy of chiropractic manipulation.

51. In another Canadian study undertaken by a specialist in orthopaedics, Kirkaldy-Willis and a chiropractor, Cassidy, 283 patients with chronic low-back and leg pain were treated by spinal manipulation for two or three weeks (Kirkaldy-Willis and Cassidy, 1985). The patients' response to treatment was assessed by an independent observer and based on the patients' impression of pain relief and reduction of disability. All patients entered the study at the grade 4 level of pain defined as constant severe pain and disability. The results of the treatment are impressive: 163 or 81 percent of the patients with referred pain improved markedly and had no pain (grade 1) or mild intermittent pain (grade 2) and no restriction for work or other activities; 39 or 48 percent of the patients with nerve compression experienced similar marked improvement in their condition. The average length of the follow-up period was a year. In a more recent study, Cassidy et al. (1992) found that the treatment of lumbar intervertebral disk herniation by side posture manipulation is both safe and effective. Safety is still challenged by some in the medical profession, as will be shown later in this chapter, but there is no evidence of significant harm.

52. Mierau et al (1987) compared the effectiveness of spinal manipulative therapy for LBP patients with and without spondylolisthesis. Data collected from a previous study showed that the results of manipulative treatment were not significantly different in those patients with or without lumbar spondylolisthesis. As such, spondylolisthesis was found not to be a contraindication to "skilful" manipulation.

META-ANALYSIS / LITERATURE REVIEWS

53. Greenland et al (1980) reviewed all the controlled clinical trials of manipulation to that time and concluded that the results, though not entirely consistent, suggested that manipulation is superior to such control procedures as detuned diathermy or no treatment in recovering from back pain. Problems that they believe existed in the design of the randomized manipulation trials were that: "definitions of patients suited to manipulative therapy were not widely agreed upon; measures of the effects of manipulation are probably not directly related to the primary biologic effect which results in the relief of back pain; there is no single appropriate control group for the evaluation of manipulation; there is no single precise definition of manipulative treatments" (Greenland et al., 1980, p.670, 671). Other problems revealed by the

previous trials of manipulation included standardization of treatments, statistical analysis, definitions of patient populations and characterization of manipulable lesions.

54. Brunarski (1984) reviewed the scientific literature (nearly fifty trials) in order to determine if there existed sufficient evidence to suggest that spinal manipulation was more effective than medical care in the management of 'painful neuromuscular conditions'. The author found that in these trials over 8300 subjects underwent spinal manipulation, and over 80% of the trials examined patients who were treated for low back pain. In aggregate, improvement in the manipulated groups averaged above 70% as compared to 50% in the non-manipulated patients. Acute conditions tended to respond best, however both acute and chronic pain patients "appeared to do consistently better when treated with spinal manipulative therapy than with other more conventional treatment" (Brunarski, 1984, p.244). The author stated that "crucial design flaws and untoward bias against manipulation has cast serious doubt on the credibility of the conclusions made by many of the studies" (Brunarski, 1984, p.244). A major problem was found to be the difficulty in determining the size of difference in treatment effects which would be clinically significant. Another, related to the first, was the difficulty in knowing how many patients to enrol to avoid statistical error. According to the author, other problems associated with previous randomized controlled trials included subject drop-outs, inconsistent inclusion and exclusion criteria, variable interventions and control treatments, and unsound measurement of outcomes.

55. Ottenbacher and DiFabio (1985) undertook a meta-analysis (quantitative review) of the efficacy of joint mobilization and manipulation. They identified 57 research reports, but these were narrowed down according to pre-specified criteria for inclusion in the quantitative review. The criteria were that: the study had to compare the effects of mobilization and/or manipulation to some control or comparison condition; the study had to have evaluated effectiveness by certain specified measures; the study had to have reported the statistical results in sufficient detail. Only nine studies met the criteria for the quantitative review. The results provided only limited empirical support for spinal mobilization and manipulation when used to treat pain, flexibility limitations, and impairment in physical therapy. The authors also concluded that "data analysis indicated that studies not employing random assignment were more likely to produce results supporting the use of manipulation/mobilization therapies. The effects in

favour of manipulation and mobilization were greater when manual therapy was provided in conjunction with other forms of treatment and were also greater when the treatment effects were measured immediately following therapy. In addition, hypotheses tests appearing in journals published in the United States showed manipulation/mobilization less effective in comparison with reports appearing in English language journals published outside the United States" (Ottenbacher and DiFabio, 1985, p.833).

56. DiFabio (1986) reviewed both non-controlled and controlled studies of manipulation and mobilization. The majority of non-controlled studies had shown 'considerable' improvement in signs and symptoms after manipulation. The author stated that most non-controlled studies were difficult to compare because the characteristics of the patient sample, the nature of the treatment, and the method of assessment were highly variable. Also, manual therapy procedures differed across studies and clinically objective measurements of lumbar dysfunction were difficult to find. As for the controlled studies, it was the author's opinion that "the interpreted efficacy of lumbar manual therapy often hinges on experimental design and protocol. The presence of control groups, random assignment to control and treatment groups, and blind assessment of the outcome of intervention are critical factors to be considered for a valid clinical trial" (DiFabio, 1986, p.52). Overall, results of the review showed that controlled studies producing positive results from joint manipulation and mobilization were not common, and in fact many had produced negative results. The author concluded that "when clinical trials of spinal manipulation and mobilization are controlled properly, a definite, but small, short-term effect can be seen. Longer term effects are more equivocal, and the comparison of many studies is complicated by the potential combination of manual therapy with other physical therapy procedures. Different methods of patient selection, manual therapy techniques, and outcome assessment tools further complicate cross-study comparisons" (DiFabio, 1986, p.53).

57. The Quebec Task Force on Spinal Disorders was formed in 1983 in order to address the burden imposed on workers, employees, employers, and society by disorders of the spinal column as they occur in the workplace. The Task Force reviewed the scientific literature on spinal disorders, and assessed the various therapeutic interventions known and utilized for spinal disorders and put into use by health professionals. In their assessment of manipulation as a therapy,

the Task Force concluded that "a few studies have shown a temporary relief of pain, versus other methods of treatment, but none has shown a reduction in the duration of work absences. All of these studies were conducted in a medical or osteopathic milieu; there is no properly controlled chiropractic study on this subject" (QTFSD, 1987, p.S24). With regards to therapeutic aspects of spinal disorders, the Task Force made the following conclusions and recommendations in their 1987 report (QTFSD, 1987, p.S37):

- "Biologic effects provide the rationale for use of most treatments. However, few have been validated in scientifically admissible clinical or epidemiologic investigations. Few of the treatments studied have been shown to improve the natural process of resolution of nonspecific spinal disorders."
- "A review of the literature has made it possible to recommend a therapeutic matrix that takes into account all clinical entities and their chronologic stage of evolution."
- "In general, the symptoms of acute pain in the lumbar, dorsal, and cervical regions tend to resolve spontaneously."
- "There is no need for obligatory bed rest in low-back pain without significant radiation. When it is prescribed, usually it should not be continued for more than 2 days for lumbar or 7 days for cervical pain. Prolonged bed rest can have adverse effects."
- "Low-back pain without anatomic disorder objectively demonstrated is not an indication for spinal surgery."
- "Surgery including chemonucleolysis, is indicated in the treatment of activity-related spinal disorders only after conservative treatments have failed."
- "A second spinal surgical intervention is indicated only in exceptional circumstances."
- "Even if there is residual chronic pain, return to work is not contraindicated. return to work may be therapeutic, assuming the work is not likely to aggravate the basic problem or increase pain."

58. Curtis (1988) reviewed the value of spinal manipulation in treating LBP. It was the author's opinion that, at that time, "the efficacy of spinal manipulation (was) neither scientifically proven or disproved" (Curtis, 1988, p.37). He concluded that literature reviews of randomized controlled studies

on the efficacy of spinal manipulation have provided evidence that "manipulation produces a specifically beneficial effect shortly after the procedure, although the long-term outcome is similar with other forms of therapy. These data do not consider certain situations in which patients with chronic back problems, unsuccessfully treated by orthodox methods, have responded dramatically to manipulation" (Curtis, 1988, p.41). Difficulties and problems encountered in the trials related to selection of subjects for study; initial assessment of subjects; techniques of manipulation; placebo effect; sample size and statistical analysis; and outcome measures.

59. Koes et al (1991) reviewed 35 randomized clinical trials comparing spinal manipulation with other treatments. In addition to analyzing the efficacy of spinal manipulation as a treatment, the authors also examined the quality of methods used in these trials (ie. study population, interventions, measurement of effect, data presentation and analysis). Most of the trials that they analyzed were found to have been of poor quality, and although there were many randomized clinical trials of manipulation, most showed 'major methodological flaws'. The most prevalent problems were "the proper description of drop outs, the small size of the study population, the lack of a placebo group, the blinding of patients, and the blinded measurements of effect" (Koes et al., 1991, p.1299). Most trials examined reported only on short term effects, and those that did assess long-term effects showed no positive results. Trials which were more methodologically sound showed negative results. This review indicated that manipulation is not consistently better than other therapies. The authors concluded that "although there are some promising results, so far the efficacy of manipulation has not been convincingly shown. Any further research should pay more attention to the methodological quality of the study design" (Koes et al., 1991, p.1302).

60. RAND recently undertook a literature review and published a report on the appropriateness of spinal manipulation for LBP (Shekelle et al., 1991). Medical literature was reviewed to gain knowledge about the efficacy of spinal manipulation for LBP. In summary, the authors concluded that "support is consistent for the use of spinal manipulation as a treatment for patients with acute low-back pain and an absence of other signs or symptoms of lower limb nerve-root involvement. Support is less clear for other indications, with the evidence for some insufficient,... while the evidence for others is conflicting" (Shekelle et al., 1991, p.v).

61. The Canadian Coordinating Office for Health Technology Assessment conducted a review of controlled trials of manipulation for back pain disorders (Conlon, 1992), with the purpose of assessing the effectiveness of chiropractic in the treatment of low-back disorders. Results of the effectiveness review are summarized below (Conlon, 1992, p.22,23):

- "Chiropractor applied manipulation, in all but one study, was at least as effective in treating back pain as the alternative treatments described in each study (these included physiotherapy, massage, electro-stimulation, drug therapy, heat, exercise, education and bed-rest)."
- "Based on the relatively small number of patients enrolled in these trials, chiropractor applied manipulation appears to be a safe treatment offering more immediate relief than other forms of conservative care."
- "Chiropractic does not appear to be more effective than other techniques in reducing the recurrence of back pain."

62. A prominent medical organization, the North American Spine Society, has recently concluded that spinal manipulation, and specifically chiropractic adjustment, is an acceptable and effective treatment for most patients with lumbosacral disorders (North American Spine Society, 1991). This review when coupled with more thorough analysis by prestigious institutions such as RAND, adds measurably to the growing credence in spinal manipulation as a therapy of choice for most low-back pain.

63. Anderson et al (1992) undertook a meta-analysis of 23 randomized controlled clinical trials of spinal manipulation in order to assess its effectiveness in the treatment of LBP. The results demonstrated a consistent (and strong) trend favouring the greater efficacy of spinal manipulative treatment over comparison forms of treatment. The authors determined that "the average patient receiving spinal manipulation is better off than from 54-85% of the patients receiving the comparison treatment, depending upon the specific outcome variable and the follow-up time period...Clearly, spinal manipulation was better than whatever treatment to which it was compared for a large majority (86%) of the outcomes...We believe that the consistently positive small to medium effect sizes noted in this meta-analysis are real and indicative of clinically meaningful differences in favour of spinal

manipulation for LBP patients" (Anderson et al., 1992, p.192).

64. Assendelft et al (1992) also undertook a similar review, but this focused on randomized controlled trials in which chiropractors were the therapists providing manipulation. As such, the specific objective of this medical review was to assess the efficacy of chiropractic for patients with LBP. In all, five chiropractic trials were identified, and the authors stated that "no similarity to chiropractic standards could be detected in any of the non-chiropractic trials" (Assendelft et al., 1992, p.487). The authors concluded that even though there were relatively few chiropractic trials on LBP and these trials had varied methodological quality, chiropractic seemed to be an effective treatment of back pain. They also concluded that more studies with a better research methodology are definitely needed, and at least five studies in progress on chiropractic trials on LBP were identified.

65. Shekelle et al (1992) reported on the use, complications and efficacy of spinal manipulation as a treatment for LBP. These were the same authors who undertook the previously mentioned RAND study, and results were basically the same. The authors concluded that spinal manipulation is of proven benefit and appropriate treatment for many back pain patients, particularly those with uncomplicated, acute LBP. The great majority of back pain patients fall into this category. "Data are insufficient concerning the efficacy of spinal manipulation for chronic low-back pain" (Shekelle et al., 1992, p.590).

MEDICAL AND OTHER TREATMENT

66. It has recently been suggested in the *Journal of Family Practice in the U.S.A.* that back pain "provides a classic example of the biopsychosocial model of illness in which social and psychologic factors play major roles in pain control, disability, and rehabilitation. Yet the tools commonly used by family physicians to treat back pain tend to be those of biomedicine and referral rather than behavioral and direct manual therapy, and this may explain why patients are more satisfied with care from chiropractors, who are much more focused on musculoskeletal problems and the context in which they occur" (Curtis and Bove, 1992, p.552). Other reasons for medical frustration with back pain have been given in the U.K. "Modern medicine can successfully treat many serious spinal diseases and persisting nerve compression but has completely failed to cure the vast majority of patients with simple low-back pain. Over-emphasis of pain alone, over-dependence on

a nominal diagnosis of disc prolapse, and over-prescription of rest may indeed be a major cause of iatrogenic disability" (Waddell, 1987, p.640).

67. Although many other forms of treatment exist for LBP, none has been as extensively examined as has manipulative therapy. Few trials have been conducted assessing the effectiveness of other forms of treatment for low-back pain. Indeed, very relevant questions that either or both of the medical profession and third party payers of medical care ought to answer are just 'how and why do so many medical technologies and procedures used in the medical management of low-back pain get adopted and diffused so widely without clinical evidence of their effectiveness'? However, a number of recent studies have investigated not only the efficacy but also the safety of certain medical therapies, both conservative and invasive. After analyzing the literature for the effectiveness of conservative therapy for LBP, Deyo (1983) concluded that at that time there was no convincing evidence to support the efficacy of corsets, bed rest, TENS, conventional traction, or drug use.

• Bed Rest

68. Gilbert et al (1985) conducted a multicentered randomized clinical trial in order to evaluate the effectiveness of some 'common treatments' for LBP in family practice. Specifically, the trial was performed to determine the effect of bed rest, a programme of physiotherapy and education, both of these treatments, or neither treatment on 242 patients with acute low-back pain. The physiotherapy programme consisted of flexion exercises. Progress was evaluated using patient daily diaries, physician assessments, questionnaires, telephone interviews, and medical record audits. Results did not show any beneficial effects on clinical outcomes for either bed rest or physiotherapy and education. The results actually showed support for early mobilisation over bed rest and indicated that the physiotherapy and education programme was actually doing more harm than good. The authors concluded that "family doctors have little reason to prescribe either bed rest or isometric exercises to patients who suffer from low-back pain" (Gilbert et al., 1985, p.791).

69. In a randomized control trial, Deyo et al (1986) also investigated the effectiveness of bed rest for acute LBP. More specifically, this study compared the consequences of recommending two days of bed rest versus seven days (ie. short versus long rest period), and whether shorter rest leads to a loss in therapeutic benefit. The authors observed that although bed rest is a mainstay of therapy,

“objective data to support its efficacy are meagre” (Deyo et al., 1986, p.1064). It was concluded that two days of bed rest would be as effective as seven days, and absence from work would thus be reduced. “Our data support a recent trend toward earlier mobilization of patients with back pain. Not only are brief periods of bed rest apparently safe for selected patients, but they may reduce the potential adverse effects of bed rest, including physical deconditioning” (Deyo et al., 1986, p.1070). Basically, the lengthy periods of bed rest that are prescribed by many doctors for LBP are found to have limited prospect of benefit and effects likely to delay the patient’s recovery. “The documented effects of bed rest tend to be negative. Noted effects include tissue contracture, general malaise, de-mineralization of bone, loss of strength and muscle tone, inhibition of tissue healing, depression and illness behaviour. It’s likely that these factors are related to the progressive decline in the ability to return to work after a back injury” (Miller, 1990, p.11). Waddell (1987) states that there is little scientific evidence supporting bed rest as an effective treatment for LBP. He notes that only one of the four controlled studies of bed rest at that time showed effectiveness. However it was serious flawed methodologically. “... Our whole (medical) management (of low-back pain) has been negative, based on rest. We have actually prescribed low-back disability!” (Allan and Waddell, 1989, p.15). In a more recent review, Waddell (1993) reasserts this conclusion and adds that there are strong theoretical arguments against bed rest. Another review concludes “that prolonged rest and passive physical therapy modalities no longer have a place in the treatment of the chronic problem (of low-back pain)” (Mooney, 1987, p.759).

• **Transcutaneous Electrical Nerve Stimulation (TENS)**

70. A randomized controlled trial of transcutaneous electrical nerve stimulation (TENS) and exercise for chronic LBP was conducted by Deyo et al (1990). TENS is very widely used in the management of LBP, therefore making its evaluation for efficacy important. This study examined the effectiveness of TENS, exercises, or a combination of both for chronic LBP. A control group received sham TENS. After one month, results indicated that there was no clinically or statistically significant therapeutic effect of TENS, although patients doing exercises reported significant improvement. However, after two months, the initial improvements found in the latter had disappeared. Results supported a trend favouring active over passive therapy for both

acute and chronic back pain, and ‘challenged’ the wide use of TENS. In a strongly worded conclusion the authors state that “for patients with chronic low-back pain, treatment with TENS is no more effective than treatment with a placebo, and TENS adds no apparent benefit to that of exercise alone” (Deyo et al., 1990, p.1627). This is the only controlled trial of TENS.

• **Corticosteroid Injection**

71. Carette et al (1991) conducted a randomized controlled trial in Canada evaluating the efficacy of injections of corticosteroid into facet joints for the treatment of chronic LBP. “Facet-joints injections are now routinely performed across North America. Although they are considered safe, they remain an expensive treatment of unproved efficacy” (Carette et al., 1991, p.1002). In this study 97 patients were divided randomly into two groups: one received the active injections whereas the other received isotonic saline (placebo). Assessments were based on pain severity, back mobility, and limitation of function at one, three and six month later. After one month, there was no difference between the two groups. No significant differences resulted three or six months later. The authors’ conclusion was that “injecting methylprednisolone acetate into the facet joints is of little value in the treatment of patients with chronic low-back pain” (Carette et al., 1991, p.1002).

• **Spinal Fusion**

72. The use of spinal fusion as a treatment for LBP has gained prominence in recent years and has sparked much controversy. Turner et al (1992) conducted a review of the literature in order to assess, among other things, the efficacy of spinal fusions in the management of LBP. No randomized trials were identified, and the authors concluded that “for several low-back disorders no advantage has been demonstrated for fusion over surgery without fusion, and complications of fusions are common” (Turner et al., 1992, p.907). In a review of 81 patients who had spinal fusions performed for back pain over a 7-year period (O’Beirne et al., 1992, p.32) it was found that 74% were satisfied with the outcome of their surgery based primarily on pain relief. However, the authors point to the interesting fact that there was no correlation between success or failure of the fusion and relief of pain, which suggests that patients gained relief from the ‘natural history of the underlying condition’ rather than the operation. Deyo (1992) cautioned that patients who had fusions had worse outcomes than patients

who didn't have fusions. He stated that "in fusion cases, the rate of in-hospital complications was nearly twice as great (and) post-operative mortality was nearly four times as high, and the likelihood of blood transfusion was nearly four times as high...And the fusion operations didn't reduce the subsequent likelihood of reoperation or rehospitalization for back pain" (Deyo, 1992, p.4).

• Chemonucleolysis Therapy

73. Much controversy has also surrounded chemonucleolysis therapy in the management of low back pain. An early randomized study (Javid et al., 1983) comparing the efficacy of injection of chymopapain versus the injection of placebo in patients with a herniated lumbar disc demonstrated that chymopapain was more effective. However, since then several studies have indicated otherwise. Fager (1984) was of the opinion that there was no adequate proof of the effectiveness of chymopapain, and that the risk rates were unacceptable: an anaphylaxis rate of 1.4%, and a mortality rate of about 0.14%, or 1 in 700 patients (Fager, 1984, p.327). An editorial in the *Medical World News* (May 27, 1985) reported the results of a survey of neurosurgeons who had used chymopapain injections but were no longer doing so. Reasons for ceasing chemonucleolysis were: injections aren't efficacious (32%); risks are too great (24%). Also, 60% of the respondents who had used the procedure found it less safe than surgery, 87% found it less efficacious than surgery. Merz (1986) reported on a 1986 meeting of the American Association of Neurological Surgeons. There were 300 surgeons at the conference who had performed chemonucleolysis; only 6 were still doing so. One prominent surgeon reported that the failure rate of the procedure when he performed it was 60% (Merz, 1986, p.317). It appears then that chemonucleolysis is under normal clinical circumstances of limited effectiveness and presents significant risk of harm.

• Early Exercise and Functional Restoration

74. There is considerable controversy over the effectiveness of early exercises for LBP. Waddell (1993, p. 317) claims that of "18 published controlled trails of an active exercise approach for low back pain, fourteen...show statistically and clinically significant benefits". Waddell's optimism is, however, not shared by others. In a recent detailed review of the 23 randomized controlled trials of exercise therapy for back pain, Koes et al. (1991a) found only four studies scored more than 50 points out of a maximum of 100, indicating the low quality of the majority of the studies. "No

conclusion can be drawn about whether exercise therapy is better than other conservative treatments for back pain or whether a specific type of exercise is more effective" (Koes et al., 1991a, p.1572). Much earlier Deyo too found that "the quantity and quality of therapeutic research in this area are disappointing" (Deyo, 1983, p.1061). He did, however, find some support for flexion exercises "but the importance of the results and their applicability to particular types of LBP were unclear" (Deyo, 1983, p.1057). These reviews suggest that those who regard the use of exercise as of proven value are not yet supported by the literature. Overall however, the early use of exercise with back pain patients is a popular and probably effective approach. There is certainly more scientific evidence in support of use of early exercise than for passive physical therapies. (Deyo, 1992). It is also quite clear that the evidence on the effectiveness of exercise is not as strong as that for manipulation. It seems reasonable to conclude on the present literature that management of most patients with low-back pain should include manipulation and the use of early exercises. With chronic disabled back pain patients there is a growing and important role for work-hardening and functional restoration programs, developed by Mayer and others during the past 10 years from the sports medicine approach to functional restoration (Mayer and Polatin, 1992; Mayer and Gatchel, 1988). However, these programs, which involve extensive supervision, training, coaching and education and a multidisciplinary team, are expensive. They are designed for patients for whom acute forms of care have failed, and whose only alternatives appear to be surgery and/or prolonged disability.

• Physiotherapy

75. We did not review in detail the approaches used by physiotherapists in the treatment of LBP, focusing instead on the therapies used by the chiropractic medical professions. However, we have made a number of observations about the use of physiotherapeutic modalities in the foregoing descriptions, and will make some further observations in later chapters. At this juncture, however, we wish to note that the literature provides little solid evidence of the effectiveness of passive physiotherapy treatments in general for LBP. There is an apparent move in practice towards active use of exercise and education which, as previously noted, has support in the literature.

76. In summary, with respect to the effectiveness of medical versus chiropractic management of LBP, the literature favours chiropractic. The literature is negative, inconclusive or virtually non-existent concerning many medical treatments, including the mainstay of bed rest if prolonged beyond 2 or 3 days. The many neutral to very positive findings on chiropractic manipulation, with no trial reporting ineffectiveness, presents a curious contrast full of irony. On the basis of the clinical research it would be reasonable for private and public insurance managers to now call firstly upon the medical profession to provide better evidence for the effectiveness of the standard therapies it uses. Yet, at present, it is the public perception because of many factors, a central one of which is medical criticism of chiropractic treatment as unscientific, that it is chiropractors who have most to prove concerning the efficacy and effectiveness of their therapeutic modalities. There is, for example, the thought-provoking claim from an eminent neurosurgeon in the USA that approximately 90% of the 250,000 back surgeries performed annually in that country could be avoided (Burton et al, 1992). Medical management of low-back pain is similar throughout North America. Are there similar savings in surgery to be made in Canada?

SAFETY ISSUES

77. The safety of chiropractic manipulation has been closely scrutinized, sometimes with evident bias. For example, Shvartzman and Abelson (1988), reporting on a single case where complications resulted from chiropractic manipulation, concluded that "although chiropractic treatment is a popular alternative (to medical care), its long-term effect is questionable and the medical literature contains numerous reports of patients whose condition worsened as a result of it. Physicians should be aware of the dangers of chiropractic treatment, particularly in patients with severe spondylitic changes, osteoporosis, fractures, tumours, ankylosing spondylitis, infections, or signs of nerve root pressure" (Shvartzman and Abelson, 1988, p.58,59). Cases of brain stem dysfunction (Mueller and Sahs, 1976), disk rupture (Richard, 1967), paraparesis (Hooper, 1973), traumatic vertebral artery pseudoaneurysm (Davidson et al., 1975), lumbar artery aneurysm (Kornberg, 1988), ischemia (Dvorak and Orelli, 1985) and stroke (Miller and Burton, 1974) following manipulative treatment by chiropractors, medical doctors, and others have been reported in the medical literature. However the relative safety of chiropractic manipulation is amply documented and studied.

The most significant risk arising from chiropractic treatment is vertebral artery syndrome (VAS) following cervical manipulation, which may lead to stroke. The incidence and mechanisms of VAS are reported better in the chiropractic literature than elsewhere (Kleynhans, 1979; Terrett, 1987; Haldeman et al, 1993). The risk of VAS is remote at about .0002 percent or 2 to 3 cases per million treatment (Gutmann, 1983; Dvorak and Orelli, 1985). This compares favourably with the 1.5 percent risk of paralysis from neurosurgery on the cervical spine often performed for similar degenerative conditions (Patel-Christopher, 1990 p.45).

78. In the context of low-back pain, we note that the lack of safety of chiropractic manipulation, or manipulation generally, is not a factor found worthy of comment in any of the clinical trials we reviewed. Indeed risk of harm is seldom mentioned, and a remarkably small number of patients being studied experienced any deterioration in their conditions following chiropractic manipulation.

79. Raftis and Warfield (1989) point out that serious complications resulting from manipulation are rare, and that most of them arise after cervical manipulation. Injuries from lumbar spinal manipulation, on the other hand, are "much less common and are usually attributed to poor technique, such as the use of a nonspecific manoeuvre" (Raftis and Warfield, 1989, p.101,102). Statistically speaking, manipulation appears to be a very safe therapy, since "with more than 90 million manipulations performed in the United States yearly, relatively few serious complications have been reported" (LaBan and Taylor, 1992, p.454). Dvorak and Orelli (1985) examined data on morbidity resulting from manipulation to the neck and found that "in one out of 40,000 cases, slight neurological complications were observed, and one important complication was found in one out of 400,000 manipulative procedures" (Dvorak and Orelli, 1985, p.1). Curtis and Bove (1992) state that "the dangerous complications of manipulative techniques, mainly vascular accidents, occur in very small numbers (about 113 documented cases) and have been used as a weapon against chiropractors...Almost all complications of manipulative therapy have involved specific rotary adjustments of the cervical spine, which comprise 30% of the 100 million visits per year made to chiropractors. In fact, a number of these complications have followed manipulations by allopathic physicians" (Curtis and Bove, 1992, p.553).

80. The degree of safety of chiropractic manipulation in the lumbar spine can be illustrated by the most frequently described severe complication, compression of the cauda equina by midline nuclear herniation at the level of third, fourth and fifth intervertebral disc. "Only thirty cauda equina complications associated with manipulation have been reported in the French, German and English literature over an 80 year period, and of these only eight were allegedly related to chiropractic treatment". (Haldeman et al., 1993, p.171).

81. In a recent literature review and analysis of data from the Back Pain Clinic at the Royal University Hospital in Saskatoon, Cassidy et al. (1992) concluded that the treatment of lumbar intervertebral disk herniation by side posture manipulation is safe. They also offer evidence of effectiveness. All except one of 14 patients in a study they report "obtained significant clinical improvement and relief of pain after 2- to 3-week regimen of daily side posture manipulation of the lumbar spine... In most cases, the CT appearance of the disk herniation remained unchanged after treatment. In five cases, there was a small decrease of the size of the disk herniation, and in one case, a large decrease was observed. Comparable results were obtained in a similar study recently conducted in France" (Cassidy et al., 1992, p.98).

SUMMARY OF CONCLUSIONS

82. There are many clinical trials assessing manipulative treatment of LBP. There are also several case-control studies, as well as meta-analyses and descriptive studies. Our review of the literature, as with previous reviews, has found many of the past studies wanting in terms of methodology and scientific validity. Nevertheless we believe that, despite the weaknesses and shortcomings, the studies do allow conclusions with respect to the effectiveness of spinal manipulation for LBP. pain. We hasten to add, however, that clinical trials with greater scientific validity need to be undertaken for further understanding of the effectiveness of this and all other treatments for LBP.

83. On the evidence, particularly the most scientifically valid clinical studies, spinal manipulation applied by chiropractors is shown to be more effective than alternative treatments for LBP. The clinical evidence is corroborated by meta-analysis, case-control studies and properly constituted clinical guidelines panels. Further sources of evidence of the effectiveness of

chiropractic treatment of LBP are offered in Chapter 5 (workers compensation studies) and Chapter 6 (patient satisfaction studies). It is noteworthy that there is no clinical or case-control study that demonstrates or even implies that chiropractic spinal manipulation is unsafe in the treatment of LBP.

84. The literature also shows clearly that many medical therapies are of questionable validity or judged to be inadequate. Some medical treatments are also deemed to be unsafe and generate iatrogenic complications for patients. Our reading of the literature suggests that chiropractic manipulation is far safer than medical management of LBP. The literature review generated a rather curious overall conclusion. While it is prudent to call for even further clinical evidence of the effectiveness and efficacy of chiropractic management of LBP, what the literature revealed to us is the much greater need for clinical evidence of the validity of medical management of LBP. Indeed, several existing medical therapies of LBP are, on the basis of the existing clinical trials, generally contraindicated. There is also some evidence in the literature to suggest that manipulations are less safe and less effective when performed by non-chiropractic professionals.

CHAPTER 5

THE COST-EFFECTIVENESS OF CHIROPRACTIC AND MEDICAL MANAGEMENT OF LOW-BACK PAIN

“Taking a global view of the evidence in this and the previous chapters, there seems to be a comprehensive body of evidence, which can fairly be described as overwhelming, for the cost-effectiveness of chiropractic over medical management of patients with low-back pain.”

INTRODUCTION

1. In Chapter 2 we offered ample evidence of the high incidence and prevalence of low-back pain (LBP), and of the enormous direct and indirect costs associated with low-back pain. One estimate of these costs for the U.S.A. is in excess of \$60 billion per annum. Workers' compensation costs in 1990 alone in the U.S.A. were estimated to be about \$30 billion (Burton and Cassidy, 1992). Authorities in the treatment of back problems believe that LBP represents the single greatest, and at the same time the most inefficient, area of health care expenditure, and hence constitutes the greatest opportunity of cost savings (Burton and Cassidy, 1992). The issue of cost-effective treatment of LBP is especially important in the present climate of fiscal restraint and increasing threats to the economic viability of Medicare. Presently, policy reform is driven largely, if not exclusively, by economic and financial considerations.

2. There are numerous studies which suggest that chiropractic care is more cost-effective than medical treatment for LBP. There are very few studies that argue or suggest the opposite. Most of the studies suffer from one or more design shortcomings, however. Many of the studies, especially those employing workers' compensation data, are retrospective rather than prospective in design. A common problem with such retrospective analysis is non-random selection of patient cohorts treated by physicians or chiropractors. These studies often lack pertinent demographic, health status and socio-economic well-being data of the patient-workers. Of obvious relevance for comparative studies is the need for standardized or common diagnoses for groups of patients treated by physicians or chiropractors. This, alas, is often not assured. Various studies report the cases as “back-related injuries”, “spine-related injuries”, “back injuries”, “musculoskeletal” or even “back sprain/strain”

injuries. Since the mix of specific diagnostic cases can vary considerably within such broad categories, precise comparisons are difficult to make. There is a lack of standardized description of the alternative therapies patients with low-back pain received from the various professionals who treat them. There is also the so-called problem of “cross-over” when patients switch between physicians and chiropractors for care as many in fact do for a variety of reasons. Also of crucial importance in many studies is the lack of outcome or effectiveness measures which is obviously needed in any thorough and valid cost-effectiveness analysis.

3. Workers' compensation data were not designed or planned for research purposes but for the administrative needs of the bureaucracy. Many studies overlooked the out-of-pocket costs borne by patients which could have affected the results. Many did not consider incentives inherent in the workers' compensation system. Inter-state comparisons are especially treacherous for this reason. Levels of benefits, tax treatment of compensation benefits, the economic climate such as recessions, are all economic phenomena which can affect claims filing and return to work decisions. As well, in many states, claims adjudication is not very precise. Legal expertise can make a difference in whether or not a claim is judged to be a temporary total disability, permanent partial disability, or something else (Nyiendo, 1990). Researchers have no control over and cannot fill in variables that can affect the results of retrospective comparative analysis of chiropractic and medical management of LBP.

4. These data difficulties are not the only shortcomings of the existing studies. Many of them also have weak statistical analysis, ignored missing numbers or other data, failed to test for significant differences, and failed to control for variables even when information on such variables were available.

5. This said, it must not be assumed that the

existing studies are all suspect or unreliable. This surely is not the case. After allowing for weaknesses in the design of individual studies, "the significance of showing cost-effectiveness in the workers' compensation system should not be underestimated" (Nyiendo, 1990, p.146). In what follows we review the many workers' compensation studies, and then consider other studies that provide evidence on the cost-effectiveness of chiropractic and medical management of LBP.

WORKER'S COMPENSATION STUDIES ON COST-EFFECTIVENESS

6. A review of the literature by Johnson et al (1985) covered 17 studies which addressed the cost-effectiveness of chiropractic treatment of patients receiving workers' compensation. The period of the studies covered the years 1940 to 1981 and they include the experience of 14 different states. Some of the earlier studies sometimes included osteopathic physicians with the broader category of physicians, and others compared chiropractors, osteopaths and physicians separately. Among the 17 studies reviewed 14 reflected a lower total cost to the health care system for patients treated by chiropractors, explained always and mainly by lower hospital costs, drug expenditure and related medical costs, and quite often but not always by lower professional costs. Additionally in all but one of the studies, chiropractic care resulted in lower and in most cases significantly lower time loss from work than physician care. In most of the studies, chiropractors are noted to have given more treatments (visits) than physicians, though this did not result in higher health care costs. Several studies noted the higher use of x-rays by chiropractors compared to physicians.

7. Return to work can be construed as a useful and valid indicator of improved health status and recovery from injury and pain. In any case, it is a good proxy for health status given that the population groups in question are all workers with jobs to return to. Thought of as an outcome proxy, the early return to work found in all but one study is one indication of the effectiveness of chiropractic care and a major factor in its cost-effectiveness as well. After all, early return to work means significant savings to the workers' compensation system through lower disability benefits. As was noted in Chapter 2 direct health care costs are not the major component of the total economic cost of LBP. Some of the studies did employ other indicators of effectiveness or outcome. Thus Wolf (1974) noted that in California less than 35 percent of the MD-treated patients and 51 percent of DC-treated group reported "full recovery". From

Utah, Kane et al (1974) reported in the *Lancet* that, using the Bush instrument to measure functional status, patients treated by chiropractors showed greater improvement than those treated by physicians. They also found that chiropractors scored better than medical doctors in terms of patient satisfaction, explanation offered to patients, comfort and confidence in treating patients, and the ability of the practitioner to return patients to their previous functional levels. There are other studies which corroborates these results, discussed in the next chapter.

8. The sole study up to 1981 that goes against the conclusions cited above is by Greenwood (1983) for the State of West Virginia. The study includes both back and neck injuries and only non-surgical cases were included. Osteopaths and physicians were combined rather than separated as two distinct non-chiropractic professions. There were several major design problems. The study acknowledged that chiropractors may have treated more chronic disability cases than either physicians or osteopaths. Strangely, the period of study and sampling was limited to just 5 weeks for physicians and osteopaths and 11 weeks for chiropractors. An even more significant design problem was the unusually small sample size, consisting of just 200 cases for chiropractors and 200 cases for the physician-osteopaths group. There was hardly any demographic information (and hence standardization) in the study. Neck and back injury claim were not separated out in the analysis. Most critically, "chronic back problems are disproportionately represented among chiropractors" (Schifrin, 1992, p.50). Schifrin also argued that in the Greenwood study "payments to medical providers seriously understate total medical care costs" (1992, p.50). Billing irregularities by some of the chiropractors were uncovered as a result of these findings, which must cast further doubt on the results. Given these weaknesses of the study it is not surprising to find the author herself calling for further and better research (Greenwood, 1983). However, the study did find the disability days and costs for chiropractic patients were greater than for physician-osteopath patients.

9. There are several studies the Johnson et al review of evidence in 1981, and we present these below. Most of these studies are better designed, took considerable care to avoid the weaknesses and shortcomings of earlier studies, and employed more valid statistical and analytical approaches.

10. Johnson et al (1989) analyzed the benefits and costs of care received by patients with back

and neck injury from chiropractors, osteopaths, and physicians in Iowa in 1984. Only workers who lost enough time from work to qualify for compensation (4 days or more), whose cases were closed, and who received all of their treatment from only one health care professional were included in the study sample. The results of the study show that the mean number of compensated days was least for workers treated by chiropractors (Johnson et al, 1989, Table 6, p.339). The mean disability compensation paid to workers was \$264 for those treated by chiropractic compared to \$618 and \$1,565 for those treated by physicians and osteopaths respectively (Johnson et al, 1989, Table 10, p.341). Lack of complete provider cost data made comparison difficult, "since employers are not required by law to provide data on treatment costs incurred and many do not" (Johnson et al, 1989, p.342). Nevertheless, the study reports that average provider cost for chiropractors was \$223 versus \$352 for physicians (Johnson et al, 1989, Table 12, p.342). We note once again a point made earlier. The early return to work is an important factor in cost saving and hence the overall cost-effectiveness of alternative therapies provided by the different professions who treat low-back pain. This study illustrates this important issue in economics, the next provides a more dramatic illustration.

11. In a similar study undertaken in Australia, Ebrall (1992) studied mechanical low-back pain claimants for a year in Victoria, Australia. Two well-matched samples of 998 patients each were identified where treatment was solely by a chiropractor or a physician. "The average compensation days with chiropractic management are one quarter (6.26) the days of claims with medical management (25.56)" (Ebrall, 1992, p.50). The provider costs for chiropractors (\$571) were lower than for physicians (\$1,738). But the big difference occurs in compensation payment with \$392 for chiropractic patients and \$1,570 for medical patients (Ebrall, 1992, Table 4, p.50). Other results are also worth noting. A greater number of patients progressed to chronic status when managed by physicians (11.6 versus 1.9 percent for chiropractors). "With respect to these 1,996 identified claims alone, medical management cost the community an additional \$1,344 per claimant, which is an additional \$1.3 million across the sample. If the Victorian chiropractors managed a similar proportion (40%) of these injuries as do Oregon chiropractors then the direct savings within the Victorian Workcare scheme... would have been \$10 million over 7,482 claims" (Ebrall, 1992, p.52). (The "workcare scheme" is the workers' compensation plan in North America parlance).

This sum, significant in itself, does not include the substantial indirect (cost) savings. Ebrall concludes (1992, p.52) that the "chiropractic management of mechanical low-back pain clearly produces wide-ranging savings".

12. A common criticism of earlier workers' compensation studies was their lack of comparable diagnostic cases treated by physicians and chiropractors. Two recent studies from Utah by Jarvis (1989) and Jarvis, Phillips and Morris (1991) assessed the total cost per case of chiropractic and medical patients with identical diagnostic codes. The sample for the second study consisted of 3,062 claims. Only those specific ICD-9 categories containing at least 50 cases were included so as not to fall prey to the problem of small number of cases. The average compensation days for patients treated by chiropractors was 2.7 compared to 20.7 for physicians; compensation costs were \$668.39 for physician care versus \$68.38 for chiropractors, a tenfold difference; and treatment costs were \$684 for physician care and \$527 for chiropractors (Jarvis et al, 1991, Table 2, p.849). The treatment costs for physicians were higher despite the fact that the mean number of treatments by chiropractors were higher. Chiropractor also treated their patients for longer periods. The study also presents the mean total costs per case for each diagnostic code. For some diagnoses there is little difference between the costs of physicians and chiropractors (e.g. sprain/strain thoracic) but for most the differences are significant (e.g. sprain/strain lumbar, sprain sacroiliac) to highly significant. (e.g. lumbosacral disc with physician management costing \$8,175 to \$1,065 for chiropractors). The earlier study by Jarvis (1989) had a similar design but covered a bigger sample and an earlier period. The conclusions were, however, very similar to the later study.

13. In a detailed case-control study of 201 randomly selected workers, Nyiendo and Lamm (1991) classified patients into three clinically comparable groups based on documented clinical signs and symptoms. The chiropractor (DC) claimants were "more likely to have a history of chronic, recurrent low-back pain and more likely to have suffered exacerbation episodes... suggesting a greater level of chronicity among chiropractic claimants" (Nyiendo and Lamm, 1991, p.177). Despite their poorer health status and higher risks, DC claimants had a higher frequency of return to work within one week or less (40%) than physician claimants (29 percent). "For claimants with a history of chronic low-back problems, the median time-loss days for MD cases was 34.5 days, compared to 9 days for DC cases. It is suggested

that chiropractors are better able to manage injured workers with a history of chronic low-back problems and to return them more quickly to productive employment” (Nyiendo, 1991b, p.231). The mean treatment costs for chiropractors were higher than for physicians, however (Nyiendo, 1991b, Table 5, p.292). This finding is “attributed to: a) higher proportion of claimants with chronic or recurrent low-back conditions in the DC group... b) a higher proportion of DC claimants with... risk factors which ... adversely affected the course of recovery c) differences in age and gender of DC and MD claimants d) differences in treatment philosophy and e) the reimbursement permitted under Oregon workers’ compensation law” (Nyiendo, 1991b, p.295). The author also concludes that “evidence pointing to greater chronicity among DC cases makes cost comparison, by itself, inappropriate” (Nyiendo, 1991b, p. 295). While we concur with this conclusion, we note that treatment costs are not the larger part of the total economic costs of LBP and that, even in this the Oregon study, chiropractic management of LBP appears to have been cost-effective despite the higher proportion of chronic cases in the chiropractors’ case-load. A proper analysis in this study would have required adjusting time-loss days, compensation costs, and treatment costs for the different case-mix of physicians and chiropractors with the use of regression analysis. This was regrettably not undertaken in the study.

14. Wolk (1988, 1988a) analyzed the Florida Workers’ Compensation data for the year 1987. Only patients classified as having a medical back diagnosis were selected for the study sample. The DRG (diagnosis-related-group) Code 243 was used and it incorporates 165 principal diagnoses related to the spine. Costs of all services were retrieved for such patients except for drugs prescribed by physicians. This data is not collected by workers’ compensation board in Florida for non-compensable injury patients, who make up about 76 percent of all claimants. Only patients who had seen chiropractors or physicians or osteopaths were included in the study to avoid the cross-over problem. The findings of the study include (a) patients treated by chiropractors had significantly lower rate of compensable injury (23.2 versus 57.7 percent) (b) treatment costs for patients of chiropractors were significantly lower at \$558 per patient compared to \$1,100 for patients of physicians (Wolk, 1988, Table 4) (c) for compensable cases only, those treated by chiropractors were much less likely to be hospitalized and (d) chiropractors’ patients had more visits and received more services than patients of physicians. Wolk concludes, however,

that “the greater number of services provided by chiropractors may ultimately result in less overall cost to the health care system by reducing the frequency of disabling back injuries and the necessity for more expensive hospital treatment” (Wolk, 1988, p.20).

15. Wolk’s second and follow-up study also limits the study sample to the DRG Code 243 (Medical Back Problems) but this time the period of analysis covers two fiscal years 1985 to 1987. Only claimants whose files were closed were selected for analysis. As well, more complete cost data were used than in the earlier study. The average total cost per claimant for chiropractors was \$1,204 versus \$2,213 for physicians (Wolk, 1988a, Table 8, p.5).

16. In a recently published study, Dean and Schmids (1992) compared chiropractic management of 11 health conditions including arthritis, disc disorders, LBP and spinal-related sprains, with five other groups of providers - general practitioners, internists, surgeons, other physicians, and other non-physicians (e.g. physical therapists). Chiropractors had the lowest average charge per visit of the six providers. Insurance payment for chiropractic care was also the lowest, hence the private burden of paying for care was the highest for chiropractic services. The frequency of visits was highest for chiropractic patients, yet the direct health care costs were lower. “Costs are lower for disc disorders and various lower back conditions” (Dean and Schmids, 1992, p.1). Chiropractors treated a greater number of low-back cases than any of the other professionals (Dean and Schmids, 1992, Table 3, p.15). Dean controlled for a variety of factors that might otherwise explain the observed cost differentials between the six professionals groups for the various conditions. These factors include (a) health status, using functional limitation and self-perceived health status (b) demographic factors including gender, race, and age, and (c) socioeconomic factors including education and family income. The eleven condition-specific regression analysis results “support the overall contention that chiropractic care is a lower cost alternative to several GP/specialist treatment regimens. Cost disparities remain even after controlling for other factors that may cause differing costs of treatment” (Dean and Schmids, 1992, p.45). We note that Dean’s study is methodologically superior to many other analyses of workers’ compensation data.

17. In a review of this literature on cost-effectiveness Schiffrin (1992, p.ii), a U.S. health

economist, observes that "twenty two studies and one "inquiry", covering many years, 14 states, and two foreign countries, have examined, in total, eight different dimensions of the cost and efficacy of chiropractic treatment of low-back pain. The cost measures have included total case costs, total provider payments, total worker compensation for injury-induced wage loss, and treatment frequency. The efficacy or outcome measures include the duration of work loss, period of disability, pain relief, and patient satisfaction with treatment. In 14 state studies in the period before 1980, only in one dimension in one study does chiropractic not rank more favourably than medical treatment of low-back pain. In about 35 other comparisons in these 14 studies and two general surveys, the cost and effectiveness results of chiropractic treatment are superior to those of medical treatment. Other studies, in New Zealand and Great Britain, provide further evidence of the valuable role of chiropractic in the provision of care for low-back injuries, in comparison with other types of treatment. By every test of cost and effectiveness, the general weight of evidence shows chiropractic to provide important therapeutic benefits, at economical costs. Additionally, these benefits are achieved with apparently minimal, even negligible impacts on the costs of health insurance".

18. Reference to New Zealand is often made in any discussion of chiropractic, because of the Report of the Commission of Inquiry into Chiropractic (1979). This inquiry was the most comprehensive and detailed independent examination of chiropractic ever undertaken in any country. The Commission's findings were very supportive of chiropractic declaring it safe and effective for musculoskeletal spinal disorders, including LBP, and several other conditions. The Commission found that no other health professional was as well qualified to carry out a diagnosis for spinal dysfunction or to perform manipulation therapy. This inquiry, as did later such inquiries in Australia and Sweden, found chiropractic care to be cost-effective and recommended government funding for chiropractic services.

19. In the studies above, one of the major economic reason for the cost-effectiveness of chiropractic care is repeatedly stressed. Dillon (1981) sums it up neatly in his paper on health economics and chiropractic by stating that "unlike medical practice, chiropractic does not spiral costs into the health care system through ancillary and specialist services, hospitalization and pharmaceuticals". On average, a dollar paid to chiropractor may generate as additional \$0.25 in

related costs in the U.S.A., but significantly less in other countries due to a more conservative approach to practice. This is true of Canada for instance. For each dollar paid for physician services, however, an average of an additional 4 to 5 dollars is generated in other health care costs.

20. One of the clearest statements on the cost-effectiveness of chiropractic care comes from the British trial (Meade et al, 1990) reviewed in the previous chapter. Meade et al (1990, p.1435) declared that "the potential economic, resource, and policy implications of our results are extensive". If 72,000 patients with mechanical back pain and no contra-indications to manipulation receiving hospital outpatient treatment under the National Health Service were instead treated by chiropractors, the savings in health care costs alone would be about \$8 million annually. The reduction in time loss would lead to further savings to industry of \$26 million in output and another \$6 million to government for reduced social security payments. "There is, therefore, economic support for use of chiropractic in low-back pain... consideration should be given to recognizing appropriately trained and experienced chiropractors and to providing chiropractic within the NHS, either in hospitals or by purchasing chiropractic treatment in existing clinics" (Meade et al, 1990, p.1435,1436).

LOWER COST OF CHIROPRACTIC - OTHER EVIDENCE

21. There are now a good number of other studies describing the fact that chiropractic management of LBP is significantly less expensive than physician management of patients with the same conditions. We offer a few select studies corroborating this overall conclusion. The sources of data and the analytical frameworks used in these studies are different from the workers' compensation studies we have reviewed above.

22. In the U.S.A., Stano (1993) examined two years of insurance claims data for a large population of beneficiaries covered for private fee-for-service health care services. The services were grouped in nine ICD-9 diagnostic codes covering lumbar and low-back conditions. The study sample included 8,928 patients with 10,884 episodes of care among the 9 lumbar and low-back conditions. The total insurance payments were substantially greater for medically managed episodes, particularly for episodes of care lasting longer than a day. The average payment to chiropractors (DCs) for all episodes was \$573 compared to \$1,112 for medical

doctors (MDs). For episodes lasting more than a day, the mean payment to DCs was \$870 compared to \$2,141 for MDs (Stano, 1993, Table 2, p.13). Stano, a health economist, concluded that there was "little doubt that medical treatment for patients with comparable diagnostic codes is considerably more costly than chiropractic treatment" (1993, p.11). He counselled that the increased utilisation of chiropractic services as a strategy to reduce the rate of growth of health care expenditure deserved careful consideration. In a personal communication, Stano (1993) confirms these findings. He has found "total cost differences in the order of \$1,000...(per) patient in subsamples of patients with specific disorders. The lower costs are attributable mainly to lower inpatient utilization. The cost differences remain statistically significant after controlling for patient demographics and insurance plan characteristics". (Stano, 1993, personal communication and abstract of a forthcoming article).

23. In a related study, Stano et al (1992) used the MEDSTAT systems database to develop a comprehensive database that would be suitable for research purposes. It contains valuable diagnostic and service codes, provider type, site of service, demographic data on patients, and insurance plan characteristics. There are two files, one for inpatients and the other for outpatients. "This database represents the largest known source of claims information on chiropractic" (Stano et al, 1992, p.41) covering 2 million beneficiaries. The authors found that payments to chiropractors represent only 1.8% of total payment and "as a result would account for very little of the nation's rapid growth rates of health care spending". (Stano et al, 1992, p.42). They also found that payments vary between health insurance plans, with payments per chiropractic patient being higher under less restrictive insurance plans. Using this database in a later study (Stano, 1993a), Stano found that the cost per patient is lower for chiropractic care than for physician or osteopath care. This was true of inpatient, outpatient and therefore also for total health care costs. The differences hold for all specific ICD-9 codes for low-back conditions (Stano, 1993a, Table 1 and Table 2, p.43). "Chiropractic use reduces the need for other forms of care but mainly for inpatient care... the pattern was even more strongly supported by analysis of 18 specific conditions" (Stano, 1993a, p.43). In only two codes were the total costs approximately the same.

SUMMARY CONCLUSIONS

24. Taking a global view of the evidence in this and the previous chapters, there seems to be a comprehensive body of evidence, which can fairly be described as overwhelming, for the cost-effectiveness of chiropractic over medical management of patients with LBP. In this chapter we have reviewed many persuasive studies. The lack of any convincing argument or evidence to the contrary must be noted and is significant to us in forming our conclusions. The evidence of cost-effectiveness includes studies showing lower chiropractic costs for the same diagnosis and episodic need for care. The underlying economic rationale for cost-effectiveness was amply and repeatedly illustrated. It is, of course, true that more rigorous analysis of the economic impact of chiropractic treatment of LBP is desirable and possible. There is, for instance, the need to take into account, more fully, differences in severity, case-mix and outcomes of treatment between patients treated by physicians and chiropractors. Nevertheless, we concur with Stano's (1993, p.298) conclusion that "the wide gap in the overall cost experience between chiropractic and medical patients cannot easily be dismissed even by skeptics of the chiropractic profession".

25. Further support for the greater use of chiropractic care derives from a number of patient satisfaction studies discussed in the next chapter, and the fact that the utilization of chiropractic has grown everywhere despite the greater private out-of-pocket costs to patients. Chiropractic meets the market test of consumer choice and preference. Simply put, despite economic disincentives for use of chiropractic services, chiropractic has met the market test of consumer choice and preference. The new evidence from Stano and more sophisticated analysis of insurance data indicates that chiropractic care can indeed substitute for medical care. This suggests that better insurance coverage of chiropractic services can lead to reduced overall health care costs.

CHAPTER 6

EVIDENCE OF PATIENT SATISFACTION WITH CHIROPRACTIC AND OTHER PROFESSIONS IN THE MANAGEMENT OF LOW-BACK PAIN

"In the language of economics, the fact that patients choose chiropractic care over physician care despite the higher cost is "revealed preference", indicating greater patient satisfaction with chiropractic care for low-back pain."

INTRODUCTION

1. The health care professions have become increasingly aware of the importance of understanding the public's attitudes towards them, and the level of patient/client satisfaction with their services. Patient satisfaction is a crucially important "outcome" measure, providing a consumer evaluation of the effectiveness and quality of health services and the professionals who provide them. After all, patients' opinions and information are judged vitally important in helping the health care providers make diagnosis of illness, disease, and disability. Providers need to know how their patients respond to treatment; how they feel about the process and the result of the care they receive; the degree to which they accept the care; their perception of the technical competence of the providers of care and the affective characteristics of providers; and the extent to which patients have been informed and made to understand the diagnosis, treatment options, and the associated risks and benefits of treatment.

2. Patient satisfaction with the treatment of low-back pain (LBP) is especially important because several different professions with quite different methods of diagnosis and treatment are available and actually utilized by the public. For example, "in 1980, 40% of Americans with chronic back problems sought care for their backs from allopathic and osteopathic physicians, while 30% consulted chiropractors" (Cherkin et al, 1989, p.351). In the absence of clear and unambiguous results from clinical trials about the effectiveness and quality of care rendered by the different professions using varying therapies, research on patient satisfaction can serve as an important source of patients' own evaluation of the alternative therapies and professions. Indeed, such satisfaction studies should be considered a useful and necessary adjunct to clinical trials, case-control studies and other forms of evaluation.

3. Studies of patient satisfaction are useful to

predict patient behaviour; their noncompliance with treatment regimens or follow-up visits; their adherence or otherwise to health advice they receive from health care providers. Patient satisfaction is also of relevance to health policy makers and program planners. It is relevant to the likelihood of malpractice suits or complaints to regulatory and professional bodies.

4. Patient satisfaction surveys of chiropractic services are much more common in the United States than in Canada. There were numerous studies at the state level in the U.S.A. in the late 1970s and especially in the 1980s. The findings from these surveys have been remarkably consistent. The results show that the majority of chiropractic patients and ex-patients are likely to be satisfied with the treatment they received; they are willing to return for chiropractic treatment for a similar condition; they would recommend chiropractic treatment to friends, family, and colleagues; and "that consumers of chiropractic services are often confused and uninformed about the nature of their insurance coverage for chiropractic treatment" (Sanchez, 1991, p.165). We suspect that the latter is true in Canada as well.

5. Most of the existing research focused on the attitudes and opinions of users of chiropractic services. Non-users have typically been used as a point of comparison with users of chiropractic care, and while this is useful and valid, there is ample scope, opportunity and need to carry out in-depth investigations of non-users of chiropractic care, especially if the evidence of effectiveness and cost-effectiveness suggests that health policy should encourage utilization of chiropractic services.

RECENT STUDIES OF PATIENT SATISFACTION WITH CHIROPRACTIC CARE

6. In what follows we review several recent studies of patient satisfaction with chiropractic care. These studies are methodologically sound, had excellent research design, adequate sample

sizes, sophisticated and detailed questionnaires, and employed sound analytical and statistical techniques in establishing their results.

7. Wardwell (1989) undertook a public opinion survey of 500 hundred randomly selected households in Connecticut via telephone interviews. A total of 21% of the respondents had visited a chiropractor at least once, of whom 78% rated the treatment they received as effective or very effective; 89% were satisfied or very satisfied with the amount of personal attention they received; 72% were satisfied with the cost of their treatment, and 72% said they would see a chiropractor again for the same or similar problem. Among those familiar with chiropractic but who had never consulted a chiropractor, 59% said they would visit a chiropractor if they had a problem chiropractors treat and 68% would encourage a friend to go visit a chiropractor. Only 12% said they would refuse to consult a chiropractor. (Wardwell, 1989, Table 3, p.170)

8. Interestingly the survey also uncovered a lot of uncertainty and some misinformation on the part of the public about chiropractic. For example, 26% of the respondents believed that chiropractors prescribed drugs. Of those familiar with chiropractic, 83% agreed with the statement that "chiropractors are entitled to just as much respect as MDs", and 82% believed that "most MDs look down unfairly on chiropractors" (Wardwell, 1989, p.170).

9. It is noteworthy that only 51% of those who visited chiropractors had insurance plans pay for the cost. Only 27% of the total sample had insurance covering chiropractic care and a surprisingly high 48% did not know whether or not they had insurance coverage for chiropractic care. Indeed, even 26% of the users of chiropractic care did not know whether their insurance plans covered chiropractic services. The high rate of utilization of and satisfaction with chiropractic treatment despite lower insurance coverage and higher out-of-pocket payment is remarkable. At the very least, one can argue that patient satisfaction with chiropractic treatment meets the market test of consumer satisfaction which free (i.e. full third party coverage) service may disguise or confound.

10. In a telephone interview of 693 respondents in New Jersey (Sanchez, 1991), 88% of the users of chiropractic care were satisfied (23%) or fully satisfied (65%) with the "effectiveness" of chiropractic treatment; and were similarly satisfied with the chiropractor's professional attitude (97%), competence (93%), and level of attention (96%).

82% of the users were satisfied with the "speed of recovery", while 71% were satisfied with the number of visits, and 77% were satisfied with the "costs of the treatment". The greatest sources of dissatisfaction for users of chiropractic services were number of visits (29%) and the cost (23%).

11. "The overwhelming majority of non-users did not ascribe their non-utilization to reasons which reflect negatively on chiropractic" (Sanchez, 1991, p.171). Indeed, of the 449 non-users of the sample only 6% gave as their reason for not seeing a chiropractic as not trusting the skills of chiropractors (Sanchez, 1991, Table 6, p.171). Interestingly, a majority of non-users did not know whether chiropractic treatment was covered by their health insurance policy (Sanchez, 1991, Table 10, p.173).

12. The survey also found that gaps in the public's knowledge about the range of problems that chiropractors treat and about insurance coverage translate into non-utilization of chiropractic care. Sanchez's research has obvious implications for consumer information services for the chiropractic profession, a subject outside the scope of this study. One aspect however, deserves to be mentioned here. "The most powerful media available for changing public opinion are family members and friends who are users and who trust chiropractic. The study found that advertisements in the various electronic and print media accounted for only a minute portion of initial utilization. Creativity in a chiropractor's approach to gaining and sustaining the trust of his/her patients can pay off in important benefits to the lives and health of the patients, as well as to his/her practice and the profession" (Sanchez, 1991, p.174). Gaining and sustaining the trust of patients can only be achieved with effective care. It is this that provokes and gives momentum to patient referrals which is widely accepted as a leading factor accounting for the growth in popularity of chiropractic care.

13. Also notable from Sanchez's research is the finding that the public is aware of the alternative health professionals to chiropractors for conditions usually treated by chiropractors. The most important alternative is, of course, the physician followed next by the physical therapist (physiotherapist). The public also cited osteopaths, orthopaedists, masseurs, and others as alternative professional sources of care. Users and nonusers alike rated chiropractors highly in terms of competence, education and training.

14. In another survey, Sawyer and Kassak (1993) attempted to determine the attitudes of chiropractic patients regarding the process and

outcomes of care and to identify patient characteristics which might predict satisfaction. The mailed questionnaire to 541 new and returning patients was in content and organization patterned after the patient questionnaire developed for use in the RAND Health Insurance Study and Medical Outcomes Study (Ware, 1978). A response rate of 69.5% considered excellent for mailed questionnaires, was achieved. Only 3% of the responding patients felt that there had been no improvement in their clinical problem and another 9% indicated slight or minimal improvement, whereas 47.4% felt that their health improved substantially or completely while they were patients of chiropractors (Sawyer and Kassak, 1993, Table 5, p.28). Significantly, 84% felt that the care received was "just about perfect" and 97% agreed that they would recommend their chiropractor to a friend or relative. Not surprisingly, patients also expressed a very high level of satisfaction with the skill of their chiropractors and the adequacy of the facilities in which care was received. Patients were, however, less satisfied with the adequacy of insurance coverage. As well, 28% either agreed or strongly agreed with the view that improvement in their condition took longer than expected.

15. In a regression analysis examining the relationship between independent variables and level of satisfaction, it was the patients' assessment of treatment outcome that was the single most important factor predicting patient satisfaction or dissatisfaction. This is hardly surprising. Patients who indicated that their health improved substantially or completely also expressed the highest degree of satisfaction with the accessibility to the chiropractor, the financial aspects of care, and the conduct and competence of their chiropractors.

16. The study also found, as in the other studies reviewed here, that chiropractic patients generally reflect the demographic and social characteristics of the society in which they live. The social profile of the chiropractic patient is not skewed towards the lower socio-economic groups in society as earlier sociological studies tended to suggest. Chiropractic populations are barely distinguishable from the general population in Canada also (Coulter, 1985). This is also generally true in other countries including New Zealand (A Report of the Commission of Enquiry, 1979), the United Kingdom (Kane, 1974), and Australia (1977).

PATIENT SATISFACTION WITH PHYSICIAN CARE FOR LOW-BACK PAIN

17. In a patient satisfaction survey of 160 medical patients with LBP, Deyo and Diehl (1986) concluded that the item that elicited the largest number of dissatisfied responses (24.5%) was the question concerning the adequacy of explanation of what was wrong with the patient. Failure to receive an adequate explanation of the problem was also highly correlated with worry about serious illness and dissatisfaction with physicians. They concluded "that explanation of symptoms has a high priority among patients with low-back pain ... this should not require more time or more tests and may in fact reduce demands for diagnostic tests while improving patient satisfaction" (Deyo and Diehl, 1986, p.30).

18. In response to the finding that many family physicians believed they had little to offer patients with back pain and in order to improve the cost-effectiveness of primary care for low-back pain, a U.S. group of researchers including three physicians, developed, implemented and evaluated a physician education intervention (Cherkin et al, 1990). The program was designed to provide family physicians with specific information, tools and techniques that the literature and previous research suggested should be associated with more satisfactory and effective care. The intervention consisted of an up-to-date summary of scientific knowledge through lectures; videotapes contrasting effective and ineffective doctor-patient encounters, and a clinical assessment form for low-back pain. In the study, the beliefs about back pain, attitudes and behaviours of 15 primary care physicians in a large health maintenance organization clinic and 14 family physicians in six group practices were evaluated before and after the education intervention. The findings of this innovative and apparently unique study suggest that the education program was somewhat successful in increasing physician comfort and confidence in the management of back pain and in encouraging doctors to provide their patients with additional information and reassurance. However, only 12% of the doctors felt that the clinical evaluation form was very useful; 52% felt that they were "not at all or slightly" more knowledgeable about the scientific/technical aspects of managing low-back pain and 48% were not at all or slightly more knowledgeable about the psychosocial and interpersonal aspects of caring for LBP. The intervention "had little effect on the number of providers who claimed to have negative feelings about back pain patients or to feel frustrated by

back pain patients... If negative provider attitudes acquired during training or the early years of practice prove to be stronger determinants of patient outcomes than provider knowledge and confidence, fundamentally changing the responses of practising physicians to patients with certain types of problems may prove very difficult" (Cherkin et al, 1991, p.1171). Furthermore, the physicians were assessed for their clinical responses to visits by three different hypothetical LBP patients before and after the education intervention. The changes were perplexingly disappointing (Cherkin et al, 1991, p.1171).

COMPARISON OF CHIROPRACTIC AND PHYSICIAN MANAGEMENT OF LOW-BACK PAIN

19. In a study that compared patient satisfaction with chiropractic and physician management of various conditions, but specifically including LBP, Cherkin and MacCornack (1989, p.353) concluded that "the percentage of chiropractic patients who were 'very satisfied' with the care they received for low-back pain was triple that for patients of family physicians (66% versus 22%, $P < 0.001$)". The family physician and chiropractic patient samples were similar in terms of age and sex but chiropractic patients had significantly more episodes of pain and had experienced pain for a longer period of time, which is to say that the patients who sought chiropractic care had worse health status on average. The sample included 457 enrollees of the Group Health Co-operative of Puget Sound between the ages 18 and 64, a 40-year old staff model health maintenance organization. The total sample included 215 patients who received their care from family physicians and 242 patients who obtained their care from chiropractors. Only enrollees who visited physicians or chiropractors for LBP were included in the study sample.

20. Patients of family physicians were significantly less satisfied than patients of chiropractors with the information they received about their back problem, including the cause of the back pain, recovery time content of care and instructions on exercise, posture and lifting. Patients also differed significantly vis-à-vis their perception of provider concern about their pain. Patients of family physicians were significantly much less satisfied than chiropractic patients with respect to the amount of time the provider spent listening to their description of the pain; the degree to which providers believed their pain was real and providers' concern about the pain after the office visit. Physicians' patients were also significantly much less confident in the correctness of the

diagnosis, or in the effectiveness of the treatment; and in the comfort with which the provider was in dealing with the patients' complaint of back pain. It is also important to note that these results, indicating a strong preference for and satisfaction with chiropractic management of LBP, were maintained after controlling for any differences in health status, frequency of back pain episodes, or years since first episode of back pain.

21. In another study (Cherkin et al, 1988) random samples of 605 family physicians and 299 chiropractors in the State of Washington were surveyed to determine their attitudes and beliefs about LBP and how they would respond to three different hypothetical cases of LBP patients. While 42% of the family physicians felt they had been poorly trained to manage LBP, only 14% of the chiropractors felt this way. There were other significant differences between the two professions in the management of LBP. One was that more than 40% of family physicians admitted to an emphasis on the "art of medicine over the science of medicine" and to "often deliberately taking advantage of the placebo effect" to help their patients, while few (10%) chiropractors did so.

22. In terms of treatment, physicians were twice as likely as chiropractors to prescribe bed rest for all three types of patients, and did so for longer periods of time. Spinal manipulation was rarely utilized/ordered by physicians, whereas 90% of chiropractors did so. There were no significant differences between the two professions in their use of heat/ice therapy. Physicians were significantly more likely to recommend physical therapy than chiropractors. Interestingly, "10% of family physicians and 16% of chiropractors noted that they would consult a specialist, such as an orthopaedic surgeon, a neurosurgeon, or a neurologist" on these hypothetical cases (Cherkin et al, 1988, p.477). Between 82 to 90% of physicians prescribed anti-inflammatory drugs; 21 to 76% prescribed analgesics; 30 to 50% for muscle relaxants; and 1 to 6% prescribed sedatives. "None of the chiropractors indicated they would recommend even non prescription drug therapy such as aspirin for the patients" (Cherkin et al, 1988, p.477).

23. There were significant differences between chiropractors and physicians as to diagnosis of the principal underlying cause of LBP. Physicians were much more likely to think that the major reason for LBP was muscle strain (47% compared to 14%) whereas chiropractors attribute the cause mainly to joint dysfunction or vertebral subluxation (55% versus 2%). Physicians were also more likely to think the causes to be psychosomatic, and to believe that most LBP will resolve itself within a

few weeks without professional help (88% versus 28%); less likely to believe that appropriate therapy for most LBP requires a precise diagnosis (31% versus 91%), and more likely to believe that there is nothing physically wrong with many patients who complain of LBP (19% compared to 3% for chiropractors). It is hardly surprising then that physicians are less comfortable and more frustrated by patients with LBP, and that only 55% of family physicians versus 99% of chiropractors feel that most of their patients are very satisfied with the care they render. Incidentally, it is this study that led to the authors to collaborate with others to develop a physician education intervention to improve physician management of LBP (Cherkin et al, 1991). The summary of this study was presented above. (see para 18 above).

CANADIAN STUDIES OF PATIENT SATISFACTION

24. Sandhu and Schoner (1992) report a study on the images of and public attitudes towards health professionals in British Columbia. A telephone interview of 450 randomly sampled individuals plus 150 from a list of patients provided by the British Columbia Chiropractic Association generated a wide range of information, some pertinent to this literature review. Of interest to the overall issue of patient satisfaction are the following results. From the random sample, 32% indicated that they would first consult chiropractors for back pain. However, from the patient list (i.e. past and present patients of chiropractors) 83.3% said that they would consult chiropractors first rather than physicians (10%) in the event of back pain (Sandhu and Schoner, 1992, p.19). The results for neck pain are similar. These results suggest that patients of chiropractors were highly satisfied with the care they received for back pain. The figure of 32% from the random sample is of interest and is the highest for any condition (e.g. headaches, neck pain, joint pain, etc.) identified by those in the random group as one for which they would choose a chiropractor first.

25. One may conclude that the public has come to believe that chiropractors are especially effective in treating back pain. This is supported by the notable fact that, even in a sub-category of the random sample in the B.C. study called "non-believers" (those who would not consider visiting chiropractors for any condition), chiropractors were thought to be more successful in treating back pain than physicians (Sandhu and Schoner, 1992, Exhibit 3, p.31). Among the "believers", consisting mainly (70%) of users of chiropractic services, the

discrepancy between chiropractors and physicians in terms of ability to treat back pain successfully is the widest with a mean of 9.0 for chiropractors and a mere 3.5 for physicians on a scale of 10. In fact, in all sub-categories of the survey sample, and for all conditions, respondents gave the lowest score to physicians for the treatment of back pain. This is a clear message that the public in British Columbia does not believe that medical management of LBP is effective. The contrast could hardly have been more marked.

26. All categories of the survey sample considered chiropractors to be more attentive and caring; more accessible, convenient and available; much less reliant on drug therapy; and less likely to create new problems or make old problems worse. Interestingly, both users and non-users, believers and non-believers, considered chiropractors "less affordable", no doubt reflecting the lack of full insurance coverage under Medicare. The study also found, not surprisingly, that use of chiropractic services increases for those with increased levels of income and education.

27. Over half of the general public (random sample) reported having visited a chiropractor, though it is not clear over what period. The great majority were referred by an acquaintance or family member, with approximately a quarter referred by physicians, mainly for back and neck problems (Sandhu and Schoner, 1992, p.13).

28. In Ontario a 1990 study based upon randomly sampled telephone interviews of 502 subjects 18 years of age or older found that the public was on average more satisfied with chiropractic care than physician care (COMPAS, 1990). This study did not have specific questions dealing with the treatment of LBP. It did, however, raise an interesting question that should be of concern to the chiropractic profession: "Do patients with muscle and other specified conditions seek assistance from MDs out of habit, because of lower cost to themselves, or because they are not aware of high patient satisfaction with chiropractic treatment for these conditions?" (COMPAS, 1990, p.4).

29. In another Canadian study involving two separate surveys of physicians (MDs) and chiropractors (DCs) Patel-Christopher (1990) gives indirect evidence of patient satisfaction and direct evidence of physician satisfaction with chiropractic management of LBP. It was found that about 62% of MDs refer patients with musculoskeletal pain to DCs and 9.5% of MDs actually consult DCs as patients themselves. Of those MDs who do refer

their patients to DCs, 42% had been doing so for only one to five years. 69% of the MDs, an impressive figure, had increased their frequency of referral during their medical practice whereas 7.7% were referring less often.

30. Judging from the surveys summarized above the image of the chiropractic profession clearly continues to improve rapidly in Canada. Opposition from physicians is greatly decreased, and there is encouraging evidence for patients of understanding and cooperation between the two professions at the level of practice. This seems to be due partly to the increased evidence of the effectiveness and safety of chiropractic treatment and patient satisfaction. It will also be due in part to a growing appreciation by the public and medical profession alike of the quality of chiropractic education in recent decades. More than 50% of the profession in Canada has graduated since 1980, with qualifications that are superior to chiropractors before them. During this time 70% of chiropractic students have had a university degree at the time of entering chiropractic college. Two years of university study in qualifying science courses is required in North America just as for medicine. "Government inquiries and independent investigations by medical practitioners have affirmed that today's chiropractic undergraduate training is of equivalent standard to medical training in all pre-clinical subjects. On contemporary faculties, chiropractors are joined by appropriate basic science and medical specialists, whose absence in earlier times provided ground for valid criticisms of chiropractic education" (Chapman-Smith, 1993, p.2).

31. It should also be noted that the increase in the utilization of chiropractic care occurred even as there was a very rapid growth in the supply of physicians in Canada and the U.S.A. Chiropractors are thus not merely "filling in" as primary care givers in medically underserved areas (Yesalis et al, 1980). Rather, the trends and data suggest that chiropractors are frequently perceived as a valid alternative or substitute for physicians in the provision of care for select illnesses, disease or disabilities. LBP is clearly one such area where effective substitution is occurring.

REVEALED PREFERENCE: THE MARKET TEST OF PATIENT SATISFACTION

32. We have noted many times already that an important source of referrals to chiropractors is former and current patients of chiropractors. Furthermore, patients of chiropractors choose

them over physicians for select health care problems and most notably for LBP. Study after study has pointed to the increasing use of chiropractors over time. Even the rate of referrals by physicians appears to be increasing in many jurisdictions including Ontario and British Columbia. The resulting higher rate of utilization is in itself ample testimony of patient satisfaction in light of the fact that chiropractic care imposes a higher out-of-pocket costs to patients than care from physicians. In the language of economics, the fact that patients choose chiropractic care over physician care despite the higher cost is "revealed preference", indicating greater patient satisfaction with chiropractic care for LBP. To counter or disprove this inference one would be obliged to argue that patients of chiropractors are elitist and are merely judging quality and effectiveness of care by its higher price (cost). This argument is, however, not credible. It flies in the face of evidence from Canada and the U.S.A. that patients are not happy paying higher cost for such care and want better insurance coverage for chiropractic services. Nor are user fees for physician services popular or desired in Canada, and in any case, are not advocated for their effect of increasing medical utilization rates.

33. Also noteworthy is the rising utilization rate of chiropractic care during an era of open antagonism by many in the medical profession. Chiropractic was condemned as "quackery" and dangerous for much of its history, and it is only during the past decade that a major shift in medical attitudes appears to be occurring. Quite simply, elitism or snobbery cannot be the reason for the rapidly growing popularity of chiropractic, especially in the treatment of LBP.

34. Having regard to the evidence of the effectiveness and cost-effectiveness of chiropractic management of LBP, the high levels of patient satisfaction, the changes of attitude that are taking place with respect to chiropractic practice, and the changes within the profession itself, there would be significant potential value in a comprehensive survey of attitudes and behaviour at this time. This should be a survey of consumers, chiropractors, and medical doctors. It would yield new and valuable information that would assist in the development and monitoring of health policy in the field of LBP. Preliminary design of and comment upon such a survey, which is an express part of our terms of reference, forms the subject of the next chapter.

CHAPTER 7

SURVEY RESEARCH OF USERS, NON-USERS AND THE PROFESSIONS

“In order to gain a better understanding of reasons for the increased utilization of chiropractors and, ultimately, to allow for the development of appropriate and effective health policies, it is important that users, non-users and providers be surveyed for the requisite information.”

INTRODUCTION

1. As the literature and data reveal, low-back pain (LBP) is a common and vexing health problem. Indeed, the review of the literature also indicates that chiropractors do offer effective treatment and management of LBP, and that a growing proportion of Canadians are going to chiropractors for relief of this and other problems. For instance, in 1978 about 5% of Canadians consulted a chiropractor at least once (Canada Health Survey, 1981). Twelve years later another survey revealed that the proportion of Ontarians visiting chiropractors was 9% (Ontario Ministry of Health, 1992). A number of factors, including increased medical referral of patients, suggest this trend will continue.

2. In order to gain a better understanding of reasons for the increased utilization of chiropractors and, ultimately, to allow for the development of appropriate and effective health policies, it is important that users, non-users and providers be surveyed for the requisite information. More precisely, it is important to obtain insights into the knowledge, awareness, attitudes and behaviours of patients/consumers who experience LBP, and also from the providers (both chiropractors and physicians) who treat this health problem. The purpose of this section, then, is to outline and discuss the objectives, content, and methodology of a formal survey - including the key research questions and indicators, data collection issues which would have to be considered, and aspects of the possible work plan.

THE SURVEY APPROACH

• Objectives

3. One of the essential reasons for undertaking surveys is to collect information which cannot be gleaned from secondary data sources. To be sure, there are a number of administrative data files (e.g. Workers' Compensation Board,

provincial hospital morbidity, OHIP files, etc.) which provide information of the utilization of the system for treatment of a variety of health problems, including LBP. However, these data sets contain information only for patients for whom the health condition was severe enough to enter the existing health care system for treatment. As many population-based health surveys indicate, a sizeable proportion of the population who experience chronic health problems, such as arthritis and LBP, do not obtain care from the “traditional” acute care system. Hence, it is quite likely that the incidence and prevalence of these problems, and in this case LBP, are understated significantly. Hence, one of the first survey objectives would be to obtain a more complete picture of the nature and extent of the problem of LBP.

4. Following from the first primary objective, it would be important to gain a better understanding of the reasons a notable proportion of the population “lives with” chronic health problems such as LBP. In the population-at-large, what are the levels of knowledge and awareness, the attitudes and behaviours vis-à-vis chronic LBP and alternative treatment approaches for this problem? If levels of knowledge and awareness are low, this finding would be useful to policy makers and professional leaders in the development of appropriate information/education/health promotion programs.

5. Thirdly, for those people who have experienced LBP and who are aware of the various treatment options, it is important to gain an appreciation of the reasons they chose one approach or health care provider over another. Did the choice arise from perceptions of comparative effectiveness or was it made for some other reason? Again, this information would be useful to policy makers and the professions in the creation of appropriate information packages. It would also be useful to collect information regarding the degree of patient satisfaction with treatments selected.

6. While it is important to gather relevant information from the general population, it is equally important to obtain data which cannot be derived from secondary sources from the providers of care for LBP. Indeed, as recent research indicates, the perceptions of quality of care, outcomes and effectiveness of treatment can differ between the providers and the patients. A better appreciation of these differences can allow for the development of programs to reduce the problem of information asymmetry between patients and providers (e.g., Wennberg's "Interactive Video" for Prostatectomy, Ontario Ministry of Health, 1990). Important data to obtain from chiropractors and physicians who treat LBP patients relate to areas such as socio-demographic information, practice patterns, intra- and inter-professional relationships (e.g., referral patterns, practices), insurance coverage and pricing.

7. More complete and reliable information from formal surveys of patients and providers will also be useful in the development of policies and programs to foster substitutability and complementarity of the most effective treatment approaches for this ubiquitous and frequently chronic health condition, to allow the health care system to capture the very large potential savings in management of LBP.

• **Key Research Questions**

8. In view of what the literature reveals and of the previous objectives for needing to undertake surveys of the population-at-large and providers of treatment for low-back pain, there are a number of key research questions which can be developed, a preliminary list of which follows. When the concepts of these surveys are clarified and finalized, this preliminary set of indicators will provide the basis for the development of a complete set of operational definitions which then can be translated into specific questions for the survey instruments.

PRELIMINARY RESEARCH QUESTIONS

• **Consumer/Patient Orientation, Knowledge and Attitude**

- Who are the users and non-users of health care providers related to LBP?
- What are the socio-demographic and health status characteristics of users and non-users?
- Are non-users people who experience no LBP, or do they endure chronic pain?
- If so, what are the reasons for not seeking

treatment and management of the problem?

- How does LBP impact activities in daily living?
- How many disability days are attributable to LBP? What proportion of time are sufferers unable to perform usual activities?
- How many bed days are reported, and how many days of work are missed due to this problem?
- What is the population's history of BP? How long have they reported having this condition? What previous episodes have they experienced?
- What is the population's perception of the causes of LBP?
- What are the knowledge and awareness levels of the population with respect to LBP and the various treatment modalities?
- Of people with LBP, what proportion seek treatment? From whom? What are the reasons for choosing the profession they have chosen? Was there a referral by a health professional?
- What is the frequency of treatments received? What are the treatments?
- According to the users, how effective are their therapies?
- How well does the population understand the problem, the therapies which exist, and their implications?
- How helpful is the information they receive from their health care provider?
- Overall, how do users and non-users rate their health status, their ability to function in daily activities?
- How does treatment for LBP contribute to health status?
- How closely does the patient/user assessment of treatment outcome compare to actual functional status?
- Were users better informed after treatment for LBP?
- Were recommendations made by their providers on ways to prevent/reduce the chance of further occurrences of LBP? Did the patients implement these recommendations?
- What are the attitudes and beliefs with respect to health care providers who treat LBP i.e., chiropractors, physicians, physiotherapists?
- From which provider does the population perceive/believe they will receive the most effective treatment? Why? Which group is most sensitive to the needs of the patient? The most caring?

- Which provider is better at motivating people, in a positive way, to alter their habits contributing to LBP?
- What are the satisfaction rates with different providers?
- Which provider would the population refer "friends" to for treatment of LBP?
- Why does the population (generally) not use chiropractors more frequently for treatment of LBP?
- What are the reasons chiropractors receive/do not receive referrals from family practitioners?
- What are the reasons which chiropractors are not used more frequently for problems related to LBP?
- How do chiropractors perceive themselves: primary care providers? specialists? both?

• Provider Orientation, Practice and Attitudes

- With respect to the major health care providers, i.e., chiropractors and family physicians, are they adequately trained to deal with LBP?
- What are the socio-demographic characteristics of the providers? What are their practice styles and patterns?
- What are the range of treatments and management protocols which the provider groups provide?
- What are provider attitudes and beliefs with respect to LBP? About patients who present themselves with LBP? About the various strategies for managing LBP?
- What are the referral practices of chiropractors and family physicians for patients with LBP? Do chiropractors refer to MD specialists? To family practitioners? Do family practitioners refer to chiropractors? What are the reasons?
- What are the attitudes and beliefs which physicians hold with respect to chiropractic? And vice versa? What associations/relationships exist?
- How and why do chiropractors and physicians think that patients choose to come to them for treatment?
- How are "new" patients obtained or recruited?
- How many patients are normally treated during a given period of time (day, week, month)? How much time is usually spent with each patient?
- Do providers spend sufficient time informing patients about the nature of the condition treatment options, and ways to prevent future occurrences?
- How important are different forms of diagnostic technology (e.g. plain x-ray, CT/MRI) in understanding, treating and managing LBP?
- Which characteristics/aspects of chiropractic and medicine are most important in treating and managing LBP?

9. The above represent a number of the essential research questions regarding the treatment and management of low-back pain which can be addressed via special surveys of the population (users and non-users) and providers. The value of such surveys is that, if done correctly, they can reveal much useful information for policy-making purposes. Surveys are appropriate (quick and relatively inexpensive) ways to obtain facts related to the population's and providers' knowledge, attitudes, beliefs, expectations and behaviour with respect to many aspects of LBP.

• Data Collection Issues

10. The usefulness of the survey, however, will be determined almost entirely by the rigor of its methods. Hence, it is essential that the following conditions be met:

- that all questions have a clear purpose and are carefully worded to obtain the needed information;
- that the final sample closely reflects the population of interest; and
- that the data collection is both valid and reliable.

11. In order to develop appropriate survey instruments and data collection approaches, a number of excellent guides to designing survey instruments, sample design, and data collection methods may be employed. Important examples are: the RAND Health Insurance Study (Brook et al, 1979), Canada Health Survey (1981), Survey Sampling (Statistics Canada, 1983), Quality Guidelines (Statistics Canada, 1985), Development and Design of Survey Questionnaires (Statistics Canada, 1985), Canada's Health Promotion Survey (Health and Welfare Canada, 1988), Ontario Health Survey 1991 (Ontario Ministry of Health, 1992). A number of unpublished reports which make use of validated survey instruments, as well as articles from the general scientific literature on LBP and patient satisfaction (cited throughout our literature review and in the bibliography) also are useful in this regard. Once a complete range of research questions is clarified, and accepted, draft questionnaires can be designed. The process

whereby one “gets from here to there” is described later in the section on “work plan”.

12. As well as developing an agreed-upon list of research questions from which questionnaires can be developed, there are a number of other key issues which could have to be addressed. Each of these issues is described below with a recommendations for dealing with them. This list should not be considered exhaustive.

DATA COLLECTION METHODS

13. For reasons of cost, face-to-face interviews of a sample of the population and providers are excluded from consideration. Good use, however, can be made of telephone surveys or a combination of telephone and mail surveys.

14. Since it would be desirable to survey a sample of the population-at-large, comprising both non-users and users of treatments for LBP, it is likely that a telephone survey, using a random-digit-dialling process would be the best way of accessing both groups in the population. Sample sizes and stratification factors are discussed later. However, with respect to surveying the providers, there are two approaches, i.e., telephone survey or mail survey. The sampling frames (i.e. membership lists) for both chiropractors and family practitioners can be obtained from the respective provincial associations and/or regulatory bodies.

15. Selecting which data collection method to use depends on a number of factors, and each approach has its advantages and disadvantages. To help in the selection of the survey method, it is useful to compare the two data collection approaches on each of the following criteria as shown in Table 10:

RECOMMENDATION

16. Choosing between a mail survey and telephone interviews is not straight forward, but we recommend mail survey for providers and a telephone survey for consumers.

• Reasons for a Mail Survey for Providers

- it offers almost the same degree of data quality as the telephone survey;
- response rate is anticipated to be sufficiently high (in the range of 60%) that non-response bias will not be a major factor;
- more interviews can be completed within a

- given budget by mail than by telephone;
- a longer and more complex questionnaire can be administered than would be the case if the survey were conducted by telephone;
- it is easier to access busy professionals with a mail survey than by telephone;
- it offers the best opportunity to deal effectively and cost efficiently with respondent sensitivity;
- it provides the greatest degree of anonymity to respondents;
- overall, if response rates are relatively high, the mail survey rates highest in terms of cost effectiveness

• Reasons for a Telephone Survey for Consumers/Patients

- it is a cost-effective means of accessing the population of users and non-users;
- it assures a relatively high response rate;
- administratively, it is a relatively efficient way of obtaining accurate answers and, hence, a good representative picture of the situation among the population in general;
- telephone interviewers are easier to select (no concern for personal appearance) and training is shorter; and
- can determine reasons for refusal and characteristics of non-respondents.

SAMPLING METHODOLOGY

17. During the design of the sampling methodology, careful attention has to be paid to each of the following issues:
- definition of the population (e.g., sampling unit, extent and time);
 - the sampling frame;
 - the sample size and level of statistical reliability; and
 - the method of selecting sampling units (e.g., probability versus non-probability, proportionate versus disproportionate, stratified versus non-stratified).

RECOMMENDATION

• Population Definition

18. With respect to patients/consumers, or users and non-users of treatments for low-back pain, the sampling unit would be the population in Ontario, the sampling extent would be persons over the age of 13, likely broken down into different age groups and sex, and the sampling time

would be a specified two or three week period. The choice of the age of 13 rather than an age of 18 or 21 is in response to the evidence that many teenagers suffer from low-back pain.

19. With respect to providers, the population would be practising chiropractors and family physicians in Ontario who managing patients with treating low-back pain. The sampling time would encompass the same period for the population-at-large.

• **Sampling Frame**

20. For the population-at-large, the sampling frame would be the bank of residential telephone numbers which can be accessed via a random digit dialling (RDD) procedure. For the providers, the sampling frames are the list of chiropractors and family physicians available from the respective provincial associations/regulatory bodies.

• **Sample Size and Statistical Reliability**

21. In order to obtain information from the population-at-large regarding the incidence and prevalence of low-back pain, and the use/non-use of various treatment approaches, it is estimated that the sample size would have to be at least approximately 1,000 Ontario residents. On such a sample, at the 95% confidence interval, aggregate results would be accurate to plus or minus 3 percentage points.

22. For the provider groups, sample sizes of approximately 500 each will yield aggregate results which are accurate to plus or minus 4-5 percentage points.

• **Sampling Method**

23. It is suggested that a stratified systematic random sampling procedure be used for each of the surveys. With respect to the population-at-large, the universe likely should be stratified on the basis of a geographical variable (east, west, south and north), an age variable (teenagers, young & middle adults, and elderly), an educational attainment variable, by sex (males and females), and perhaps income. For the providers, the basic demographic data from the membership lists can be used to stratify according to the first four factors above.

24. It is strongly emphasized that these are preliminary design considerations. When additional information becomes available, following the complete specification of research questions and other matters, more precise

estimates of sample sizes can be made. These will take into consideration such elements as precision required, level of dis-aggregation desired, design effects, population size, and non-response.

NON-RESPONSE ERROR

25. Non-response error is a systematic bias in survey data, usually unknown, caused by the failure of some subjects to participate in the study. The error arises when key characteristics of non-respondents differ from those who respond to a survey. The key issues surrounding non-response in this particular study (especially the mail survey) are the measures that will be taken to enhance the response rate to the survey and the procedures for identifying and calibrating for the error if it exists.

RECOMMENDATION

26. Suggested measures which should be taken to enhance the response rates to the mail surveys include:

- attaching a covering letter to the questionnaire signed by the Deputy Minister of Health (or a senior official) or consulting firm which outlines the purpose of the study and clearly indicates the anonymity/confidentiality of responses;
- a self-addressed, postage paid return envelope should be included in each mailing;
- definitions of key concepts should be included in the questionnaire to make it easier for respondents to answer;
- two to three weeks after the initial mailing, a second mailing should be made; the second mailing should include another questionnaire;
- where possible, questions should be pre-coded to make it easier for respondents to answer;
- a person should be identified in the covering letter and questionnaire to whom respondents can call toll-free to answer questions about the surveys;
- confidentiality must be guaranteed;
- questionnaires must be designed to collect information efficiently. Once it is known how long the questionnaire should take to complete (i.e., following the pretest), respondents should be told this in the covering letter.

27. Even with these measures, non-response will occur, and this raises questions about the

potential for systematic error to be present in the data. Two techniques can be undertaken to assess the level and significance of non-response error:

- “Trend analysis” - groups of respondents could be formed depending on whether they responded to the first or second mailing. Analytically, it can be determined if a significant trend exists across response waves, then use this information to model the characteristics of non-respondents. The modelled data could finally be statistically tested against the survey results to assess whether non-response error is present in the survey results; and
- With basic information (socio-demographics) obtained on all providers on the membership lists, these data can provide a basis for comparing and statistically testing differences between the characteristics of respondents and non-respondents.

CONFIDENTIALITY OF INFORMATION

28. If honest answers are to be obtained in the surveys, respondents must be guaranteed that the information they provide will not be released to anyone on an individual basis. They must also feel secure that nowhere will their names be reported as participants in the study.

RECOMMENDATION

29. In addition to making it clear (as noted above) that respondents’ anonymity will be guaranteed, as will the confidentiality of the information they provide, it is important to:

- have the return envelope for completed questionnaires pre-printed with the institutional address of the researchers.
- point out to the respondents (in the covering letter) that they are returning their questionnaires directly to the researchers, i.e., bypassing the Ministry of Health and other interested parties.
- assign a numerical identifier to returned questionnaires and to store the matching list of identifiers and respondent names in a secure file; and
- protect the computer tape compiled from completed questionnaires with a security code to which only members of the research group would have access.

WORK PLAN CONSIDERATIONS

30. In order to undertake the complete development of survey design and data collection and capture there are number of essential steps which must be completed. Regardless of which approach is taken, these steps have to be followed.

• Survey Design Phase

31. With the comprehensive review of the literature done in the front part of this report, a full familiarization of the issues surrounding the treatment and management of low-back pain has been achieved. The next essential step is the questionnaire design, an important part of which is the development of a set of refined research questions which has full agreement and acceptance by the stake holders. A very preliminary set of such questions has been outlined earlier in this section of the report. It is important that agreement on such questions, concepts and terms be obtained before time and effort is invested in drafting questionnaires.

32. Once draft questionnaires are developed, it is important to conduct an internal pretest to test the quality of the instruments. The next step involves testing the instruments with a few “real” respondents. Throughout this process, it is advisable to liaise with the clients.

33. The next step in the process is the design of the sampling methodology. At this stage, it is important to obtain a good description of the sampling frames. After reviewing the sample requirements with the clients, the study population can be defined in precise terms and the specifications for the sampling frames can be made, encompassing details around stratifying variables, method of selecting sampling elements and units, sample sizes and allocations of the sample to the various strata. Again, prior to proceeding further, it is advisable to review the sample design with the clients.

34. In order to ensure that the instruments and sampling methodology work properly in the field, it is essential to complete a pretest of the surveys and data collection methods. This involves doing the population-at-large and provider surveys under “real” conditions, i.e., via telephone and mail surveys of 10-15 respondents in actual field conditions, compiling the pretest results, and making any necessary alterations.

• **Data Collection and Capture Phase**

35. This phase involves such steps as preparing for whatever field work will be necessary, doing the fieldwork, and completing the data capture, including quality control (both during the fieldwork and during the transfer of questionnaire data to a computerized data-base).

• **Analysis and Reporting Phase**

36. If surveys are to be developed and conducted as a subsequent activity, a third and obviously integral stage of the overall process is an analytical phase. Key steps in this phase include the preparation of the data base for the final analysis (e.g., univariate analysis and some analysis of non-response error), the final analysis (examine univariate results, prepare and examine bivariate and multivariate results), and the preparation of a draft final report for presentation to and consideration by the clients.

CHAPTER 8

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

"It is the massive economic significance of low-back pain that has made it the focus of our review and we have been surprised at the depth of the evidence to support the proposition that chiropractic management of low-back pain is well proven to be successful in terms of effectiveness, cost-effectiveness and patient satisfaction."

1. Low-back pain (LBP) is ubiquitous. There are numerous epidemiological and related statistical studies documenting the very high incidence and prevalence of LBP. It is equally clear that disability caused by LBP has increased dramatically over the past two decades. Health economists have shown that LBP is among the most costly of health problems. It accounts for the single largest percentage of workers' compensation benefit payments for illness and injury. In every jurisdiction, a small proportion of LBP sufferers account for a large proportion of the direct costs to the workers' compensation system. Many disabled workers remain permanently out of the work force. In the U.S.A., estimates of the direct costs of back pain as a proportion of total health care expenditure vary but some comprehensive and reliable estimates place the figure in the 8-10% range. We have suggested earlier that LBP has not received due attention from the government and the medical profession. There is a tendency not to focus on morbidity but rather on causes of mortality. Physicians' lack of success in managing LBP is probably also a factor. The diffuse burden of the costs of LBP is also a factor, and a significant portion of the direct cost is paid by workers' compensation funds and not the Ministry of Health.

2. In the current and foreseeable economic and fiscal environment, financial considerations are paramount in policy making in the health care system. We expect the appropriate Ministries (health, labour and finance) to take the problem of LBP a lot more seriously than they have hitherto. Health economists have argued for a few decades that there is significant potential for improving both outcomes and efficiency of management of a variety of health problems through policies of human resource (manpower) substitution. LBP is an excellent illustration of this potential as argued in chapters four and five (Stano et al., 1992; Ebrall, 1992).

3. The cost-effectiveness of managing LBP is thus of the utmost importance. We have offered evidence from Australia, Canada, the U.K., and the

U.S.A. and much expert testimony of potential savings of many millions of dollars annually if more of the management of low-back pain was in fact transferred from physicians to chiropractors. The magnitude of the estimates of saving is very impressive, and demands serious attention and response in light of the painful cost pressures faced in the health care system in Ontario, Canada, and indeed other countries. A comparison of health care costs for chiropractic and medical patients "suggest a significant cost-saving potential for users of chiropractic care. The results also suggest the need to reexamine insurance practices and programs that restrict chiropractic coverage relative to medical coverage" (Stano, 1993, p.291).

4. Chapters 3, 4 and 5 refer to ample evidence of the efficacy and cost-effectiveness of chiropractic management of LBP compared to several alternatives which include physician management of LBP and a variety of medical therapies. At present, physicians see more back pain patients than chiropractors in Canada, though the utilization of chiropractic care is growing rapidly and constitutes a rising proportion of patients with LBP who seek treatment. Chiropractic care for LBP is safe. Indeed, the literature suggests that it is not only very safe but safer than medical and other professional management of LBP.

5. Much of the evidence of the cost-effectiveness of chiropractic management of LBP can be characterized as "persuasive" only because of design limitations, but many studies in a number of countries have sound methodology, and overall the evidence is very convincing. Some of shortcomings in some of the studies mean that the effectiveness and cost-effectiveness of chiropractic care for LBP may be slightly overstated or understated. However, the overall body of evidence is sizeable, clear and consistent. It shows that major savings following chiropractic management come from fewer auxiliary costs, fewer hospitalizations, and a significant reduction in chronic problems and disability.

6. Equally impressive is the evidence that questions the effectiveness, efficacy and the safety of medical therapies for LBP. The literature declares them in most instances ineffective, and some even harmful. It is surprising to discover how “unscientific” traditional medical therapies for LBP are and, further, how slowly clinical research affects actual medical practice. Most low-back surgery is not founded on evidence from randomized or even non-randomized clinical trials. An example of this is lumbar spinal fusion. There are poor guidelines on use for many surgical therapies, and serious questions raised by rates of complications and regional variations in practice. In addition the economic cost of medical management is high. We have suggested that more clinical trials of the medical therapies are warranted and that physicians be better informed about the treatment approaches that are harmful and otherwise counterproductive. The Ontario Workers’ Compensation Institute is aware of the problem. “The medical care system itself may present opportunities for reducing iatrogenic disability if it inadvertently extends disability through inappropriate interventions” (Frank et al, 1990, p.9). Iatrogenic disability from medical treatment and wasted resources were also emphasized in a recent major review of LBP and its economic costs. (Deyo et al, 1991). In another review, assessing the different diagnoses and therapies for low back pain and published in the *British Medical Journal*, Frank (1993, p.902) concluded that “a strictly medical approach to management is disadvantageous”. Frank (1993, p.902) also suggested that “medical training may hinder a satisfactory therapeutic approach”. He concluded that “manipulation has been found effective in reducing pain of longer duration... patients with acute and chronic pain showed early benefits from manipulation” (Frank, 1993, p.906). We note too that short continuing education courses to improve physicians’ management of LBP have proven to be disappointing.

7. For decades, as providers of “scientific medicine”, the medical profession has been partisan in its criticism of chiropractors, and in the U.S. the American Medical Association has been found in breach of antitrust laws in an unlawful attempt to contain and, indeed, ultimately eliminate the alleged “quackery” of chiropractic. Despite this official medical disapproval and the relatively higher private out-of-pocket cost to patients, the use of chiropractic has grown steadily over the years. It is now accepted as a legitimate healing profession by the public and an increasing number of physicians. Indeed, many MDs have sought to learn and incorporate spinal

manipulation into their management of LBP (Bachop, 1980). We offered a lot of empirical evidence in Chapter 6 that patients are very satisfied with chiropractic care for LBP, and considerably less satisfied with physician management. Patient satisfaction is an important health outcome indicator and adds further weight to the clinical and health economic results favouring chiropractic.

8. There are also very important economic efficiency arguments that favour the greater use of chiropractors in the management of LBP. Chiropractic therapy is almost wholly hands-on care. There is a minimal use of auxiliary services, no use of drugs, and little hospitalization. Payments to chiropractors for services they provide is 80% or more of the total cost of care. For physician management of LBP the proportions are virtually reversed. Prescription drugs, laboratory tests, referrals to specialists, and hospital in-patient care lead to a four or five increase in total health care costs of the physician’s own billing for medical services. While it is difficult to compare the unit-time fees of chiropractors and physicians, it seems likely that chiropractors’ hourly fees are less than those of physicians. Certainly they are not more (Price Waterhouse, 1992).

POLICY RECOMMENDATIONS AND REFORM

9. In our view, the constellation of the evidence of (a) the effectiveness and cost-effectiveness of chiropractic management of LBP, (b) untested, questionable and even harmful use of medical therapies by physicians, (c) the economic efficiency of chiropractic over physician care for LBP (d) the safety of chiropractic care and (e) the preference and satisfaction expressed by patients of chiropractic, together offers an overwhelming case in favour of much greater use of chiropractic services for the management of LBP. However, the desired change in the health care delivery system will not occur by itself, by accommodation between the professions, or by actions on the part of workers’ compensation boards or the private sector generally. The government will have to instigate the reform and monitor the progress of the desired changes called for by our overall conclusion.

10. Governments in Canada will need to make several changes, some of which are mutually reinforcing. We offer here the more basic reforms that would serve to transform the management of low-back pain in the desired direction. We note that all of these recommendations have been made before, though sometimes softened by the call for

further research or consideration. Furthermore, these recommendations are not unique to Canada. They have, indeed, been proposed in many other countries including notably Australia, New Zealand, the U.K. and the U.S.A.

• **Recommendation 1**

11. There should be a shift in policy now to encourage the utilization of chiropractic services for the management of LBP, given the impressive body of evidence on the effectiveness and comparative cost-effectiveness of these services, and on high levels of patient satisfaction.

• **Recommendation 2**

12. Perhaps the most important change the government should initiate immediately is offer full coverage under the Ontario Health Insurance Plan for the cost of chiropractic care for patients with low-back pain. Thirteen years ago, Kelner et al (1980) suggested that "artificial limitations placed on the dollar amount per patient, per year, seem unwarranted... our survey indicates that few patients make high numbers of visits for any particular problem, although chronic conditions may require long-term care". The shift in utilization from physician to chiropractic care should lead to significant savings in health care expenditure judging from evidence in the Canada, U.S.A., the U.K. and Australia, and even larger savings if a more comprehensive view of the economic costs of low-back pain is taken. In a review of the literature in the U.S.A. on the cost-effectiveness of chiropractic care Dean and Schmids (1992, p.50) concluded that "chiropractic care is a lower cost option for several prominent back-related ailments. This is despite its 'last resort' status for many patients. One explanation for this is the lower insurance coverage of chiropractic care. If chiropractic care is insured to the extent other specialists are stipulated it may emerge as a first option for patients with certain medical conditions. This could very well result in a decrease in overall treatment costs for these conditions".

13. The data and studies we reviewed suggest that over-treatment of patients is not a common problem in chiropractic practice. "In Ontario, where government benefits are available for up to 22 treatments per annum, only approximately 8% of patients have used that maximum in recent years" (Chapman-Smith, 1993, p.7). We presume that the chiropractic profession, through its association and regulatory college, is willing to

participate in utilization reviews and monitoring systems to curb any over-treatment. Full OHIP coverage could be extended on condition that such control mechanisms be implemented by the chiropractic profession and monitored by the government itself.

14. Saving cost through expanding insurance may seem improbable and paradoxical. However, in the Canadian experience, greater insurance coverage has in fact led to substantial cost-savings and improved efficiency on several occasions in the past. The challenge for the governments to adopt related policies that capture the savings and ensure increased utilization of chiropractic services by patients with low-back pain is by way of substitution for physician services. Such substitution is seen in the U.S.A. (Stano, 1993). Relevant policies are suggested below.

• **Recommendation 3**

15. We recommend that chiropractors be employed by tertiary hospitals in Ontario. Hospitals already employ chiropractic in the United States with good effect. Meade et al (1990) recommended the introduction of chiropractic into NHS hospitals in the U.K. The Layton Report, following a major review of Medicare in Australia, make a similar recommendation in that country. Unnecessary or failed surgery is not only wasteful and costly but, ipso facto, low quality medical care. The opportunity for consultation, second opinion and wider treatment options are significant advantages we foresee from this initiative which has been employed with success in a clinical research setting at the University Hospital, Saskatoon. Introduction of chiropractic services in hospitals would also emphasize government acceptance of the value of chiropractic care. A further advantage will be the new and appropriate opportunities for further research.

16. Hospital privileges should be extended to all chiropractors for the purposes of treatment of their own patients who have been hospitalized for other reasons, and for access to diagnostic facilities relevant to their scope of practice and patients' needs. This recommendation has been made in a previous government funded study in Canada (Kelner et al, 1980, p.255). Such institutional support is warranted in the interests of patients. It is illogical to extend hospital privileges to the medical profession for diagnostic and treatment services for patients with low-back pain but deny similar privileges to a profession whose services have far more extensive evidence of safety, effectiveness and cost-effectiveness. We are

recommending that policy should encourage patients with LBP to use chiropractic services - they should not be deterred by limitations on access to publicly-funded facilities. Again, there should be utilization review and monitoring of hospital based chiropractic services in the interest of efficiency and patient welfare.

17. Chiropractors should have access to all pertinent patient records and tests from hospitals, physicians, and other health care professionals upon the consent of their patients. Access should be given upon the request of chiropractors or their patients. Such access can be expected to lead to better patient management and lower costs of treatment. There are, of course, circumstances under which a health professional or institution may justifiably refuse to transfer the pertinent information and records.

• **Recommendation 4**

18. Since LBP is of such significant concern to worker's compensation, chiropractors should be engaged at a senior level by Workers' Compensation Board to assess policy, procedures and treatment of workers with back injuries. This should be on an interdisciplinary basis with other professional, technical and managerial staff so that there is early development of more constructive relationships between chiropractors, physicians, physiotherapists and Board staff and consultants. A very good case can be made for making chiropractors the gatekeepers for management of LBP in the workers' compensation system in Ontario.

• **Recommendation 5**

19. Chiropractic services should be fully integrated into the health care system. Because of the high incidence and cost of LBP, managed health care groups (community health centres, comprehensive health organizations, and health service organizations) and long-term care facilities should employ chiropractors on a full-time and/or part-time basis. Additionally such organizations should be encouraged to refer patients to chiropractors.

• **Recommendation 6**

20. The government should make the requisite research funds and resources available for further clinical evaluation of chiropractic management of LBP, and for further socio-economic and policy research concerning the management of LBP generally. Such research should include surveys to

obtain a better understanding of patients' choices, attitudes and knowledge of treatments with respect to LBP. The objective of these surveys should be better information for health policy, programme planning and consumer education purposes.

• **Recommendation 7**

21. Chiropractic education in Ontario should be in the multidisciplinary atmosphere of a university with appropriate public funding. Chiropractic is the only regulated health profession in Ontario without public funding for education at present, and it works against the best interests of the health care system for chiropractors to be educated in relative isolation from other health science students. "There are also valid grounds for public support of students in chiropractic colleges. Since education and training in most other forms of health care have been accepted as a public responsibility, it seems invidious to deny such assistance to students of chiropractic" (Kelter et al, 1980, p.256).

22. Chiropractic is the only regulated health profession in Ontario without public funding for education. Chiropractic education is within the university system in other countries, such as Australia and England. The Canadian Memorial Chiropractic College (CMCC) is a private, non-profit institution with no direct support from government funds. Members of the profession pay an annual fee to CMCC to subsidize the cost of the students' education. Currently chiropractic students pay approximately \$32,000 in tuition costs over a four-year period of study. In our view, public support for chiropractic education is also warranted on grounds of equity and access. Given the high cost of education access is dependent on the financial means of students or their families, and denied to many. This situation is quite different from access to educational programs for all other regulated health professions.

• **Recommendation 8**

23. Finally, the government should take all reasonable steps to actively encourage cooperation between providers, particularly the chiropractic, medical and physiotherapy professions. Lack of cooperation has been a major factor in the current inefficient management of LBP. Better cooperation is important if the government is to capture the large potential savings in question and, it should be noted, is desired by an increasing number of individuals within each of the professions.

IMPLICATIONS FOR THE PRINCIPAL PROFESSIONS

24. The success of better integration and utilization of chiropractic services for the management of LBP depends to a considerable degree upon co-operation between physicians and chiropractors. Earlier inter-referral of patients between physicians and chiropractic has economic consequences for both, notwithstanding the better results in terms of health status and cost efficiency. Achieving appropriate levels of referrals is, therefore, not uncomplicated. The more extreme reform proposed above, under which chiropractors might become the predominant gatekeepers for injured workers with LBP, would have even greater economic consequences.
25. Further and improved co-operation between the professions is occurring present. It will be enhanced through the physicians and chiropractors working in multidisciplinary teams in community health centres, health service organizations, comprehensive service organizations, and hospitals. Referral of patients from medical practitioners to chiropractors now accounts for about 20% of chiropractic practice. The foundations for greater co-operation are already evident in other areas as well, notably in research and professional meetings.
26. Though the long history of organized medicine's rejection of chiropractic, which once had substantial grounds, is gradually closing it is still a force to be reckoned with. Organized medicine has opposed first the inclusion and then increased coverage of chiropractic services under private and public insurance. It has been successful in prohibiting subsidies for chiropractic education and otherwise ensuring that chiropractic care is less accessible and affordable for patients (Feldstein, 1977, p.54-56). In the 1980s, following a successful antitrust lawsuit against the American Medical Association for the illegal restraint of chiropractic, several major medical associations have made official statements acknowledging the value of chiropractic and encouraging greater co-operation between physicians and chiropractors (Chapman-Smith, 1992; Caplan, 1991). We believe that there is considerable value in such official pronouncements and urge the two professions to collaborate and work towards such declarations at the provincial and national levels in Canada.
27. There are, by now, many examples of co-operation between physicians and chiropractic manifest in joint national and international conferences and colloquia and, equally importantly, joint research. We recommend further joint research under the sponsorship of the Medical Research Council, the most prestigious research establishment in Canada. "The chiropractic profession has failed to produce a reasonable volume of research in the past. In the last 10 years the profession has established a strong research presence for its size. This has been aided by the emergence of competent researchers, strong funding within the profession, and a new era of co-operation with medicine. There has been work of major importance concerning chronic low-back and leg pain... four major controlled trials of chiropractic treatment of back pain... all involve the co-operation of medical and chiropractic researchers" (Patel-Christopher, 1990, p.56). There is indeed, growing evidence of such co-operation in many countries (Chapman-Smith, 1991; Nyiendo, 1992, Caplan, 1991).
28. In the U.S.A. the federal government, through the Agency for Health Care Policy and Research, has established an interdisciplinary panel which includes both physicians and chiropractors to produce better and comprehensive guidelines for the management of low-back pain. The RAND Corporation recently published a report of a similar consensus panel, as mentioned in Chapters 4 and 5. There should be a similar developments in Canada. Such panels could, of course, be established by the professional bodies themselves but we recommend that, as in the U.S.A., federal and provincial governments in Canada take the lead. This could be done through the Canadian Coordinating Office for Health Technology Assessment, already in existence and funded by the federal government and provincial governments, including Ontario, or some similar agency.
29. In concluding this report we wish to stress that, in accordance with our terms of reference, we have focused upon LBP only in our review of chiropractic services. For this reason the review may leave the impression that chiropractic is valuable for the management of LBP but of no proven worth for other disorders. This, most emphatically, is not the message we intend. Chiropractors treat patients with many conditions, often in an apparently competent and cost-effective manner. In our review, we came across many studies that support the effectiveness of chiropractic care for headache and migraine, neck pain, referred and radiating pain, and a variety of other ailments. However, about 80% of chiropractic patients present with disorders of the neuromusculoskeletal system, among which LBP constitutes the most frequent presenting system.

The World Health Organization has recently described occupational LBP in the industrialized world as an epidemic that can only be controlled through multidisciplinary management, including use of the unique skills of the chiropractic profession (Mikheev, 1993). Leading medical and chiropractic authorities in the U.S.A. and Canada see greater potential for cost savings in the field of management of LBP than anywhere else in the health care system. (Burton and Cassidy, 1992). It is the massive economic significance of LBP that has made it the focus of our review and we have been surprised at the depth of the evidence to support the proposition that chiropractic management of LBP is well proven to be successful in terms of effectiveness, cost-effectiveness and patient satisfaction. We are satisfied that neither the medical profession nor governments in Canada have been aware of the evidence we have found. We respectfully suggest that the government of the province of Ontario should now introduce policy reforms in accordance with our recommendations.

APPENDICES

Appendix 1

Back Related Hospital Separations, per 100,000 by Sex & Province, 1980-81 to 1989-90

	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90
MALE										
NFLD	91.8	90.6	119.5	100.2	107.5	123.9	139.7	150.5	131.4	139.6
PEI	215.5	194.4	136.1	177.1	191.9	187.5	238.3	286.7	250.9	240.9
NS	123.3	123.7	104.4	113.6	124.6	117.5	114.4	110.2	108.2	103.8
NB	107.6	121.9	137.5	155.7	153.3	145.0	159.9	147.8	119.1	120.6
QUE	46.4	48.3	53.7	52.5	49.9	52.1	55.8	55.4	46.8	41.7
ONT	67.0	68.7	73.2	76.2	68.4	73.7	68.7	73.3	70.7	66.4
MAN	51.5	58.0	65.7	59.0	67.0	65.4	70.4	68.6	64.9	66.1
SASK	126.0	129.4	123.3	136.3	121.7	126.4	128.6	122.7	111.8	122.9
ALTA	91.5	91.0	111.7	124.8	133.7	143.7	145.7	143.3	137.4	140.5
BC	78.8	82.4	82.3	99.4	96.6	95.4	93.7	84.4	86.1	81.0
CAN	71.1	73.3	78.3	83.4	80.7	83.8	84.1	84.1	78.5	75.7
FEM										
NFLD	98.6	84.6	105.5	94.1	107.0	121.9	139.9	135.8	110.0	108.6
PEI	216.6	193.4	186.5	205.2	164.0	197.4	232.6	276.5	259.2	257.3
NS	120.9	114.9	105.6	119.1	116.4	119.0	122.7	118.1	120.5	109.7
NB	96.4	107.5	113.8	123.6	138.3	138.3	129.7	141.2	126.2	126.9
QUE	35.3	34.8	34.5	37.9	39.2	38.6	40.2	41.1	37.4	35.2
ONT	72.1	71.0	72.6	71.9	69.7	73.1	70.7	72.1	67.4	66.9
MAN	55.1	64.2	59.5	68.2	68.7	63.0	64.2	71.8	61.7	70.5
SASK	138.6	138.7	124.9	125.3	116.4	119.7	122.5	127.5	129.0	135.4
ALTA	96.1	90.6	106.2	114.7	126.6	131.5	139.5	132.8	140.3	126.7
BC	80.0	82.1	84.0	100.0	103.4	95.9	104.8	95.4	94.2	84.5
CAN	70.3	69.7	71.4	75.6	76.7	77.8	79.5	79.5	76.0	73.1
Total	94.8	87.8	112.6	97.4	107.3	122.9	140.2	143.7	120.9	123.9
NFLD										
PEI	216.2	194.4	161.9	191.0	176.3	192.8	234.5	282.0	255.4	251.8
NS	121.9	119.3	104.7	116.6	120.2	119.1	118.4	114.3	115.2	106.6
NB	102.1	115.0	125.9	139.8	146.3	142.3	144.5	144.7	123.6	123.7
QUE	40.8	41.3	43.8	45.1	44.4	45.2	47.8	48.2	42.2	38.6
ONT	69.8	69.9	73.0	74.2	69.3	73.6	70.0	72.8	69.2	66.8
MAN	53.2	61.4	62.8	63.8	68.1	64.5	67.5	70.8	63.7	68.7
SASK	132.4	134.1	124.6	131.1	119.5	123.4	126.1	125.6	121.0	129.5
ALTA	93.5	91.0	109.2	120.1	131.0	137.8	143.3	138.4	139.5	134.2
BC	79.5	82.2	83.1	99.7	100.3	95.9	99.5	90.2	90.4	83.1
CAN	70.7	71.5	74.9	79.6	78.9	80.9	82.0	82.0	77.5	74.6

Source: Statistics Canada: Morbidity on Diskette

Appendix 2

Hospital Separations Age Specific Rates & Age Standardized Rates per 100,000, by Province, 1989-90

AGE	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	AGE STD
NFLD	0.0	2.2	9.8	12.7	72.9	148.3	189.5	220.0	245.5	218.6	228.1	175.2	172.3	148.7	130.7	112.6	123.9
PEI	0.0	0.0	20.0	38.8	169.7	225.4	188.8	363.0	329.3	501.5	557.2	540.2	332.4	321.6	594.0	549.8	251.8
NS	1.7	1.6	11.2	15.9	39.9	90.9	91.1	174.8	167.0	190.0	167.6	192.5	232.0	203.1	196.1	228.9	106.6
NB	0.0	3.9	7.2	17.0	62.7	122.6	144.1	188.6	210.9	248.6	197.2	209.5	227.1	187.6	204.8	204.3	123.7
QUE	0.2	1.1	5.2	8.0	15.5	31.7	39.4	46.1	65.8	73.0	64.2	72.0	63.7	66.5	86.6	93.4	38.6
ONT	1.0	0.9	3.3	12.9	25.1	46.8	66.8	84.0	89.4	108.5	128.9	110.9	123.4	157.0	156.5	188.5	66.8
MAN	0.0	5.1	9.0	19.6	21.3	48.6	53.9	77.1	100.2	125.0	109.0	137.9	121.8	105.9	174.0	241.6	68.7
SASK	0.0	1.2	11.5	34.7	47.9	74.0	109.9	168.3	160.9	194.5	226.1	179.3	229.1	344.3	375.0	448.6	129.5
ALTA	1.0	2.6	7.4	26.0	40.1	91.7	117.1	161.1	199.7	211.2	244.9	236.2	243.8	363.8	387.3	348.7	134.2
BC	0.0	1.0	5.6	19.2	36.4	53.6	89.4	101.0	107.7	129.8	156.2	166.2	158.7	170.8	206.5	214.7	83.1
CAN	0.6	1.5	5.7	15.3	29.6	55.5	74.2	96.1	107.9	123.5	134.0	128.7	132.8	159.5	178.5	199.9	74.6

Source: Statistics Canada: Morbidity on Diskette

Appendix 3

Days in the Hospital Age Standardized Rates by sex & Province, Canada, 1980-81 to 1989-90

	1980-8 1	1981-8 2	1982-8 3	1983-8 4	1984-8 5	1985-8 6	1986-8 7	1987-8 8	1988-8 9	1989-9 0
MALE										
NFLD	728.1	761.2	990.4	841.9	856.9	828.6	845.1	1083.1	824.6	836.5
PEI	1832.2	1627.0	1734.3	1180.1	1602.6	1444.5	1459.0	1587.3	1210.1	1208.0
NS	1235.1	1244.5	979.4	1020.0	1039.0	877.1	958.0	849.2	779.8	796.3
NB	948.0	1069.4	1157.1	1333.3	1382.8	1307.4	1252.6	1060.8	706.9	843.0
QUE	429.7	420.6	468.1	478.1	468.3	443.6	503.2	503.0	437.7	368.6
ONT	699.0	709.7	734.9	764.3	653.8	660.1	628.8	634.4	585.9	506.9
MAN	434.3	508.9	573.8	461.5	673.1	692.7	623.5	467.0	582.3	459.6
SASK	905.8	1037.2	808.6	865.8	829.9	841.3	797.5	796.1	663.5	799.0
ALTA	796.2	894.0	1020.4	1021.5	1072.0	1113.7	1061.5	925.9	872.5	960.0
BC	568.7	602.0	565.2	716.2	643.1	604.4	677.6	589.7	565.5	526.9
CAN	649.7	676.9	695.4	724.8	689.6	676.8	683.8	652.7	592.4	552.1
FEM										
NFLD	798.2	794.5	862.1	773.5	823.3	945.2	899.2	969.7	751.0	744.2
PEI	1835.7	1853.1	1664.0	1950.7	1663.6	1859.1	1632.0	1993.7	1645.9	1867.7
NS	1319.8	1217.5	1120.6	1211.0	1141.2	1176.7	1140.4	1022.9	1118.6	1027.5
NB	1053.8	1096.1	1116.8	1373.7	1266.3	1332.5	1409.4	1313.4	1025.8	1021.0
QUE	431.2	356.6	343.1	446.2	398.6	420.2	431.3	496.0	430.4	405.0
ONT	851.0	801.0	831.3	785.6	760.3	793.2	788.9	725.6	655.2	612.3
MAN	713.5	650.3	599.4	699.3	729.7	721.8	581.6	664.6	974.8	629.1
SASK	1056.8	978.0	801.9	889.0	793.8	765.1	862.0	918.0	968.9	911.2
ALTA	832.5	833.2	939.8	1016.8	1203.1	1151.5	1308.8	1094.7	1053.0	1034.7
BC	663.9	704.1	635.9	842.6	962.5	762.4	926.2	774.5	754.9	607.5
CAN	743.4	700.7	698.0	755.5	757.4	752.6	781.1	742.0	703.6	638.1
TOTAL										
NFLD	755.6	780.2	928.8	809.3	840.7	886.8	876.0	1036.0	789.6	790.5
PEI	1834.4	1758.6	1719.9	1580.4	1629.5	1659.3	1533.5	1805.7	1428.0	1574.1
NS	1278.0	1237.1	1051.2	1126.8	1089.9	1047.9	1054.3	944.2	966.2	916.1
NB	1010.0	1087.9	1144.1	1364.8	1326.8	1330.2	1349.1	1201.7	885.6	933.3
QUE	433.4	386.9	404.0	466.2	428.0	430.4	465.1	503.4	439.0	391.6
ONT	782.0	757.5	787.5	774.5	709.2	734.5	718.1	687.1	626.7	563.7
MAN	582.5	583.5	590.7	588.0	707.6	717.9	604.7	580.8	826.8	559.5
SASK	984.4	995.8	807.0	882.5	816.9	805.4	834.5	865.0	831.9	861.6
ALTA	811.5	861.4	978.6	1023.6	1151.8	1135.2	1202.4	1022.1	972.1	1006.9
BC	619.2	658.7	600.4	781.1	823.4	690.7	809.4	689.9	668.5	570.2
CAN	700.6	689.5	698.4	743.2	728.2	720.1	739.0	705.3	658.3	600.2

Source: Statistics Canada Morbidity on Diskette

Appendix 4

Days in the Hospital Age Specific Rates & Age Standardized Rates by Province, Canada, 1989-90

AGE	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	AGE STD
NFL	0.0	4.4	74.6	81.9	575.5	775.5	960.3	1062.8	1209.8	1547.4	1356.1	1300.4	1525.0	1563.8	1183.1	1066.8	790.5
PEI	0.0	0.0	140.1	223.1	1046.7	802.6	575.9	2043.4	2373.4	2477.2	3169.1	2850.2	2404.7	2150.8	5963.4	5786.9	1574.1
NS	74.3	14.8	55.9	60.9	231.0	531.8	606.2	1175.8	1102.1	1413.4	1447.1	1435.6	2502.2	2653.8	3127.7	2540.1	916.1
NB	0.0	23.4	19.9	52.7	295.1	582.4	821.2	1089.8	1446.1	1580.4	1052.1	1951.6	1954.2	1742.8	3231.7	3050.1	933.3
QUE	0.5	4.1	20.2	31.5	103.7	198.2	253.7	308.6	494.5	603.1	559.8	553.9	719.1	1022.5	1464.5	2067.8	391.6
ONT	2.4	6.8	12.2	45.7	135.2	275.1	424.2	510.1	619.7	729.1	1034.9	885.3	1030.7	1670.5	1902.6	2727.5	563.7
MAN	0.0	24.1	25.8	71.1	85.1	165.4	353.1	449.2	687.2	860.2	864.0	1018.4	946.6	1001.6	1892.1	3607.8	559.5
SAS	0.0	3.7	34.6	105.4	212.7	207.0	476.5	790.0	740.3	1171.1	1077.0	1078.1	1550.1	2618.6	3579.1	5551.0	861.6
ALB	1.0	11.0	22.9	130.6	170.0	409.3	574.6	874.5	1058.0	1521.1	1541.8	1752.3	2120.4	2908.8	3922.0	4938.2	1006.9
BC	0.0	1.9	21.2	65.8	114.7	246.8	415.3	502.4	607.3	765.5	1007.5	1186.2	1147.5	1589.4	1889.7	2599.7	570.2
CAN	3.5	7.3	22.1	59.1	153.2	287.7	420.7	554.5	688.8	852.8	972.5	974.0	1145.4	1632.8	2110.0	2893.6	600.2

Source: Statistics Canada Morbidity on Diskette

BIBLIOGRAPHY

- Abenhaim, L., Suissa, S. (1987) "Importance and economic burden of occupational back pain: a study of 2500 cases representative of Québec", *Journal of Occupational Medicine*, Vol. 29, p. 670.
- Abenhaim, L., Suissa, S., Rossignol, M. (1988) "Risk of recurrence of occupational back pain over three year follow-up", *British Journal of Industrial Medicine*, Vol. 45, No. 12, pp. 829-833.
- Abenhaim, L., Suissa, S., Rossignol, M., Bilodeau, D. (1985) *The social burden of occupational back pain: a study of 3000 cases representative of Québec*, Montréal: École de relations industrielles, Université de Montréal.
- Akeson, W.H., Murphy, R.W. (1977) "Low Back Pain", *Clinical Orthopaedics*, Vol. 129, pp 2-3.
- Allan, D.B., Waddell, G. (1989) "An historical perspective on low back pain and disability", *Acta Orthopaedica Scandinavica*, Vol. 60, No. 234, pp. 1-23.
- Anderson, R., Meeker, W.C., Wirick, B.E., Mootz, R.D., Kirk, D.H., Adams, A. (1992) "A meta-analysis of clinical trials of spinal manipulation", *J Manipulative Physiol Ther*, Vol. 15, pp. 181-194.
- Andersson, G.B.J. (1981) "Epidemiologic aspects on low-back pain in industry", *Spine*, Vol. 6, No. 1, pp. 53-60.
- Anonymous (1990) "Low back pain: the scorecard", *Harvard Medical School Health Letter*, Vol. 15, No. 11, pp. 1-3.
- Arkuszewski, Z. (1986) "The efficacy of manual treatment in low back pain: a clinical trial", *Manual Medicine*, Vol. 2, pp. 68-71.
- Assendelft, W.J.J., Bouter, L.M., Kessels, A.G.H. (1991) "Effectiveness of chiropractic and physiotherapy in the treatment of low back pain: a critical discussion of the British randomized clinical trial", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 5, pp. 281-286.
- Assendelft, W.J.J., Koes, B.W., Van der Heijden, G.J.M., Bouter, L.M. (1992) "The efficacy of chiropractic manipulation for back pain: blinded review of relevant randomized clinical trials", *J Manipulative Physiol Ther*, Vol. 15, pp. 487-494.
- Australia (1977) *Report of the Committee of Inquiry into Chiropractic, Osteopathy, Homeopathy, and Naturopathy*. (Webb Report) Aust. Gov't Publishing Service: Canberra.
- Australia. National Occupational Health and Safety Commission (1989) *Preventing back pain at work: resource kit*, Sydney: Worksafe Australia, National Occupational Health and Safety Commission.
- Bachop, W.E. (1980) "Controlled clinical trials, third party, payers, and the fall of the chiropractor", *Journal of Manipulative and Physiological Therapeutics*, Vol. 3, pp. 93-6.
- Banks, S.D. (1983) "Lumbar facet syndrome: An assessment of treatment by spinal manipulative therapy", *Journal of Manipulative and Physiological Therapeutics*, Vol. 6, No. 4, pp. 175-80.
- Benn, R.T., Wood, P.H.N. (1975) "Pain in the back: an attempt to estimate the size of the problem", *Rheumatology and Rehabilitation*, Vol. 14, pp. 121-128.
- Benson, J.D. (1987) "Control of low back pain: using ergonomic task redesign techniques", *Professional safety*, Vol. 32, No. 9, pp. 21-25.
- Bergemann, B.W., Cichoke, A.J. (1980) "Cost effectiveness of medical vs. chiropractic treatment of low-back injuries", *Journal of Manipulative and Physiological Therapeutics*, Vol. 3, No. 3, pp. 143-147.
- Bergquist-Ullman, M., Larsson, U. (1977) "Acute low back pain in industry. A controlled prospective study with special reference to therapy and confounding factors", *Acta Orthop Scand*, Suppl 170, pp. 11-117.
- Biering-Sorensen, F. (1982) "Low-back trouble in a general population of 30-40-50-, and 60- year old men and women", *Danish Medical Bulletin*, Vol. 29, No. 6, pp. 289-299.
- Biering-Sorensen, F. (1983) "A prospective study of low back pain in a general population - I. Occurrence, recurrence and aetiology", *Scand. J. Rehab. Med.*, Vol. 15, pp. 71-79.
- Bigos, S., Spengler, D., Fisher, L., Nachemson, A., Martin, N.A., Zeh, J. (1986) "Back injuries in industry: a retrospective study III employee related factors", *Spine*, Vol. 11, pp. 252-56.

- Bigos, S.J., Spengler, D.M., Martin, N.A., Zeh, J., Fisher, L., Nachemson, A. (1986) "Back injuries in industry: a retrospective study", *Spine*, Vol. 11, pp. 246-55.
- Breen, A.C. (1977) "Chiropractors and the treatment of back-pain", *Rheumatology and Rehabilitation*, Vol. 16, pp. 46-53.
- Brigham, C.R., Harris, J.S. (1990) "Low back pain, part II: administrative, disability, and workers' compensation issues", *Occupational and Environmental Medicine Report*, Vol. 4, No. 12, pp. 92-96.
- British Association of Physical Medicine (Brewerton D.A., Chairman) (1966) "Pain in the neck and arm: a multicentre trial of the effects of physiotherapy", *Br J Med*, Vol. 1, pp. 253-258.
- Brodie, D.J., Burnett, J.V., Walker, J.M., Lydes-Reid, D. (1990) "Evaluation of low back pain by patient questionnaires and therapist assessment", *Journal of Orthopaedic and Sports Physical Therapy*, Vol. 11, No. 11, pp. 519-29.
- Brodin, H. (1984) "Cervical pain and mobilisation", *Int J Rehab Res*, Vol. 7, 190-1.
- Brontfort, G. (1986) "Chiropractic treatment of low back pain: a prospective survey", *Journal of Manipulative and Physiological Therapeutics*, Vol. 9, pp. 99-113.
- Brontfort, G. (1989) "Chiropractic versus general medical treatment of low back pain: a small scale controlled clinical trial", *Am J Chiropractic Med*, Vol. 2, pp. 145-50.
- Brook, R.H., Ware, J.E. Jr., Davies-Avery, A., Stewart, A.L., Donald, C.A., Rogers, W.H., Williams, K.N., Johnston, S.A. (1979) *Overview of Adult Health Status Measures Fielded in RAND's Health Insurance Study*, Supplement to *Medical Care*, Vol. 17, No.7.
- Brunarski, D.J. (1984) "Clinical trials of spinal manipulation: a critical appraisal and review of the literature", *Journal of Manipulative and Physiological Therapeutics*, Vol. 7, No. 4, pp. 243-249.
- Buerger, A.S. (1980) "A controlled trial of rotational manipulation in low back pain", *Manual Medicine*, Vol. 2, pp. 17-26.
- Bunker, Elizabeth M., O'Sullivan, Justin, Horrigan, K.R. (1989) *Preventing back pain at work: ergonomics applied*, 2nd Edition, Brisbane, A.C.T.: National Safety Council of Australia.
- Bureau of National Affairs (Washington, D.C.) (1988) *Back injuries: costs, causes, cases and prevention*, Washington, D.C.: Bureau of National Affairs.
- Burton, C.V. (1981) "Conservative management of low back pain", *Low Back Pain*, Vol. 70, No. 5, pp. 168-183.
- Burton, C.V.; Cassidy, J.D. (1992) "Economics, Epidemiology and Risk Factors", in Kirkaldy-Willis, W.H. and Burton, C.V. (eds), *Managing Low-Back Pain* 3rd Edition, Churchill Livingstone, New York, Chapter 1.
- Camp, P.E. (1988) "Invasive procedures for treating herniated discs: clinical and cost considerations", *Occupational Medicine: State of the Art Reviews*, Vol. 3, No. 1, pp. 75-90.
- Canada Health Survey (1981) *The Health of Canadians*, Supply and Services Canada: Ottawa.
- Canadian Physiotherapy Association (1990) *Orthopaedic Division Newsletter*, Canadian Physiotherapy Association, Edmonton, November/December Issue.
- Canadian Union of Public Employees. National Health and Safety Department (1988) *Back injuries: strategy for prevention*, CUPE National Health and Safety Department, Ottawa: Canadian Union of Public Employees.
- Caplan, R.L. (1991) "Chiropractic in the United States and the changing health care environment: a review from outside the profession", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 1, pp. 46-50.
- Carette, S., Marcoux, S., Truchon, R., Grondin, C., Gagnon, J., Allard, Y., Latulippe, M. (1991) "A controlled trial of corticosteroid injections into facet joints for chronic low back pain", *The New England Journal of Medicine*, Vol. 325, No. 14, pp. 1002-1007.
- Cassels, J.R. (ed) (1981) *Staffing Primary Care in 1990: Physician Replacement and Cost Savings*, Springer, New York.
- Cassidy, J.D., Kirkaldy-Willis, W.H. (1988) "Manipulation" in Kirkaldy-Willis, W.H. (Ed.), *Managing Low Back Pain*, Second Edition, Churchill Livingstone, New York, pp. 287-296.

- Cassidy, J.D., Kirkaldy-Willis, W.H., McGregor, M. (1985) "Spinal manipulation for the treatment of chronic low-back and leg pain: an observational study" in Buerger, A.A., Greenman, P.E. (Eds), *Empirical Approaches to the Validation of Spinal Manipulation*, Charles C. Thomas Publisher: Springfield, ILL, pp. 119-148.
- Cassidy, J.D., Lopes, A.A., Yong-Hing, K. (1992) "The immediate effect of manipulation versus mobilisation on pain and range of motion in the cervical spine: a randomized controlled trial", *J Manipulative Physiol Ther*, Vol. 9, pp. 570-75.
- Chapman-Smith, D. (1987) "Chronic low back pain - new evidence, a new approach", *The Chiropractic Report*, Vol. 1, No. 2.
- Chapman-Smith, D. (1991) "The RAND study - manipulation for low-back pain", *The Chiropractic Report*, Vol. 5, No. 6.
- Chapman-Smith, D. (1992) "Manipulation for chronic back pain - strong new evidence of long term results", *The Chiropractic Report*, Vol. 6, No. 4.
- Chapman-Smith, D. (1993) "Lumbar Disc Herniation - New Research and New Conclusions", *The Chiropractic Report*, Vol. 7, No. 4, Toronto.
- Charteris, J. (1991) "Our low-productivity crisis: you cannot afford to dismiss low back pain as a significant factor", *Safety Management*, Vol. 17, No. 12, pp. 26, 28.
- Cherkin, D., Deyo, R.A., Berg, A.O. (1991) "Evaluation of a physician education intervention to improve primary care for low-back pain II: impact on patients", *Spine*, Vol. 16, No. 10., pp. 1173-1178.
- Cherkin, D., Deyo, R.A., Berg, A.O., Bergman, J.J., Lishner, D.M. (1991) "Evaluation of a physician education intervention to improve primary care for low-back pain I: impact on physicians", *Spine*, Vol. 16, No. 10., pp. 1168-1172.
- Cherkin, D.C., MacCornack, F.A. (1989) "Patient evaluations of low back pain care from family physicians and chiropractors", *Western Journal of Medicine*, Vol. 150, No. 3, pp. 351-5.
- Cherkin, D.C., MacCornack, F.A., Berg, A.O. (1988) "Managing low back pain - a comparison of the beliefs and behaviours of family physicians and chiropractors", *Western Journal of Medicine*, Vol. 149, No. 4, pp. 475-80.
- Cherkin, D.C., MacCornack, F.A., Berg, A.O. (1989) "Family physicians' views of chiropractors: hostile or hospitable?", *American Journal of Public Health*, Vol. 79, No. 5, pp. 636-637.
- Chrisman, D., Mittnacht, A., Snook, G.A. (1964) "A study of the results following rotatory manipulation in the lumbar intervertebral disc syndrome", *The Journal of Bone and Joint Surgery*, Vol. 46, pp. 517-524.
- COMPAS (1990) *A report on public attitudes toward issues associated with the chiropractic profession in Ontario*, prepared for the Ontario Board of Chiropractic.
- Conlon, J. (1992) *Chiropractic Treatment of Neck and Back Disorders: A Review of Selected Studies*, Canadian Coordinating Office for Health Technology Assessment, Ottawa.
- Coulter, I.D. (1985) "The chiropractic patient: a social profile", *The Journal of the CCA*, Vol. 29, No. 1, pp. 25-28.
- Cox, J.M., Aspegren, D.D. (1987) "A hypothesis introducing a new calculation for discal reduction: emphasis on stenotic factors and manipulative treatment", *Journal of Manipulative and Physiological Therapeutics*, Vol. 10, No. 6, pp. 287-294.
- Cox, J.M., Shreiner, S. (1984) "Chiropractic manipulation in low back pain and sciatica: statistical data on the diagnosis, treatment, and response of 576 consecutive cases", *Journal of Manipulative and Physiological Therapeutics*, Vol. 7, pp. 1-11.
- Coxhead, C.E., Inskip, H., Meade, T.W., North W.R., Troup, J.D. (1981) "Multicentre trial of physiotherapy in the management of sciatic symptoms", *Lancet*, Vol. 1, pp. 1065-8.
- Coyer, A.B., Curwin, I. (1955) "Low back pain treated by manipulation", *Br Med J*, Vol. 1, pp. 705-7.
- Crawshaw, C., Frazer, A.M., Merriam, W.F., Mulholland, R.C., Webb, J.K. (1984) "A comparison of surgery and chemonucleolysis in the treatment of sciatica: a prospective randomized trial", *Spine*, Vol. 9, No. 2, pp. 195-198.
- Crocker, K. (1989) "Cost-effective management of back pain", *Occupational Health*, Vol. 41, No. 1, pp. 24-25.

- Cunningham, L.S., Kelsey, J.L. (1984) "Epidemiology and musculoskeletal impairments and associated disability", *American Journal of Public Health*, Vol. 74, No. 6, pp. 574-579.
- Curd, J.G., Thorne, R.P. (1989) "Diagnosis and management of lumbar disk disease", *Hospital Practice*, Vol. 24, No. 9, pp. 135-9, 142, 145-8.
- Curtis, P. (1988) "Spinal manipulation: does it work?", *State of the Art Reviews: Occupational Medicine*, Vol. 3, No. 1, pp. 31-44.
- Curtis, P., Bove, G. (1992) "Family physicians, chiropractors, and back pain", *The Journal of Family Practice*, Vol. 35, No. 5, pp. 551-555.
- Cust, G., Pearson, J.C.G., Mair, A. (1972) "The prevalence of low back pain in nurses", *International Nursing Review*, Vol. 19, No. 2, pp. 169-178.
- Cyriax, J. (1980) "Manipulation trials", *British Medical Journal*, Vol. 280, p. 111.
- Damlund, M. et al. (1982) "Low-back pain and early retirement among Danish semiskilled construction workers", *Scandinavian J Work Environment and Health*, Vol. 8, Suppl. 1, pp. 100-4.
- Daniel, J.W., Fairbank, J.C.T., Vale, P.T., O'Brien, J.P. (1980) "Low back pain in the steel industry: a clinical economic and occupational analysis at the North Wales integrated steelworks of the British Steel Corporation", *J. Soc. Occup. Med.*, Vol. 30, pp. 49-56.
- Davidson, K.C., Welford, E., Dixon, G. (1975) "Traumatic vertebral artery pseudoaneurysm following chiropractic manipulation", *Radiology*, Vol. 115, p. 653.
- Dean, H., Schmids, R. (1992) *A Comparison of the Cost of Chiropractors Versus Alternative Medical Practitioners*, Virginia Chiropractic Association.
- DeRosa, C.P., Porterfield, J.A. (1992) "A physical therapy model for the treatment of low back pain", *Physical Therapy*, Vol. 72, No. 4, pp. 261-72.
- Deyo, R.A. (1983) "Conservative Therapy for low back pain: distinguishing useful from useless therapy", *JAMA*, Vol. 250, No. 8, pp. 1057-1062.
- Deyo, R.A. (1988) "The role of the primary care physician in reducing work absenteeism and costs due to back pain", *Occupational Medicine: State of the Art Reviews*, Vol. 3, No. 1, pp. 17-30.
- Deyo, R.A. (1991) "Fads in the treatment of low back pain", *New England Journal of Medicine*, Vol. 325, pp. 1039-40.
- Deyo, R.A. (1992) "Study generates heat over fusion", *The Back Letter*, Vol. 7, No. 6, pp. 1,4.
- Deyo, R.A., Cherkin, D.C., Conrad, D., Volinn, E. (1991) "Cost controversy crisis: low back pain and the health of the public", *Annual Review of Public Health*, Vol. 12, pp. 141-56.
- Deyo, R.A., Diehl, A.K. (1986) "Patient satisfaction with medical care for low-back pain", *Spine*, Vol. 11, No. 1, pp. 28-30.
- Deyo, R.A., Diehl, A.K., Rosenthal, M. (1986) "How many days of bed rest for acute low back pain?: a randomized clinical trial", *The New England Journal of Medicine*, Vol. 315, No. 17, pp. 1064-1070.
- Deyo, R.A., Tsui-Wu, Y. (1987) "Descriptive epidemiology of low back pain and its related medical care in the United States", *Spine*, Vol. 12, pp. 264-268.
- Deyo, R.A., Tsui-Wu, Y.J. (1987a) "Functional disability due to back pain - a population-based study indicating the importance of socio-economic factors", *Arthritis Rheum*, Vol. 30, pp. 1247-53.
- Deyo, R.A., Walsh, N.E., Martin, D.C., Schoenfeld, L.S., Ramamurthy, S. (1990) "A controlled trial of transcutaneous electrical nerve stimulation (tens) and exercise for chronic low back pain", *The New England Journal of Medicine*, Vol. 322, No. 23, pp. 1627-1634.
- Difabio, R.P. (1986) "Clinical assessment of manipulation and mobilization of the lumbar spine: a critical review of the literature", *Physical Therapy*, Vol. 66, pp. 51-54.
- Dillman, D. (1978), *Mail & Telephone Surveys: The Total Design Method*, John Wiley & Sons: N.Y.
- Dillon, J.L. (1981) "Health Economics and Chiropractic", *Annals of the Swiss Chiropractic Association*, Vol. VII, pp. 7-17.
- Doran, D.M., Newell, D.J. (1975) "Manipulation in the treatment of low back pain: a multicentre study", *Br Med J*, Vol. 2, pp. 161-4.
- Dossetor, A.E. (1975) "Management of backache in general practice", *Br. Med. J.*, Vol. ii, pp. 32-33.

- Duffy, D.J. (1978) *A Study of Wisconsin Industrial Back Injury Cases*, University of Wisconsin, Madison.
- Dvorak, J., Orelli, P. (1985) "How dangerous is manipulation to the cervical spine", *Manual Medicine*, Vol. 2, pp. 1-4.
- Dyer, C., Fidderman, H. (1992) "Back pain at work", *Occupational Health Review*, No. 39, pp. 8-12.
- Ebrall, P.S. (1992) "Mechanical low-back pain: a comparison of medical and chiropractic management within the Victorian workcare scheme", *Chiropractic Journal of Australia*, Vol. 22, No. 2, pp. 47-53.
- The Economist (1991) "Health, the lose-lose issue", November 16, pp. 27-31.
- Edwards, B.C. (1969) "Low back pain and pain resulting from lumbar spine conditions: a comparison of treatment results", *Aust J Phys*, Vol. 15, pp. 104-10.
- Elie, J. (1992) "Musculoskeletal injuries: pay now or pay later", *Occupational Health & Safety Canada*, Vol. 8, No. 6, pp. 72-74.
- Ergo Systems Canada Ltd., Ontario. Occupational Health and Safety Division (1990) *A review paper identifying causative factors and effective strategies to reduce occupational back injuries*, prepared for Ontario Ministry of Labour by Ergo Systems Canada Ltd., Toronto: Ontario: Ergo Systems Canada.
- Evans, D.P., Burke, M.S., Lloyd, K.N., Roberts, E.E., Roberts, G.M. (1978) "Lumbar spinal manipulation on trial. Part 1: Clinical assessment", *Rheumatol Rehabil*, Vol. 17, pp. 46-53.
- Fager, C.A. (1984) "The age-old back problem: new fad, same fallacies", *Spine*, Vol. 9, No. 3, pp. 326-328.
- Farnham, A. (1992) "Backache", *Fortune*, Vol. 126, No. 13, pp. 132-133, 136, 138, 140-141.
- Farrell, J.P., Twomey, L.T. (1982) "Acute low back pain. Comparison of two conservative treatment approaches", *Med J Aust*, Vol. 1, pp. 160-4.
- Feeler, Larry (1992) "Task-specific rehab program reduces claims", *Occupational Health & Safety*, Vol. 61, No. 8, pp. 22-24.
- Feldstein, P.J. (1977) *Health Associations and the Demand for Legislation*, Ballinger, Cambridge.
- Fisk, J.W. (1979) "A controlled trial of manipulation in a selected group of patients with low back pain favouring one side", *New Zealand Journal of Medicine*, Vol. 10, pp. 288-291.
- Fordyce, W.E., Brockway, J.A., Bergman, J.A., Spengler, D. (1986) "Acute back pain: a control group comparison of behavioral vs traditional management methods", *Journal of Behavioral Medicine*, Vol. 9, pp. 127-140.
- Frank, A. (1993) "Low Back Pain", *British Medical Journal*, Vol. 306, 3 April, pp 901-9.
- Frank J.W., Goel, V, Pulcins, I.R., Bombardier, C. (1990) "Reducing the burden of work-related disability", Working Paper #1, Ontario Workers' Compensation Institute, Toronto, p. 12.
- Fredrickson, B.E., Trief, P.M., van Beueren, P., Yuan, H.A., Baum, G. (1988) "Rehabilitation of the patient with chronic back pain: a search for outcome predictors", *Spine*, Vol. 13, No. 3, pp. 351-3.
- Frymoyer, J.W. (1988) "Back pain and sciatica", *The New England Journal of Medicine*, Vol. 318, No. 5, pp. 291-300.
- Frymoyer, J.W., Cats-Baril, W.L. (1991) "An overview of the incidences and costs of low back pain", *Orthopaedic Clinics of North America*, Vol. 22, No. 2, pp. 263-71.
- Frymoyer, J.W., Pope, M.H., Castanza, M.C., Rosen, J.C., Gaggin, J.E., Wilder, D.G. (1980) "Epidemiology studies of low-back pain", *Spine*, Vol. 5, pp. 419-423.
- Frymoyer, J.W., Pope, M.H., Clemens, J.H., Wilder, D.G., MacPherson, B., Ashikaga, T. (1983) "Risk factors in low-back pain: an epidemiological survey", *Journal of Bone Joint Surgery*, Vol. 65A, pp. 213-218.
- Fulop, T., Roemer, M.I. (1982) *International Development of Health Manpower Policy*, WHO, Geneva.
- Garrett, B., Singiser, D., Banks, S.K. (1992) "Back injuries among nursing personnel: the relationship of personal characteristics, risk factors, and nursing practices" *AAOHN Journal*, Vol. 40, No. 11, pp. 510-516.

- Gatchel, R.J., Mayer, T.G., Hazard, R.G., Rainville, J., Mooney, V. (1992) "Functional restoration: pitfalls in evaluating efficacy", *Spine*, Vol. 17, No. 8, pp. 989-95.
- Gesler, W.M. (1988) "The place of chiropractic in health care delivery: a case study of North Carolina", *Social Science in Medicine*, Vol. 26, No. 8.
- Gibson, E.S., Martin, R.H., Terry, C.N. (1980) "Incidence of low-back pain and pre-placement x-ray screening", *Journal of Occupational Medicine*, Vol. 8, pp. 515-519.
- Gibson, T., Grahame, R., Harkness, J., Woo P., Blagrove, P., Hills, R. (1985) "Controlled comparison of short-wave diathermy with osteopathic treatment in non-specific low back pain", *Lancet*, Vol. 2, pp. 1258-61.
- Gilbert, J.R., Taylor, D.W., Hildebrand, A. (1985) "Clinical trial of common treatments for low back pain in family practice", *BMJ*, Vol. 291, pp. 791-794.
- Glover, J.R. (1966) "A clinical trial of rotational manipulation of the spine in back pain cases occurring in a factory", *Proceedings of the Royal Society of Medicine*, Vol. 59, pp. 847-848.
- Glover, J.R., Morris, J.G., Khosla, T. (1974) "Back pain: a randomized clinical trial of rotational manipulation of the trunk", *Br J Ind Med*, Vol. 31, pp. 59-64.
- Godfrey, C.M., Morgan, P.P., Schatzker, J. (1984) "A randomized trial of manipulation for low-back pain in a medical setting", *Spine*, Vol. 9, pp. 301-4.
- Government of Saskatchewan (1989) *Study in the Growth and Use of Health Services*, Report of the Review Committee to the Minister of Health, Regina.
- Grahame, R. (1980) "Clinical trials in low back pain", *Clinics in Rheumatic Diseases*, Vol. 6, No. 1, pp. 145-157).
- Greenland, S., Reisbord, L.S., Haldeman, S., Buerger, A.A. (1980) "Controlled clinical trials of manipulation: a review and a proposal", *Journal of Occupational Medicine*, Vol. 22, No. 10, pp. 670-676.
- Greenwood, J.G. (1983) *Report on Work-Related Back and Neck Injury Cases in West Virginia: Issues Related to Chiropractic and Medical Costs*, West Virginia Workers' Compensation Fund.
- Gutmann, G. (1983) "Injuries to the vertebral artery caused by manual therapy", *Manuelle Medizin*, Vol. 21, pp. 2-14.
- Gyntelberg, F. (1974) "One year incidence of low back pain among male residents of Copenhagen aged 40-59", *Danish Medical Bulletin*, Vol. 21, No. 1, pp. 30-36.
- Haas, M., Nyiendo, J. (1992) "Diagnostic utility of the McGill pain questionnaire and the Oswestry disability questionnaire for classification of low back pain syndromes", *Journal of Manipulative and Physiological Therapeutics*, Vol. 15, No. 2, pp. 90-98.
- Haddad, G.H. (1987) "Analysis of 2932 workers compensation system back injury cases: the impact on cost to the system", *Spine*, Vol. 12, pp. 765-769.
- Hadler, N.M. (1989) "Disabling backache in France, Switzerland, and the Netherlands: contrasting sociopolitical constraints on clinical judgement", *J Occupational Medicine*, Vol. 31, No. 10, pp. 823-831.
- Hadler, N.M., Curtis, P., Gillings, D.B., Stinnett, S. (1987) "A benefit of spinal manipulation as adjunctive therapy for acute low back pain: a stratified controlled trial", *Spine*, Vol. 12, pp. 702-6.
- Haggard-Guénette, C. (1988) "Work injuries in Canada, 1982 to 1986", *The Labour Force*, Monthly Catalogue 71-001, Ottawa: Statistics Canada, pp. 85-120.
- Haig, A.J. (1992) "Diagnoses and treatment options in occupational low-back pain", *Occupational Medicine: State of the Art Reviews*, Vol. 7, No. 4, pp. 641-653.
- Hakelius, A. (1970) "Prognosis in sciatica: a clinical follow-up of surgical and non-surgical treatment", *Acta Orthop Scand.*, Vol. 129, No. 1 (Suppl), pp. 1-76.
- Haldeman, S.C. (1983) "Spinal manipulative therapy", *Clinical Orthopaedics and Related Research*, Vol. 179, pp. 62-70.
- Haldeman, S., Chapman-Smith, D., Petersen, D.M. Jr. (1993) *Guidelines for Chiropractic Quality Assurance and Practice Parameters: Proceedings of the Mercy Center Consensus Conference*, Gaithersburg, Maryland: Aspen.
- Harber, P., Billet, E., Gutowski, M. et al. (1985) "Occupational low-back pain in hospital nurses", *J Occupational Medicine*, Vol. 27, No. 7, pp. 518-524.

- Harris, J.S., Brigham, C.R. (1990) "Low back pain: impact, causes, work relatedness, diagnosis, and therapy", *Occupational and Environmental Medicine Report*, Vol. 4, No. 11, pp. 84-86.
- Hasue, M., Fujiwara, M. (1979) "Epidemiological and clinical studies of long term prognosis of LBP and sciatica", *Spine*, Vol. 4, pp. 150-155.
- Health and Welfare Canada (1988) *Canada's Health Promotion Survey: Technical Report*, Supply and Services Canada: Ottawa.
- Health and Welfare Canada (1993) *Health Expenditures in Canada Summary Report 1987-1991*, Health Information Division, Ottawa.
- Helliwell, P.S., Cunliffe, G. (1987) "Manipulation in low back pain", *Physician*, Apr., pp.187-8.
- Hessler, R.M., Walters, M.J. (1975), "Consumer Evaluation of Health Services: Implications for Methodology and Health Care Policy", *Medical Care*, Vol. 13, No. 8, pp. 683-693.
- Hoehler, F.K., Tobis, J.S. (1987) "Appropriate statistical methods for clinical trials of spinal manipulation", *Spine*, Vol. 12, No. 4, pp. 409-411.
- Hoehler, F.K., Tobis, J.S., Buerger, A.A. (1981) "Spinal manipulation for low back pain", *J Am Med Assoc*, Vol. 245, pp. 1835-8.
- Holbrook, T.L., Grazier, K., Kelsey, J.L., Stauffer, R.N. (1984) *The Frequency of Occurrence, Impact and Cost of Selected Musculoskeletal Conditions in the United States*, American Academy of Orthopaedic Surgeons, Chicago, Illinois.
- Hooper, J. (1973) "Low back pain and manipulation: paraparesis after treatment of low back pain by physical methods", *The Medical Journal of Australia*, Vol. 1, pp. 549-557.
- Horal, J. (1969) "The Clinical appearance of low back disorders in the City of Gothenburg Sweden: comparisons of incapacitated probands with matched controls", *Acta Orthopaedica Scandinavica*, Suppl. 118, pp. 1-109.
- Howe, D.H., Newcombe, R.G., Wade, M.T. (1983) "Manipulation of the cervical spine -a pilot study", *J Royal Coll Gen Pract*, Vol. 33, pp. 574-9.
- Hsieh, C.Y., Phillips, R.B., Adams, A.H., Pope, M.H. (1992) "Functional outcomes of low back pain: comparison of four treatment groups in a randomized controlled trial", *Journal of Manipulative and Physiological Therapeutics*, Vol. 15, No. 1, pp. 4-9.
- Hublely-Kozey, C.L., Westers, B.M., Stanish, W.D., Wall, J.C. (1985) "An investigation into the incidence of low back pain in hospital workers", *The Nova Scotia Medical Bulletin*, Vol. 64, pp. 8-10.
- Hult, L. (1954) "Cervical, dorsal and Lumbar spinal syndromes: a field investigation of a non-selected material of 1200 workers in different occupations with special reference to disc degeneration and so-called muscular rheumatism", *Acta Orthopaedica Scandinavica*, Suppl. 17, pp. 1-102.
- Hult, L. (1954a) "The Munkfors investigation: a study of the frequency and causes of the stiff neck - brachialgia and lumbago-sciatica syndromes, as well as observations on certain signs and symptoms from the dorsal spine and the joints of the extremities in industrial and forest workers", *Acta Orthopaedica Scandinavica*, Suppl. 16, pp. 1-76.
- Imrie, David, Dimson, Colleen (1983) *Goodbye backache: the practical way to a pain-free and healthy back: eighty million North Americans suffer back pain, don't be one of them*, David Imrie with Colleen Dimson, New York: Arco Pub.
- Imrie, J.D. (1991) "Occupational back injuries: myth vs. reality", *Occupational Health and Safety Canada*, Vol. 7, No. 1, pp. 20, 22-25.
- Jarvis, K.B. (1989) "Cost per case analysis of Utah industrial back injury claims: chiropractic management versus medical management for diagnostically equivalent conditions", *D.C. Tracts*, Vol. 1, No. 2, pp. 67-79.
- Jarvis, K.B., Phillips, R.B., Morris, E.K. (1991) "Cost per case comparison of back injury claims of chiropractic versus medical management for conditions with identical diagnostic codes", *Journal of Occupational Medicine*, Vol. 33, No. 8, pp. 847-852.
- Jarvis, W. (1991) "Chiropractic: a sceptical view", *The Hundredth Monkey and Other Paradigms of the Paranormal: A Sceptical Inquirer Collection*, ed. K. Frazier, Buffalo, N.Y.: Prometheus Books.
- Javid, M.J., Nordby, E.J., Ford, L.T., Hejna, W.J., Whisler, W.W., Burton, C., Millett, D.K., Wiltse, L.L., Widell, E.H., Boyd, R.J., Newton, St Elmo, Thisted, R. (1983) "Safety and efficacy of chymopapain (chymodiactin) in herniated nucleus pulposus with sciatica: results of a randomized, double-blind study", *JAMA*, Vol. 249, No. 18, pp. 2489-2494.

- Jayson, M., Sims-Williams, H., Young, S., Baddeley, H., Collins, E. (1981) "Mobilization and manipulation for low-back pain", *Spine*, Vol. 6, No. 4, pp. 409-416.
- Jayson, M.I. (1986) "A limited role for manipulation", *British Medical Journal*, Vol. 293, pp. 1454-1455.
- Johnson, M.R., Ferguson, A.C., Swank, L.L. (1985) "Treatment and cost of back or neck injury -a literature review", *Research Forum*, Spring, pp. 68-78.
- Johnson, M.R., Schultz, M.K., Ferguson, A.C. (1989) "A comparison of chiropractic, medical and osteopathic care for work-related sprains and strains", *Journal of Manipulative and Physiological Therapeutics*, Vol. 12, No. 5, pp. 335-344.
- Johnston, B.G. (1992) "Duty to accommodate: returning injured employees to work", *Occupational Health & Safety Canada*, Vol. 8, No. 4, pp. 36, 38.
- Just, J.J. (1985) "The unturned stone: chiropractic as cost saver for employers", *Personnel Administrator*, Vol. 30, No. 4, pp. 71-73.
- Kaminski, M. (1990) "Evaluation of chiropractic methods", *Chiropractic Technique*, Vol. 2, No. 3, pp. 107-113.
- Kane, R.L., Olsen, D., Leymaster, C., Woolley, F.R., Fisher, F.D. (1974) "Manipulating the patient: A comparison of the effectiveness of physician and chiropractor care", *Lancet*, June 29, Part I, pp. 1333-1336.
- Kaplan, R.M., Deyo, R.A. (1988) "Back pain in health care workers", *Occupational Medicine: State of the Art Reviews*, Vol. 3, No. 1, pp. 61-74.
- Keating, J.C. Jr., Bergmann, T.F., Jacobs, G.E., Finer, B.A., Larson, K. (1990) "Interexaminer reliability of eight evaluative dimensions of lumbar segmental abnormality", *Journal of Manipulative and Physiological Therapeutics*, Vol. 13, No. 8, pp. 463-70.
- Kelman, H.R. (1976), "Evaluation of Health Care Quality by Consumers", *International Journal of Health Services*, Vol. 6, No. 3, pp. 431-441.
- Kelner, M., New, P.K. (1980), "The Chiropractors in Canada: A Study of Recruitment, Training and Practice, Appendices I, J, K and L", part of a study funded by Health and Welfare Canada (unpublished mimeo), Toronto.
- Kelsey, J.L., White, A.A. (1980) "Epidemiology and impact of LBP", *Spine*, Vol. 5, pp. 133-142.
- Kelsey, J.L., White, A.A., Pastides, H., Bisbee, G.E. (1979) "The impact of musculoskeletal disorders on the populations of the U.S.", *Journal of Bone and Joint Surgery*, Vol. 61, pp. 959-964.
- Kertesz, A., Kormos, R. (1976) "Low back pain in the workman in Canada", *Canadian Medical Association Journal*, Vol. 115, pp. 901-903.
- Kinalski, R., Kuwik, W., Pietrzak, D. (1989) "The comparison of the results of manual therapy versus physiotherapy methods used in treatment of patients with low back pain syndromes", *Manual Medicine*, Vol. 4, pp. 44-6.
- Kirkaldy-Willis, W.H., Burton, C.V. (1992) *Managing Low Back Pain*, Churchill Livingstone, New York.
- Kirkaldy-Willis, W.H., Cassidy, J.D. (1985) "Spinal manipulation in the treatment of low-back pain", *Can Fam Physician*, Vol. 31, pp. 535-540.
- Klein, B.P., Jensen, R.C., Scaderson, L.M. (1984) "Assessment of workers' compensation claims for back strains / sprains", *Journal of Occupational Medicine*, Vol. 26, No. 6, pp. 443-448.
- Kleynhans, A.M. (1979) "Complications of and contraindications to spinal manipulative therapy", *Modern Developments in the Principles and Practice of Chiropractic*, ed. S. Haldeman, New York, N.Y.: Appleton-Century-Crofts, pp. 360-377.
- Koes, B.W., Assendelft, W.J., Van der Heijden, G.J.M., Bouter, L.M., Knipschild, P.G. (1991) "Spinal manipulation and mobilisation for back and neck pain - a blinded review", *Br Med J*, Vol. 303, pp. 1298-303.
- Koes, B.W., Bouter, L.M., Beckerman, H., van der Heijden, G.J.M.G., Knipschild, P.G. (1991a) "Physiotherapy exercises and back pain: a blinded review", *BMJ*, Vol. 302, pp. 1572-6.
- Koes, B.W., Bouter, L.M., Knipschild, P.G., van Mameren, H., Essers, A., Houben, J.P., Verstegen, G.M., Hofhuizen, D.M. (1991b) "The effectiveness of manual therapy, physiotherapy and continued treatment by the general practitioner for chronic non-specific back and neck complaints: design of a randomized clinical trial", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 9, pp. 498-502.

- Koes, B.W., Bouter, L.M., van Mameren, H., Esser, A.H., Verstagen, G.M., Hofhuizen, D.M., Houben, J.P., Knipschild, P.G. (1992) "A blind randomized clinical trial of manual therapy and physiotherapy for chronic back and neck complaints: physical outcome measures", *J Manipulative Physiol Ther*, Vol. 15, pp. 16-23.
- Koes, B.W., Bouter, L.M., van Mameren, H., Esser, A.H., Verstagen, G.M., Hofhuizen, D.M., Houben, J.P., Knipschild, P.G. (1992a) "Randomized clinical trial of manipulative therapy and physiotherapy for persistent back and neck complaints: results of one year follow-up", *Br Med J*, Vol. 304, pp. 601-5.
- Koes, B.W., Bouter, L.M., van Mameren, H., Esser, A.H., Verstagen, G.M., Hofhuizen, D.M., Houben, J.P., Knipschild, P.G. (1992b) "The effectiveness of manual therapy, physiotherapy, and treatment by the general practitioner for nonspecific back and neck complaints" *Spine*, Vol. 17, pp. 28-35.
- Kornberg, E. (1988) "Lumbar artery aneurysm with acute aortic occlusion resulting from chiropractic manipulation: a case report", *Surgery*, pp. 122-124.
- Kramer, J.S., Yelin, E.H., Epstein, W.V. (1983) "Social and economic impacts of 4 musculoskeletal conditions: a study using national community-based data", *Arthritis Rheum.*, Vol. 26, pp. 901-7.
- Kuo, P.P., Loh, Z.C. (1987) "Treatment of lumbar intervertebral disc protrusion by manipulation", *Clinical Orthopaedics and Related Research*, Vol. 215, pp. 47-55.
- Laban, M.M., Taylor, R.S. (1992) "An objective analysis of the literature", *Orthopaedic Clinics of North America*, Vol. 23, No. 3, pp. 451-9.
- LaBar, G. (1992) "A battle plan for back injury prevention", *Occupational Hazards*, Nov., pp. 29-33.
- Labour Canada (1991) *Occupational Injuries and Their Cost in Canada, 1987-1989*, Catalogue L151-2238/91B, Ottawa: Occupational Health and Safety Branch.
- Lawrence, D.J. (1990) "Report from the consensus conference on the validation of chiropractic methods", *Journal of Manipulative and Physiological Therapeutics*, Vol. 13, No. 6, pp. 138-143.
- Lawrence, V.A., Tugwell, P., Gafni, A., Kosuwon, W., Spitzer, W.O. (1992) "Acute low back pain and economics of therapy: the interative loop approach", *Journal of Clinical Epidemiology*, Vol. 45, No. 3, pp. 301-11.
- Leavitt, S.S., Johnston, T.L., Beyer, R.D. (1971) "The process of recovery: patterns in industrial back injury. Part I. Costs and other quantitative measures of effort", *Industrial Medicine*, Vol. 40, No. 8, pp. 7-14.
- Leboeuf, C., Love, A., Crisp, T.C. (1989) "Chiropractic chronic low back pain sufferers and self-report assessment methods. Part II. A reliability study of Middlesex hospital questionnaire and the VAS disability scales questionnaire", *Journal of Manipulative and Physiological Therapeutics*, Vol. 12, No. 2, pp. 109-12.
- Lee, P., Helewa, A., Smythe, H.A., Bombardier, C., Goldsmith, C.H. (1985) "Epidemiology of musculoskeletal disorders (complaints) and related disability in Canada", *Journal of Rheu.*, Vol. 12, p. 1169-73.
- Leigh, J.P., Sheetz, R.M. (1989) "Prevalence of back pain among full-time United States Workers", *British J Industrial Medicine*, Vol. 46, No. 9, pp. 651-657.
- Lewith, G.T., Turner, G.M.T. (1982) "Retrospective analysis of the management of acute low back pain", *Practitioner*, Vol. 226, pp. 1614-1618.
- Lidstrom, A., Zachrisson, M. (1970) "Physical therapy on LBP and sciatica: an attempt at evaluation", *Scand. J. Rehab. Med.*, Vol. 2, pp. 37-42.
- Linton, S.J. (1990) "Risk factors for neck and back pain in a working population in Sweden", *Work and Stress*, Vol. 4, No. 1, pp. 41-49.
- Lipton, M. (1981) "Epidemiologic aspects of low back pain in industry", *Spine*, Vol. 1, p. 53.
- Livingstone, M.C.P. (1971) "Spinal manipulation causing injury", *Clin. Orthop. Rel. Res.*, Vol. 89, pp. 82-86.
- Lomas, J. (1990) "Words without action? The production, dissemination and impact of consensus recommendations", Paper presented at the workshop on the Independent Facilities Act, November 29-30, 1990, Mimeo.

- Lonstein, M.B., Wiesel, S.W. (1988) "Standardized approaches to the evaluation and treatment of industrial LBP", *Occupational Medicine: State of the Art Reviews*, Vol. 3, No. 1, pp. 147-156.
- MacDonald, R.S., Bell, C.M.J. (1990) "An open controlled assessment of osteopathic manipulation in nonspecific low-back pain", *Spine*, Vol. 15, pp. 364-70.
- Macnab, I., McCulloch, J. A. (1990) *Backache*, 2nd Edition, Baltimore: Williams & Wilkins.
- Magera, A. (1970) "Investigation of the relation between low back pain and occupation", *Industrial Medicine*, Vol. 39, No. 11, pp. 31-37.
- Manceaux, G.D. (1987) "Can physical therapists and chiropractors co-exist despite differences?", *Journal of Manipulative and Physiological Therapeutics*, Vol. 10, No. 5, pp. 260-263.
- Manga, P., Campbell, T. (1993) *Health Manpower Substitution: A Literature Review*, Mimeo, University of Ottawa.
- Manga, P., Weller, G.R. (1983) "The push for reprivatization" *Journal of Health Politics, Policy and Law* Vol. 8, No. 3, pp. 495-518.
- Mathews, J.A., Mills, S.B., Jenkins, V.M., Grimes, S.M., Morkel, M.J., Mathews, W., Scott, C.M., Sittampalam, Y. (1987) "Back pain and sciatica: controlled trials of manipulation, traction, sclerosant and epidural injections", *Br J Rheumatol*, Vol. 26, pp. 416-23.
- Mathews, J.A., Yates, D.A.H. (1969) "Reduction of lumbar disc prolapse by manipulation", *British Medical Journal*, Vol. 3, p. 696.
- Mayer, T., Gatchel, R. (1988) *Functional Restoration for Spinal Disorders: The Sports Medicine Approach*. Philadelphia: Lea & Febiger.
- Mayer, T., Polatin, P. (1992) "Spinal Rehabilitation", In *Principles and Practices of Chiropractic*, 2nd edition, Haldeman, S. Ed, Norwalk: Appleton & Lange.
- Maynard, A. (1993) "The future of health services research", *Centre for Health Economics Newsletter*, Issue No. 9, pp. 1-4.
- McKenzie, R. (1989) "A perspective on manipulative therapy", *Physiotherapy*, Vol. 75, No. 8, pp. 440-4.
- McKinney, L.A. (1989) "Early mobilisation and outcome in acute sprains of the neck", *Br Med J*, Vol. 299, pp. 1006-8.
- McPherson, K. (1990) "International differences in medical care practices" in *Health Care Systems in Transition*, OECD, Paris pp. 17-28.
- McVeigh, E. (1987) "Occupational low back pain: an introduction", *Canadian Centre for Occupational Health and Safety. At the Centre*, Vol. 10, No. 3, pp. 9-11.
- Meade, T.W. (1986) "Comparison of chiropractic and hospital outpatient management of low back pain: a feasibility study", *Journal of Epidemiology and Community Health*, Vol. 40, pp. 12-17.
- Meade, T.W., Dyer, S., Browne, W., Townsend, J., Fran, A.O. (1990) "Low back pain of mechanical origin: randomised comparison of chiropractic and hospital outpatient treatment", *Br Med J*, Vol. 300, pp. 1431-37.
- Mealy, K., Brennan, H., Fenelon, G.C. (1986) "Early mobilisation of acute whiplash injuries", *Br Med J*, Vol. 22, pp. 228-32.
- Medical World News (1985) "Cymopapain: Help or Hindrance?" Editorial, May 27, pp. 17-18.
- Mensor, M.C. (1955) "Non-operative treatment, including manipulation for lumbar intervertebral disc syndrome", *The Jour. of Bone and Joint Surgery*, Vol. 5, pp. 925-936.
- Merz, B. (1986) "The Honeymoon is Over: Spinal Surgeons begin to Divorce themselves from Chemonucleolysis", *J.A.M.A.*, Vol. 256, No. 3, pp. 317-18.
- Mierau, D., Cassidy, J.D., McGregor, M., Kirkaldy-Willis, W.H. (1987) "A comparison of the effectiveness of spinal manipulative therapy for low back pain patients with and without spondylolisthesis", *Jour. of Manipulative and Physiological Therapeutics*, Vol. 10, No. 2, pp. 49-55.
- Mikheev, M. (1993) Welcoming Address. World Chiropractic Congress. London, U.K. 27-29 May.
- Miller, Jack (1990) "Low back pain - rest vs recovery", *Health in the Work Place*, Vol. 3, No. 10, pp. 9-12.
- Miller, R.G. & Burton, C.V. (1974) "Stroke following chiropractic manipulation of the spine", *JAMA*, Vol. 229, p. 189.

- Milne, M. (1988) "Are physicians' opinions about chiropractors changing?", *CMAJ*, Vol. 138, pp. 1052-1055.
- Mitchell, R.I., Carmen, G.M. (1990) "Results of a multicenter trial using an intensive active exercise program for the treatment of acute soft tissue and back injuries", *Spine*, Vol. 15, No. 6, pp. 514-521.
- Mooney, V. (1987) "Where is the pain coming from?", *Spine*, Vol. 12, No. 8, pp. 754-759.
- Moritz, U. (1979) "Evaluation of manipulation and other manual therapy. Criteria for measuring the effect of treatment", *Scand. J. Rehab. Med.*, Vol. 11, pp. 173-179.
- Mueller, S. & Sahs, A.L. (1976) "Brain stem dysfunction related to cervical manipulation. Report of 3 cases", *Neurology*, Vol. 26, p. 547.
- Mugge, R.H. (1984) "Visits to physicians and other health care practitioners", *Health United States 1993*, Public Health Service, National Center for Health Statistics, Hyattsville, Maryland.
- Mulry, Ray (1992) "Five steps to controlling back injury costs", *Professional Safety*, Vol. 37, No. 12, pp. 24-26.
- Nachemson, A. (1979) "A critical look at the treatment for low back pain", *Scand. J. Rehab. Med.*, Vol. 11, pp. 143-147.
- Nachemson, A., Spitzer, W.O. et al. (1987) "Scientific approach to the assessment and management of activity-related spinal disorders. A monograph for clinicians. Report of the Québec Task Force on Spinal Disorders", *Spine*, Vol. 12, No. 75 (Suppl. 1), p. 51.
- Nachemson, A.L. (1992) "Newest knowledge of low back pain. A critical look", *Clinical Orthopaedics and Related Research*, Vol. 279, pp. 8-20.
- Nagi, S.Z., Riley, L.E., Lewby, L.G. (1973) "A social epidemiology of back pain in a general population", *Journal of Chronic Disease*, Vol. 26, pp. 769-779.
- N.B.C.E. (National Board of Chiropractic Examiners) (1993) *Job Analysis of Chiropractic: A project report, survey analysis, and summary of the practice of chiropractic within the United States*, Colorado.
- Newman, R.I., Seres, J.L., Yospe, L.P., Garlington, B. (1977) "Multidisciplinary treatment of chronic pain long term follow-up of LBP patients", *Pain*, Vol. 4, pp. 283-92.
- Nordemr, R., Thorner, C. (1981) "Treatment of acute cervical pain - a comparative study group", *Pain*, Vol. 10, pp. 93-101.
- North American Spine Society (1991) "Common diagnostic and therapeutic procedures of the lumbosacral spine", *Spine*, Vol. 16, No. 10, pp. 1161-1167.
- Nwuga, V.C.B. (1982) "Relative therapeutic efficacy of vertebral manipulation and conventional treatment in back pain management", *Am J Phys Med*, Vol. 61, pp. 273-8.
- Nyiendo, J. (1990) "A Comparison of Low Back Pain Profiles of Chiropractic Teaching Clinic Patients with Patients Attending Private Clinicians", *Journal of Manipulative and Physiological Therapeutics*, Vol. 13, No. 8, pp. 437-447.
- Nyiendo, J. (1990a) "Economic measures used in determining effectiveness and efficiency of chiropractic methods", *Chiropractic Technique*, Vol. 2, No. 3, pp. 143-150.
- Nyiendo, J. (1991a) "Disabling low back Oregon workers' compensation claims. Part II: time loss", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 4, pp.231-239.
- Nyiendo, J. (1991b) "Disabling low back Oregon worker's compensation claims. Part III: diagnostic and treatment procedures and associated costs", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 5, pp. 287-97.
- Nyiendo, J., Haldeman, S. (1987) "A prospective Study of 2000 patients attending a chiropractic college teaching clinic", *Medical Care*, Vol. 25, No. 6, pp. 516-525.
- Nyiendo, J., Lamm, L. (1991) "Disabling low back Oregon worker's compensation claims. Part I: methodology and clinical categorization of chiropractic and medical cases", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 3, pp. 177-84.

- Nyiendo, J., Phillips, R.B., Meeker, W.C., Konsler, G., Jansen, R., Menon, M. (1989) "A comparison of patients and patient complaints at six chiropractic college teaching clinics", *Journal of Manipulative and Physiological Therapeutics*, Vol. 12, No. 2, pp. 79-85.
- Nyiendo, J., Rosenberg, P., Lamm, L. (1990) "Time loss characteristics of low back disabling Oregon workers' compensation claims", *Proceedings of the 1990 International Conference on Spinal Manipulation*, Foundation for Chiropractic Education and Research, Arlington, VA.
- O'Beirne, J., O'Neill, D., Gallagher, J., Williams, D.H. (1992), "Spinal fusion for back pain: a clinical and radiological review", *Journal of Spinal Disorders*, Vol. 5, No. 1, pp. 32-38.
- Ongley, M.J., Klein, R.G., Dorman, T.A., Eek, B.C., Hubert, L.J. (1987) "A new approach to the treatment of chronic low back pain", *Lancet*, Vol. 2, pp. 143-6.
- Ontario Ministry of Health (1990) *Report of the International Conference on Quality Assurance and Effectiveness in Health Care*, Toronto.
- Ontario Ministry of Health (1992) *Ontario Health Survey 1990: Highlights*, Ontario Ministry of Health, Toronto.
- Ontario Ministry of Health (1993) Ontario Health Survey results. (phone conversation).
- Ontario Worker's Compensation Board (1993) "Backfacts for 1991 Accidents", mimeo, Toronto.
- Ottenbacher, K., DiFabio, R.P. (1985) "Efficacy of spinal manipulation/mobilization therapy: a meta-analysis", *Spine*, Vol. 10, pp. 833-837.
- Overman, S.S., Larson, J.W., Dickstein, D.A., Rockey, P.H. (1988) "Physical therapy care for low back pain: monitored program of first contact nonphysician care", *Physical Therapy*, Vol. 68, No. 2, pp. 199-207.
- Paris, S.V. (1983) "Spinal manipulative therapy", *Clinical Orthopaedics and Related Research*, Vol. 179, pp. 55-61.
- Parsons, W.B., Cumming, T.D.A. (1958) "Manipulation in back pain", *Journal of Cdn Medical Association*, Vol. 79, pp. 103-109.
- Patel-Christopher, A. (1990), "Family Physicians and Chiropractors: A Need for Better Communication and Co-operation" (unpublished mimeo).
- Payne, S.M.C. (1982) "Identifying and managing inappropriate hospital utilization: a policy synthesis", *Health Services Research*, Vol. 22, pp. 709-69.
- Pelz, D.M., Haddad, R.G. (1989) "Radiology investigation of low back pain", *Canadian Medical Association Journal*, Vol. 140, pp. 289-295.
- Pheasant, H.C. (1977) "Backache - its nature, incidence and cost", *Western Journal of Medicine*, Vol. 126, pp. 330-332.
- Pheasant, S., Stubbs, D. (1992) "Back pain in nurses: epidemiology and risk assessment", *Applied ergonomics*, Vol. 23, No. 4, pp. 226-232.
- Phillips, R.B., Buther, R. (1982) "Survey of chiropractic in Dade County, Florida", *Journal of Manipulative and Physiological Therapeutics*, Vol. 83, pp. 83-89.
- Pope, M.H. (1991) *Occupational low back pain: assessment, treatment, and prevention*, edited by Malcolm H. Pope, et al., St. Louis: Mosby Year Book.
- Postacchini, F., Facchini, M., Pelieri, P. (1988) "Efficacy of various forms of conservative treatment in low back pain. A comparative study", *Neuro-Orthop*, Vol. 6, pp. 28-35.
- Potter, G.E. (1977) "A study of 744 cases of neck and back pain treated with spinal manipulation", *Journal of the Canadian Chiropractic Association*, Vol. 21, No. 4, pp. 154-156.
- Price Waterhouse (1992) *Ontario Chiropractic Association: Results of Price Waterhouse Survey of Income and Expenses*, Toronto, Price Waterhouse Management Consultants.
- Putnam, A. (1988) "How to reduce the cost of back injuries", *Safety and Health*, Vol. 138, No. 5, pp. 48-50.
- Q.T.F.S.D. (Quebec Task Force on Spinal Disorders) Spitzer, W.O., Chairman. (1987) "Scientific approach to the assessment and management of activity-related spinal disorders: a monograph for clinicians", *Spine*, Vol. 12, suppl., pp. S1-S59.
- Quinet, R.J., Hadler, N.M. (1979) "Diagnosis and treatment of backache". *Seminars in Arthritis and Rheumatism*, Vol. 8, No. 4, pp. 261-287.

- Quon, J.A., Cassidy, J.D., O'Connor, S.M., Kirkaldy-Willis, W.H. (1989) "Lumbar intervertebral disc herniation: treatment by rotational manipulation", *Journal of Manipulative and Physiological Therapeutics*, Vol. 12, No. 3, pp. 220-227.
- Rachlis, M., Fooks, C. (1988) "Utilization analysis: current initiatives across Canada" in Conference Proceedings on *Reviewing Utilization: The Methods and Promise of Utilization Analysis*, McMaster University, Hamilton.
- Rachlis, M., Kushner, C. (1989) *Second Opinion: What's Wrong With Canada's Health Care System and How To Fix It*, Collins, Toronto.
- Raftis, K.L., Warfield, C.A. (1989) "Spinal manipulation for back pain", *Hospital Practice* (office edition), Vol. 24, No. 3, pp. 89-90, 95-6, 102.
- Rasmussen, G.G. (1979) "Manipulation in the treatment of low back pain - a randomized clinical trial", *Manual Medicine*, Vol. 1, pp. 8-10.
- Reisbord, L.S., Greenland, S. (1985) "Factors associated with self-reported back pain prevalence: a population - based study", *Journal of Chronic Diseases*, Vol. 38, No. 8, pp. 691-702.
- Report of the Commission of Inquiry (1979) *Chiropractic in New Zealand*, Wellington, N.Z.
- Rice, V.E. (1986) "Low back pain among community nurses", *J Occupational Health and Safety, Australia and New Zealand*, Vol. 2, No. 2, pp. 134-137.
- Richard, J. (1967) "Disk rupture with Cauda Equina Syndrome after chiropractic adjustment", *New York State Journal of Medicine*, Sept. 15, pp. 2496-2498.
- Riches, R.W. (1930) "End results of manipulation of the back", *Lancet*, Vol. 1, pp. 957-59.
- Riihimaki, H. (1991) "Low-back pain, its origin and risk indicators", *Scandinavian J. Work Environment and Health*, Vol. 17, No. 2, pp. 81-90.
- Roncarati, A., McMullen, W. (1988) "Correlates of low back pain in a general population sample: a multidisciplinary perspective", *Journal of Manipulative and Physiological Therapeutics*, Vol. 11, No. 3, pp. 158-64.
- Rossignol, M., Suissa, S., Abenhaim, L. (1988) "Working disability due to occupational back pain: three-year follow-up of 2300 compensated workers in Québec", *Journal of Occupational Medicine*, Vol. 30, No. 6, pp. 502-505.
- Roth, J. (1991) "Back to bed or back to work?", *Canadian Occupational Safety*, Vol. 29, No. 3, pp. 8-9.
- Rupert, R.L., Wagnon, R., Thompson, P., Ezzeldin, M.T. (1985) "Chiropractic adjustments: results of a controlled trial in Egypt", *ICA Rev Chiro*, Winter, pp. 58-60.
- Ryan, M.P. (1993) "Recognizing and treating the causes of low back pain", *The Canadian Journal of CME*, Vol. 5, No. 1, pp. 49-58.
- Sanchez, J.E. (1991) "A Look in the Mirror: A Critical and Exploratory Study of Public Perceptions of the Chiropractic Profession in New Jersey", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 3, pp. 165-176.
- Sanders, G.E., Reinert, O., Tepe, R., Maloney, P. (1990) "Chiropractic adjustive manipulation on subjects with acute low back pain: visual analog pain scores and plasma beta-endorphin levels", *Journal of Manipulative and Physiological Therapeutics*, Vol. 13, No. 7, pp. 391-5.
- Sandhu, D.J. and Schoner, B. (1992) *Images of and Attitudes Toward B.C. Health Professionals, A Study Prepared for the B.C. Chiropractic Association* (unpublished mimeo), Vancouver.
- Sawyer, C.E., Kassak, K. (1993) "Patient satisfaction with chiropractic care", *Journal of Manipulative and Physiological Therapeutics*, Vol. 16, No. 1, pp. 25-32.
- Scham, S.M. (1974) "Manipulation of the lumbosacral spine", *Clinical Orthopaedics and Related Research*, Vol. 101, pp. 146-150.
- Schieber, G.J., Poullier, J.P. (1990) "Overview of international comparisons of health care expenditures" in *Health Care Systems in Transition*, OECD, Paris. pp. 9-15.
- Schifrin, L.G. (1992) *Mandated Health Insurance Coverage for Chiropractic Treatment: An Economic Arrangement with Implications for the Commonwealth of Virginia*, Richmond, Virginia.
- Shapiro, E. (1983) "Physician visit patterns of chiropractic users: health-seeking behaviour of the elderly in Manitoba, Canada", *American Journal of Public Health*, Vol. 73, No. 5.

- Shekelle, P.G., Adams, A.H., Chassin, M.R., Hurwitz, E.L., Brook, R.H. (1992) "Spinal manipulation for low-back pain", *Annals of Internal Medicine*, Vol. 117, No. 7, 590-598.
- Shekelle, P.G., Adams, A.H., Chassin, M.R., Hurwitz, E.L., Park, R.E., Phillips, R.B., Brook, R.H. (1991) *The appropriateness of spinal manipulation for low back pain: indications and ratings by a multidisciplinary expert panel*, RAND, Santa Monica, California.
- Shekelle, P.G., Adams, A.H., Chassin, M.R., Hurwitz, E.L., Phillips, R.B., Brook, R.H. (1991a) *The Appropriateness of Spinal Manipulation for Low Back Pain. Project Overview and Literature Review*, RAND, Santa Monica, California.
- Shekelle, P.G., Brook R.H. (1991b) "A community-based study of the use of chiropractic services", *American Journal of Public Health*, Vol. 81, No. 4, pp. 439-442.
- Sheladia, V.L., Johnston, D.A. (1986) "Efficacy of various chiropractic treatments, age distribution and incidence of accident and nonaccident-caused low back pain in male and female patients", *Journal of Manipulative and Physiological Therapeutics*, Vol. 9, No. 4, pp. 243-247.
- Sheps, B., Anderson, G., Cardiff, K. (1991) "Utilization management: a literature review for Canadian health care administrators", *Healthcare Management Forum*, Vol.4, No.1 pp. 34-39.
- Shults, J.D. (1991) "Back pain prevention: a cure for workers' compensation costs", *Safety and Health*, Vol. 144, No. 2, pp. 26-29.
- Shvartzman, P., Abelson, A. (1988) "Complications of chiropractic treatment for back pain", *Postgraduate Medicine*, Vol. 83, No. 7, pp. 57-8, 61.
- Simmons, J.W., Avant, W.S., Demski, J., Parisher, D. (1988) "Determining successful pain clinic treatment through validation of cost effectiveness", *Spine*, Vol. 13, No. 3, pp. 342-344.
- Sims-Williams, H., Jayson, M.I., Young, S.M., Baddeley, H., Collins, E. (1978) "Controlled trial of mobilisation and manipulation for low back pain: hospital patients", *Br Med J*, Vol. 2, 1318-20.
- Sims-Williams, H., Jayson, M.I., Young, S.M., Baddeley, H., Collins, E. (1978) "Controlled trial of mobilization and manipulation for patients with low back pain in general practice", *BMJ*, pp. 1338-1340.
- Sloop, P.R., Smith, D.S., Goldberg, E., Dore, C. (1982) "Manipulation of chronic neck pain: a double-blind controlled study", *Spine*, Vol. 7, pp. 532-35.
- Snook, S.H. (1988) "The costs of back pain in industry", *Occupational Medicine: State of the Art Reviews*, Vol. 3, No. 1, pp. 1-5.
- Spengler, D.M., Bigos, S.J., Martin, N.A., Zehn, J., Fisher, L., Nachemson, A. (1986) "Back injuries in industry: a retrospective study I. Overview and cost analysis", *Spine*, Vol. 11, pp. 141-45.
- Spitzer, W.O., Harth, M., Goldsmith, C.H., Norman, G.R., Dickie, G.L., Bass, M.J., Newell, J.P. (1976) "The arthritic complaint in primary care: prevalence, related disability and costs", *The Journal of Rheumatology*, Vol. 3, No. 1, pp. 88-99.
- Stano, M. (1992) "The chiropractic services market: a literature review" in Rossiter, L.F. and Scheffler, R., *Advances in Health Economics and Health Services Research*, Vol. 13, Greenwich, CT: JAI Press.
- Stano, M. (1993) "A comparison of health care costs for chiropractic and medical patients", *Journal of Manipulative and Physiological Therapeutics*, Vol.16, No. 5, pp. 291-299.
- Stano, M. (1993a) "An overview of the ACA cost of care analysis project", *ACA Journal of Chiropractic*, March, pp. 41-45.
- Stano, M., Ehrhart, J., Allenburg, T. (1992) "The growing role of chiropractic in health care delivery", *Journal of American Health Policy*, Vol. 2, p39-45.
- Statistics Canada (1983) *Survey Sampling*, Supply and Services Canada: Ottawa.
- Statistics Canada (1985) *Development and Design of Survey Questionnaires*, Supply and Services Canada: Ottawa.
- Statistics Canada (1985) *Quality Guidelines*, Supply and Services Canada: Ottawa.
- Statistics Canada (1991) *Work Injuries, 1989-1991*, Annual, Catalogue 72-208, Ottawa.
- Strasser, A.L. (1988) "Low back pain presents tough challenge to occupational physicians", *Occupational Health and Safety*, Vol. 57, No. 2, pp. 26, 83.

- Stratmann, W.C., Block, J.A., Brown, S.P., Rozzi, M.V. (1975), "A Study of Consumer Attitudes About Health Care: The Control, Cost, and Financing of Health Services", *Medical Care*, Vol. 13, No. 8, pp. 659-668.
- Svensson, H.O., Anderson, G.B.J. (1982) "LBP in 40-47 year old men frequency of occurrence and impact on medical services", *Scand. J. Rehab. Med.*, Vol. 14, p. 47-53.
- Task Force on Backs Chairman's Annual Report for 1984*, Ontario: Task Force on Backs.
- Terret, A. (1987) "Vascular accidents from cervical spine manipulation: report on 107 cases", *Journal of Australian Chiropractors Association*, Vol. 17, No. 1, pp. 15-24.
- Tobis, J.S., Hoehler, F.K. (1983) "Musculoskeletal manipulation in the treatment of LBP", *Bull NY Acad. Med.*, Vol. 59, No. 7, pp. 660-68.
- Turner, J.A., Ersek, M., Herron, L., Haselkorn, J., Kent, D., Ciol, M.A., Deyo, R. (1992) "Patient outcomes after lumbar spinal fusions", *JAMA*, Vol. 268, No. 7, pp. 907-911.
- Turner, W. (1992) "Prevention of low-back pain in industry", *J Occupational Health and Safety, Australia and New Zealand*, Vol. 8, No. 6, pp. 523-529.
- Verbugge, L.M., Ascione, F.J. (1987) "Exploring the iceberg: common symptoms and how people care for them", *Medical Care*, Vol. 25, No. 6, pp. 539-563.
- Vernon, H. (1991) "Chiropractic: a model of incorporating the illness behaviour model in the management of low back pain patients", *Journal of Manipulative and Physiological Therapeutics*, Vol. 14, No. 6, pp. 379-89.
- Vernon, H.T., Aker, P., Burns, S., Viljakaanen, S., Short, L. (1990) "Pressure pin threshold evaluation of the effect of spinal manipulation in the treatment of chronic neck pain: a pilot study", *J Manipulative Physiol Ther.*, Vol. 13, pp. 13-16.
- Volinn, E., Turczyn, K.M., Loeser, J.D. (1991) "Theories of back pain and health care utilization", *Neurosurgery Clinics of North America*, Vol. 2, No. 4, pp. 739-48.
- Volinn, E.J., Mayer, P., Diehr, et al. (1992) "Small area analysis for LBP", *Spine*, Vol. 17, No. 5, pp. 575-78.
- Waagen, G.N., DeBoer, K., Hansen, J. McGee, D., Haldeman, S. (1991) "A prospective short and long term comparative trial of general practice medical care, chiropractic manipulation therapy and sham manipulation in the management of chronic low back pain", Abstract.
- Waagen, G.N., Haldeman, S., Cook, G., Lopez, D., DeBoer, K.F. (1986) "Short term trial of chiropractic adjustments for the relief of chronic low back pain", *Manual Med*, Vol. 2, pp. 63-7.
- Waddell, G. (1987) "A new clinical model for the treatment of low-back pain", *Spine*, Vol. 12, No. 7, pp. 632-644.
- Waddell, G. (1993) "Simple low back pain: rest or active exercise?", *Annals of the Rheumatic Diseases*, vol. 52, pp. 317-319.
- Wall, J.C., Turnbull, G.I., Vernon, H. (1988) "The move towards research in the health professions: a comparison of chiropractic and physiotherapy", *Journal of the Canadian Chiropractic Association*, Vol. 32, No. 1, pp. 17-22.
- Wallace, Jean (1992) "Welcome injured workers back to work", *Safety & Health*, Vol. 146, No. 4, pp. 42-46.
- Walsh, K., Varnes, N., Osmond, C. et al. (1989) "Occupational causes of low-back pain", *Scandinavian J Work, Environment and Health*, Vol. 15, No. 1, pp. 54-59.
- Walsh, N.E. Dumitru, D. (1988) "The influence of compensation on recovery from low back pain", *Occupational Medicine: State of the Art Reviews*, Vol. 3, No. 1, pp. 109-21.
- Wardwell, W.I. (1989) "The Connecticut survey of public attitudes toward chiropractic", *Journal of Manipulative and Physiological Therapeutics*, Vol. 12, No. 3, pp. 167-173.
- Ware, J.E. Jr. (1978), "Effects of Acquiescent Response Set on Patient Satisfaction Ratings", *Medical Care*, Vol. 16, No. 4, pp. 327-336.
- Ware, J.E. Jr. (1981), "How to Survey Patient Satisfaction", *Drug Intelligence and Clinical Pharmacy*, Vol. 15, pp. 892-899.
- Ware, J.E. Jr. and Snyder, M.K. (1975) "Dimensions of Patient Attitudes Regarding Doctors and Medical Care Services", *Medical Care*, Vol. 13, No. 8, pp. 669-682.

- Waterworth, R.F., Hunter, I.A. (1985) "An open study of difunisal, conservative and manipulative therapy in the management of acute mechanical low back pain", *N Z Med J*, Vol. 98, pp. 372-5.
- Webb, G.R., Redman, S., Wilkinson, C., Sanson-Fisher, R.W. (1989) "Filtering effects in reporting work injuries", *Accident Analysis and Prevention*, Vol. 21, No. 2, Great Britain, pp. 115-123.
- Webster, B.S., Snook, S.H. (1990) "The cost of compensable low back pain", *J Occupational Medicine*, Vol. 32, No. 1, pp. 13-15.
- Weller, G.R., Manga, P. (1983) "The development of health policy in Canada" in Atkinson, M.A. and Chandler, M.A. (eds) *The Politics of Canadian Public Policy* University of Toronto Press, Toronto, pp. 223-246.
- White, A.W.M. (1966) "Low back pain in men receiving workmen's compensation", *Canadian Medical Association Journal*, Vol. 95, pp. 50-56.
- White, A.W.M. (1969) "Low back pain in men receiving workmen's compensation: a follow-up study", *Canadian Medical Association Journal*, Vol. 101, No. 2, pp. 61-67.
- Wilkinson, W.E., Salazar, M.K., Uhl, J.E., Koepsell, T.D., Deroos, R.L., Long, R.J. (1992) "Occupational Injuries: a study of health care workers at a northwestern health science center and teaching hospital", *AAOHN Journal*, Vol. 40, No. 6, pp. 287-293.
- Winer, C.E.R. (1985) *A survey of controlled clinical trials of spinal manipulation*, Aspects of Manipulative Therapy, 2nd Edition, New York: Churchill Livingstone.
- Wolf, C.R. (1974) "Industrial back injury", *International Review of Chiropractic*, Jan.
- Wolk, S. (1988) *An Analysis of Florida Workers' Compensation Medical Claims for Back-Related Injuries*, The Foundation for Chiropractic Education and Research, Publisher, Arlington, VA.
- Wolk, S. (1988a) *Chiropractic vs Medical Care: A Cost Analysis of Disability and Treatment for Back-Related Workers' Compensation Cases*, Foundation for Chiropractic Education and Research, Arlington, VA.
- Woodward, C.A., Stoddart, G.L. (1989) "Is the Canadian health care system suffering from abuse?" CHEPA Working Paper Series No.19, McMaster University.
- Yesalis, C.E., Wallace, R.B., Fisher, W.P., Tokem, R. (1980) "Does chiropractic utilization substitute for less available medical services?", *Am. J. Public Health*, Vol. 70, pp. 415-17.
- Yu, T-S, Roht, L.H., Wise, R.A. et al. (1984) "Low-back pain in industry", *J Occupational Medicine*, Vol. 26, No. 7, pp. 517-524.
- Zylbergold, R.S., Piper, M.C. (1981) "Lumbar disc disease: comparative analysis of physical therapy treatments", *Arch Phys Med Rehabil*, Vol. 62, pp. 176-9.