IMPLEMENTING EVIDENCE-BASED GUIDELINES FOR X-RAY USE IN ACUTE LOW BACK PAIN

A PILOT STUDY IN A CHIROPRACTIC COMMUNITY

By

Carlo Ammendolia

A thesis submitted in conformity with the requirements for the degree of Master of Science in Clinical Epidemiology, Department of Community Health, University of Toronto

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Implementing Evidence-Based Guidelines for X-ray Use in Acute Low Back Pain:

A Pilot Study in a Chiropractic Community. Carlo Ammendolia, Master of Science in Clinical Epidemiology, Graduate Department of Community Health, University of Toronto, 1999

Abstract

Objective: To evaluate the ability of a systematic educational intervention strategy in changing the x-ray ordering behaviour of chiropractors, for patients with acute low back pain (ALBP), towards evidence-based practice.

Design: A quasi-experimental method was used comparing outcomes before and after the intervention with that of a control community.

Setting: Two communities in southern Ontario.

Data Source: Mailed survey data on the management of ALBP.

Outcome Measures: The x-ray use rates for ALBP based on responses to mailed surveys.

Results: Following the intervention there was a significant reduction in x-ray use for uncomplicated ALBP ($p < 0.025$) and for patients with ALBP < 1 month ($p < 0.025$) in the intervention community. There was no significant change in x-ray use in the control community ($p > 0.05$).

Conclusions: The educational intervention strategy used in this study appeared to have an effect in reducing the perceived need for x-ray use in ALBP.
Acknowledgements

I would like to thank my committee members, Drs. Sheilah Hogg- Johnson and Richard Glazier for their assistance during the pilot study and their comments and suggestions for this manuscript. A very special thanks to Dr. Claire Bombardier for all her ongoing support. The opportunity to enter and successfully complete the Master’s program would not have been possible without her support and encouragement.

Most of all I am grateful to my wife Mary and my three children who endured two and a half years with a phantom husband and father. Thank you Mary for your unconditional support, strength and humour (even in the worst of times).

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# Table of Contents

## CHAPTER 1. INTRODUCTION

1.1 Thesis overview................................................................. 1  
1.2 Background and rationale.................................................. 2  
1.3 Objectives........................................................................... 15

## CHAPTER 2. PREVIOUS STUDIES

2.1 Literature search strategy.................................................. 17  
2.2 Studies evaluating the value of x-ray for acute low back .......... 18  
2.3 Clinical guidelines and x-ray utilization for ALBP.................. 21  
2.4 Intervention trials on strategies for practice guidelines implementation............................................................ 23  
2.5 Intervention studies changing x-ray ordering behaviour for LBP... 25  
2.6 Focus groups in qualitative research.................................... 31

## CHAPTER 3. METHODS

3.1 Research design, setting and participants............................ 34  
3.2 Pre-intervention phase....................................................... 34  
3.3 Intervention phase............................................................. 38  
3.4 Post-intervention phase...................................................... 43  
3.5 Outcome measures............................................................ 43  
3.6 Analysis............................................................................. 44
CHAPTER 4. RESULTS

4.1 Baseline characteristics................................................................. 46
4.2 Identification and training of OL and EI in the intervention community................................................................. 50
4.3 Focus group session................................................................. 50
4.4 Intervention..................................................................................... 59
4.5 Change in post intervention outcomes................................................. 60
4.6 Evaluation of the intervention.......................................................... 64

CHAPTER 5. PROTOCOL FOR USING ADMINISTRATIVE DATABASES

5.1 Overview............................................................................................ 66
5.2 Description of databases.................................................................. 66
5.3 Algorithm for identifying ALBP patients from databases............... 69
5.4 Assessing the validity of the algorithm........................................... 71
5.5 Outcome measures........................................................................... 72
5.6 Analysis............................................................................................ 72
5.7 Strengths and limitations of administrative databases............... 74
FIGURES

Figure 1. Summary of AHCPR Guidelines on X-ray Use

Figure 2. Rating of Available Evidence Supporting AHCPR Guidelines

Figure 3. Mercy and Glenerin Guideline Statements on X-ray Use

Figure 4. Ratings for Mercy and Glenerin Guideline Statements

Figure 5. Questions Pertaining to X-ray Use in Survey

Figure 6. Survey questions used to Identify Community OL and/or EI

Figure 7. Decision Aid Tool for X-ray Use in ALBP

Figure 8. News Release Sent to Local Community Newspapers

Figure 9. Additional Question used in Post Intervention Surveys

Figure 10. Study Time Line

Figure 11. Focus Group Session: Reasons Given for Taking X-rays in ALBP

Figure 12. Clinical Vignette used During Focus Group Session

Figure 13. Important X-ray, Service, and Diagnostic Codes for OHIP and WCB Databases
TABLES

Table 1. Comparison of Development of Clinical Practice Guidelines

Table 2. Critical Appraisal of Practice Guidelines

Table 3. Comparison of Personal and Practice Characteristics, Including X-ray use, of Respondents to Pre-intervention Surveys in both Communities

Table 4. Comparison of Personal and Practice Characteristics of Respondents and Non-Respondents to Pre-Intervention Surveys in both Communities

Table 5. Comparison of Personal and Practice Characteristics of Focus Group Participants and Survey Respondents in the Intervention Community

Table 6. Focus Group Evaluation

Table 7. Number of all Survey Respondents, and Participants in the Intervention Community

Table 8. Change in Proportion of Respondents to Questions on X-ray use in ALBP in Pre-intervention Surveys Compared to Post Intervention in both Communities

Table 9. Comparison of Personal and Practice Characteristics of Respondents Reporting High X-ray use for Clinical Vignette 1 at Baseline with those who had Positive responses to the Intervention

Table 10. Comparison of Personal and Practice Characteristics of Respondents and Non-Respondents to Post-intervention Surveys in both Communities

Table 11. Evaluation of the Intervention
CHAPTER 1

Introduction

1.1 Thesis overview

The past dozen years have witnessed important advancements in the field of ALBP. These advancements were largely due to the publication of randomized controlled clinical trials on the evaluation and treatment of LBP. In 1994, the Agency for Health Care Policy and Research (AHCPR), a US government agency, published evidence-based guidelines on the management of adult ALBP. The evidence from this research suggests that the vast majority of patients with ALBP recover spontaneously within a month, and further investigations including x-ray are not necessary. Despite the evidence, chiropractors continue to have a high rate of x-ray use in patients with ALBP. Unnecessary x-ray utilization has implications to health care costs and public safety. Changing practice behaviour towards evidence-based practice is complex. The publication of practice guidelines alone has not been shown to be effective in changing practice patterns. What appears to be more effective are specific strategies in the implementation and diffusion of evidence-based guidelines.

This thesis will describe a pilot study in which the main purpose is to test the ability of a community educational intervention strategy in narrowing the gap between current x-ray use by chiropractors and the available evidence. The educational intervention was tested among chiropractors in the community of Peterborough, Ontario. This pilot study forms part of a larger study being conducted at the Institute for Work & Health (IWH). The larger study is investigating the effectiveness of a community intervention strategy, in changing the overall management of ALBP among physicians toward evidence-based practice.
1.11 Structure of thesis: The remaining pages of Chapter 1 provide background information on x-ray use for ALBP, the role of chiropractors in managing LBP and their x-ray utilization, and a summary of practice guidelines for x-ray use in ALBP. This chapter attempts to provide a rationale for the need to reduce x-ray use in ALBP among chiropractors. Chapter 2 is an overview of the literature, reviewing studies evaluating strategies for changing practice behaviour, critiquing previous studies on changing x-ray ordering behaviour for LBP, and summarizing the evidence on the value of x-ray for ALBP. The methods used for the pilot study are described in Chapter 3 with details of the community intervention strategies, the main outcomes of interest and the analysis used. In Chapter 4, baseline characteristics of chiropractors in the study communities are summarized and the results of analysis of pre and post intervention survey data and a focus group session are described. A protocol for the use of administrative databases to assess change in x-ray utilization before and after the intervention is outlined in Chapter 5. In this chapter, advantages and disadvantages of using administrative databases are also reviewed. Chapter 6, the final chapter, discusses the results of the study and outlines the study’s limitations. This chapter also evaluates the study design, its strengths and weaknesses and suggests areas for future research.

1.2 Background and rationale

1.21 Prevalence and cost of low back pain: LBP is a common problem in adults. It is estimated that 60% to 80% of the population will suffer from back pain sometime in their lives and at any given point in time 15% to 20% of the population will have symptoms.
[Frymoyer et al., 1991] It is second to the common cold as the most frequent reason for both work absenteeism and physician visits. [Deyo et al., 1991] In terms of costs, LBP is considered to be the most expensive benign condition in the industrialized world. [Bigos et al., 1994] Over $25 billion are spent each year in the US on direct medical costs alone. [Frymoyer et al., 1991] In Ontario, the Workers’ Compensation Board (WCB) spends over $3.3 billion on back injury claims per year which makes up two-thirds of all lost time claims costs. [Workers’ Compensation Board of Ontario, Annual review, 1993] An important contributor to this high cost, is the use of x-ray for assessing patients with ALBP. An estimated $500 million was spent in the US on low back x-rays in 1991. [Russo et al., 1998] In Ontario, about $15 million are spent annually by Ontario’s Health Insurance Plan (OHIP) for lumbar spine x-rays. [Anderson, 1996] This is an underestimation of the total cost of x-rays in Ontario since it excludes those paid for by private insurance, chiropractic co-payments and WCB costs.

1.22 Value of x-rays in ALBP: The vast majority of patients with ALBP (about 90%) will spontaneously recover within 4 to 6 weeks. [Bigos et al., 1994] Most of these patients with ALBP also have normal lumbar spine x-ray films or age-related degenerative changes that do not correlate with the presence, absence or severity of pain. [Maravilla et al., 1991; Halpin et al., 1991; Witt et al., 1984; Sorenson et al., 1985; Russo et al., 1998; van Tulder et al., 1997] The likelihood of finding a serious cause of ALBP, such as a malignancy, infection or inflammatory disease on x-ray without other clinical clues is rare, estimated to be 1 in 2500 in the 20 to 50 age group. [Deyo, 1991] Moreover, it is estimated that low back x-rays are useful
in less than 0.2% of patients with ALBP in determining the cause or guiding treatment. [Liang et al., 1982]

1.23 Potential risks of low back x-rays: Due to the close proximity of the reproductive organs, lumbar spine x-rays result in one of the highest cumulative doses of radiation to the gonads of any radiologic study. [Maravilla et al., 1991] It is estimated that a standard lumbar spine x-ray series is equivalent to female gonadal exposure of daily chest x-rays for 6, 16 or 96 years, depending on the x-ray machine. [Hall, 1980] This exposure increases the risk of cell mutation and cancer in this highly susceptible tissue. [Owens et al., 1990] According to the International Commission on Radiology Protection, five malignancies are induced per million persons exposed to lumbar spine x-rays, [Owens et al., 1990] and in Britain, the National Radiation Protection Board estimates that 19 lives are lost each year due to unnecessary lumbar spine x-rays. [Halpin et al., 1991]

1.24 Chiropractors in the health care system: Chiropractors are members of the third largest primary contact health care profession after medicine and dentistry. [Shekelle et al., 1996] There are approximately 4500 active chiropractors in Canada and almost half practice in Ontario. [Kopansky-Giles et al., 1997] Approximately 3 million Canadians consulted a chiropractor in 1997, representing more than 30 million treatments and a cost of more than $700 million. [CCA, 1997] In Ontario, over 96% of visits to chiropractors are for musculoskeletal disorders. [Aker et al., 1994] The utilization of chiropractic services is increasing in both Canada and the US. [Shekelle et al., 1996; Aker et al., 1991; Millar, 1997] In the US, the percentage of the population seeking chiropractic care has doubled over the past
15 years. [Hurwitz et al., 1998] In Canada, chiropractic services are partially insured by the Public Health Plans of five provinces (British Columbia, Alberta, Saskatchewan, Manitoba and Ontario) and covered by all provincial Workers’ Compensation Boards. [CCA, 1996] Chiropractors are licenced to own and operate their own x-rays machines. Approximately 50% of Canadian chiropractors take their own x-rays. [Kopansky et al., 1997]

Chiropractors are important players in the treatment of LBP. In the US, it is estimated that two-thirds of all outpatient visits for LBP are made to chiropractors. [Shekelle et al., 1995] In Ontario, chiropractors see one-third of all patients who seek care for LBP. [Ontario Health Survey, 1990] Patient visits for LBP represent over 75% of all visits to chiropractors, and in almost half the cases, the duration of symptoms are less than 6 weeks and only 20% are chronic (> 6 months). [Hurwitz et al., 1998]

1.25 X-ray utilization by chiropractors for ALBP: Despite the costs, risks and limited value, utilization of x-ray among chiropractors for ALBP continues to be high. In a recent survey of 1000 Ontario chiropractors, about 58% of the respondents indicated they would x-ray their patients with uncomplicated ALBP (no red flags). [Aker et al., 1996] In a prospective study in North Carolina [Carey et al., 1996], using telephone interviews following an initial visit for ALBP, almost 70% of chiropractic patients received an x-ray. In another survey, 92% of 208 randomly selected chiropractors in Washington State indicated they would x-ray their patients with uncomplicated ALBP. [Cherkin et al., 1988] Up to very recently, Medicare in the US required chiropractors to demonstrate radiographically each year the need for treatment prior to reimbursement. [Mootz et al., 1997] The high x-ray utilization rates suggested by
these studies are of concern, considering x-rays in this patient population are rarely necessary. [Bigos et al., 1994] When considering all conditions chiropractors see, a survey of all practicing chiropractors in Canada (with a response rate of 70.4%) suggested the mean percentage of patients that receive an x-ray at least once was almost 50%. [Kopansky-Giles et al., 1997] In a recent study of chiropractic services in Canada and the US, 390 charts of Ontario chiropractic patients with LBP were randomly reviewed. The chart review indicated that over 35% of patients received an x-ray. [Hurwitz et al., 1998]

The high utilization rate of x-rays for ALBP by chiropractors indicates a large gap between current practice behaviour and the available evidence, and suggests the need to reduce unnecessary x-rays.

1.26 Practice guidelines for ALBP: In December 1994, the AHCPR published evidence-based guidelines on the management of adult ALBP. [Bigos et al., 1994] This was a follow-up to the Quebec Task Force on Spinal Disorders (QTFSD) which published evidence-based guidelines for ALBP in 1987. [Spitzer et al., 1987] The AHCPR guidelines were developed using an independent, multidisciplinary panel of private sector clinicians and other experts (including two chiropractors). The panel employed explicit, science-based methods and expert clinical judgement to develop specific guidelines on the management of ALBP in adults including the use of x-ray. Each guideline recommendation was assigned a rating indicating the strength of the evidence supporting that recommendation. The main message of the guidelines is that, in the vast majority of cases, patients who present with ALBP do not have “red flags” suggesting serious pathology; therefore, there is no need to investigate further.
Ordering an x-ray should only be considered when symptoms persist for more than 4 weeks or in the presence of "red flags", some of which include significant trauma, history of cancer, pre-disposition to fracture or infection, unexplained weight loss, pain worse with rest and high fever. (Figure 1) The x-ray guideline recommendation was supported by moderate research-based evidence (one relevant, high quality scientific study or multiple adequate scientific studies). The rating of evidence supporting the AHCPR guideline statements are outlined in Figure 2.

Figure 1  Summary of the AHCPR Guidelines on X-ray Use

Plain film x-rays are not recommended for routine evaluation of patients with acute low back problems within the first month of symptoms unless a red flag is noted on clinical examination (see below). (strength of evidence = B.)

Plain film x-rays are recommended for ruling out fracture in patients with low back problems when any of the following red flags are present: recent significant trauma (any age), recent mild trauma (patient over age 50), history of prolonged steroid use, osteoporosis, patient over age 70. (strength of evidence = C.)

Plain film x-rays in combination with CBC and ESR may be useful for ruling out tumour or infection in patients with acute low back problems when any of the following red flags are present: prior cancer or recent infection, fever over 100 degrees F, IV drug abuse, prolonged steroid use, low back pain worse with rest, unexplained weight loss. (strength of evidence = C.)

In the presence of red flags, especially for tumour and infection, the use of other imaging studies such as bone scan, CT, or MRI may be clinically indicated even if plain x-rays are negative. (strength of evidence = C.)

The use of routine oblique views on plain film lumbar x-ray is not recommended for adults in light of the increased radiation exposure. (strength of evidence = B.)
In Britain, the Royal College of General Practitioners (RCGP) published evidence-based guidelines for ALBP in 1996. [Huchinson et al., 1996] These guidelines were developed by a 12 member multidisciplinary group (including one chiropractor) who performed systematic reviews of the literature since that conducted by the AHCPR in 1992. There was emphasis on evidence pertaining to bed rest, advice, exercise and manipulation. The evidence was rated on a three star system based on the strength of evidence. Where new evidence was lacking, the AHCPR recommendations, and those from the UK Clinical Standards Advisory Group on Back Pain (CSAG) [Hutchinson et al., 1996] were adapted. The guideline’s statements for x-ray use were based on the CSAG which were adopted from recommendations by the Royal College of Radiologists (RCR). [Roberts et al., 1994] The guideline states there is no indication for routine x-ray use in ALBP of less than 6 weeks in the absence of red flags. This is similar to the AHCPR guidelines except they suggest waiting an additional two weeks before x-ray use in ALBP patients without red flags who are not improving. Interestingly, the evidence for this recommendation was based on consensus and given a rating of one star indicating limited scientific evidence (does not meet all the criteria of acceptable studies).
Guidelines for chiropractic practice were published both in Canada (Glenerin Guidelines) [Henderson et al., 1994] and the US (Mercy Guidelines) [Haldeman et al., 1992] and included statements on x-ray use. The recommendations and the process by which these guidelines were developed, were critiqued and compared to that of the AHCPR and QTFSD guidelines [Ammendolia, 1996] using standardized methods. [Guyatt et al., 1995; Hayward et al., 1995; Wilson et al., 1995; Jaeschke et al., Feb.,1994; Jaeschke et al., Mar., 1994; AHCPR, 1995] The critique and comparison of these guidelines are summarized in Tables 1 and 2. The Mercy and Glenerin practice guidelines are very similar both in methodology and recommendations. The approach was a consensus conference [Mullan et al., 1985] where general topics were selected such as diagnostic imaging, initial clinical examination and frequency and duration of care. Statements were developed on these topics based on patient-doctor contact. A literature review was then performed assessing the evidence to support these statements. The evidence was rated based on quality (Class I, II, III). There was also a consensus rating (1 to 5) and a procedural rating (established - inappropriate). There were no guidelines specifically for x-ray in ALBP, only general statements for x-ray use. The guidelines recommended against the use of routine x-ray use but provided no specific patient selection criteria. The Mercy and Glenerin guideline statements on x-ray use are outlined in Figure 3 and the rating system used is summarized in Figure 4.

The Mercy and Glenerin guidelines did not score well in the area of reliability and /or reproducibility, clarity and clinical applicability. (Table 2) The guidelines are vague and non specific and would generally not be useful in clinical decision making. The lack of explicit and restrictive x-ray use statements was likely due to inherent bias in the development process.
of the guidelines. These guideline statements were developed by chiropractors for chiropractors and sponsored by chiropractic political associations. It was not in their best interest to restrict x-ray use especially in light of its controversy within the profession. Finding supportive evidence for general statements on the use of x-ray was not difficult. The Mercy guidelines did attempt to explain why these statements were vague, stating there was the need to consider the impact of the political, litigious and social climate on the perceived need of many practitioners to have prior radiographic evidence of the area to be manipulated. Consequently the statements provided large latitude for x-ray decision making. This is contrary to that taught at the Canadian Memorial Chiropractic College where student instruction on x-ray use for LBP follows closely that recommended by AHCPR guidelines. [Cardin, 1997] In comparison to the Mercy and Glenerin guidelines, the AHCPR x-ray guidelines scored well, with high ratings for validity, reliability, clarity and clinical applicability. (Table 2) Validity refers to the relationship between the evidence and the recommendations, the quality of the scientific and clinical evidence cited, and the means used to evaluate the evidence. [AHCPR,1995] The AHCPR guideline statements were explicit and supported by moderate evidence.
Figure 3  Summary of Mercy and Glenerin X-ray Guidelines Recommendations

**Mercy Recommendations**

- **Patient Selection Procedures for diagnostic imaging:**
  The decision on whether or not to use diagnostic imaging studies is made following a carefully performed history, physical and regional evaluation, and consideration of cost/benefit/radiation exposure ratios. It is based on sound clinical reasoning and the likelihood that significant information can be obtained from the study in regards to diagnosis, prognosis and therapy. The decision remains solely the domain of the examining (primary) practitioner.
  
  * Rating: Established  
  * Evidence: Class I, II, III  
  * Consensus Level: 1

- **Plain film radiographs**
  This is considered an adequate first step in the evaluation of degenerative and inflammatory joint disease, fracture and neoplasm. Not every patient with these conditions will require radiography for diagnosis. Orthogonal views are a necessary minimum for visualizing any body area. Additional views are used as appropriate to demonstrate conditions which could exist given the findings of the clinical diagnosis.
  
  * Rating: Established  
  * Evidence: Class I, II, III  
  * Consensus Level: 1

**Glenerin Recommendations**

Chiropractors shall use proper patient selection protocols with reference to age, child bearing status, and clinical indications of need. Before requesting radiologic studies, chiropractors should consider the risk/benefit ratio and use as low as reasonably achievable principal as to dosage. The number of views taken should be based upon clinical indication. Minimum Views should be two at right angles.

* Rating: Established  
* Evidence: Class II, III  
* Consensus Level: 1

* see Figure 4 for definitions
Figure 4  Ratings for Mercy and Glenerin Guideline Statements

**Procedural Rating**

**Established:** Accepted as appropriate by the practising chiropractic community for the given indication in the specified patient population.

**Promising:** Given current knowledge, this appears to be appropriate for the given indication in the specified patient population. As more experience and long-term follow-up are accumulated, this interim rating will change. This connotes provisional acceptance, but permits a greater role for the current level of clinical use.

**Equivocal:** Current knowledge exists to support a given indication in a specified patient population, though value can neither be confirmed nor denied. As more evidence and experience accumulates this rating will change. Expert opinion recognizes a need for caution in general application.

**Investigational:** Evidence is insufficient to determine appropriateness. Further study is warranted. Use for a given indication in a specified population should be confined to research protocols. As more experience and evidence accumulates, this rating will change.

**Doubtful:** Given current knowledge, this appears to be inappropriate for the given indication in the specified patient population. As more experience and long-term follow-up are accumulated, this interim rating will change.

**Inappropriate:** Regarded by the practising chiropractic community as unacceptable for the given indication in the specified patient population.

**Quality of Evidence**

**Class I:** Evidence provided by one or more well designed controlled clinical trials; or well designed experimental studies that address reliability, validity, positive predictive value, discriminability, sensitivity, and specificity.

**Class II:** Evidence provided by one or more well-designed uncontrolled, observational clinical studies, such as case-control, cohort studies, etc; or clinically relevant basic science studies that address reliability, validity, positive predictive value, discriminability, sensitivity, and specificity; and published in refereed journals.

**Class III:** Evidence provided by expert opinion, descriptive studies or case reports.

**Consensus Levels**

**Level 1** (Full agreement) - over 85%

**Level 2** (Consensus) - 70-85%

**Level 3** (Majority/Minority Opinions) - 51-69%

**Level 4** (Multiple Minority Opinions) - 26-50%

**Level 5** (No Consensus) - no agreement by more than 25%
Table 1 Comparison of the Development of Clinical Practice Guidelines

<table>
<thead>
<tr>
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<th>AHCPR</th>
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<th>GLENERIN</th>
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Table 2  Critical Appraisal of Practice Guidelines

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* Source- AHCPR, 1995
Rating:  + poor, ++ fair, +++ good

1.27 Changing practice patterns: It has become increasingly clear that systematic reviews and clinical practice guidelines are not by themselves sufficient to change practice behaviour, the so-called "changing from top to bottom".[Davis et al., 1997; Lomas et al., 1988; Haynes, 1993; The Lancet, 1998] Researchers now believe that successful implementation of guidelines requires strategies that focus on a multitude of factors that influence change, and include patient, clinical, personal, educational, administrative and economic factors. [Davis et al., 1997; Lomas et al., 1988] Some implementation strategies that have shown promise include the use of local community "opinion leaders" (OL) and/or "educational influential" (EI) (individuals named by their peers as trusted sources of clinical information and/or to whom they seek advice and guidance) who facilitate the training of others with the help of experts and educational material.
Individual focused education known as “academic detailing” [Davis et al., 1997; Brook, 1993; Lomas et al., 1988; Lomas, 1993; Anderson, 1993] (used extensively in the pharmaceutical industry to change prescribing behaviour in physicians), and the use of feedback which involves providing doctors with information on how their practice compares with that of others or an external standard [Lomas et al., 1993; Anderson, 1993; Cherkin et al., 1991] have also been shown to be effective.

Other promising strategies include the use of a patient-based approach where patients are provided educational information (via mailings, posters, media news release, etc) which is then used to influence the decision making of their doctors. [Lomas et al., 1988; Lomas, 1993; Deyo et al., 1987]

On review of the literature, it is unlikely that one intervention will be successful in all circumstances but rather the use of multiple strategies tailored to a specific group will more likely be effective in changing behaviour. [Davis et al., 1997; Lomas et al., 1988; Lomas, 1993; Haynes, 1993; Lomas, 1993; Stross, 1996; Anderson, 1993]

1.3 Objectives

1.3.1 Primary objective: The main purpose of this pilot study was to test the effectiveness of a multifaceted educational intervention strategy in reducing x-ray use for ALBP by chiropractors. The educational intervention was directed at chiropractors and their patients in a select community in Ontario, and incorporated the AHCPR recommendations on x-ray use for ALBP. Prior to the intervention, the x-ray use rate for ALBP by chiropractors in the study community was assessed to establish the need to reduce x-ray use. A successful intervention is expected to
reduce x-ray use in the chiropractic community and be associated with savings in cost of care and a decrease in unnecessary radiation exposure.

1.32 Secondary objectives: Other objectives of the pilot study included the qualitative assessment of attitudes and beliefs of chiropractors toward x-ray use for ALBP and the comparison of these views to the available evidence. This study also evaluated the feasibility of implementing various components of the educational intervention in a chiropractic community, such as the identification and training of OL and EI, since previous studies testing these strategies have used physician groups.
CHAPTER 2

Previous Studies

2.1 Literature search strategy

A Medline search was initially undertaken from 1966 to June 1998. The main headings were "low back pain" and "lumbar vertebra" with subheading "radiology" and textwords "x-rays and lumbar spine". The search was restricted to the English language. A total of about 24 papers were located. Papers were selected if they reviewed or evaluated 1) the value and/ or costs and/ or potential risks of plain film radiology for LBP 2) the use of clinical guidelines and x-ray utilization for LBP and 3) changing x-ray ordering behaviour for LBP. Case studies, papers related to surgical patients and papers involving the technical aspects of x-ray use were excluded. A total of seven papers were reviewed.

Mantis, a chiropractic database was also used to search for publications and proceeding from 1880 to November 1998. Key words used were "low back pain", "radiology", "lumbar spine", "lumbar vertebra" and "x-ray". A total of 26 papers were identified. When the above inclusion and exclusion criteria were applied this yielded eight relevant papers, of which 6 were located and reviewed. An additional literature source was the Institute for Work & Health (IWH) database which contains a comprehensive database of studies related to guideline implementation, changing practice behaviour and the management of ALBP. References from pertinent studies were reviewed. Experts at the IWH and the Canadian Memorial Chiropractic College Research Department also provided additional information.
2.2 Studies evaluating the value of x-ray for acute LBP

The AHCPR conducted a literature review of studies evaluating the efficacy of x-ray for LBP up to 1992.[Bigos et al., 1994] A brief summary of the review is included in the guideline publication. Of the 128 articles screened, 20 studies met the criteria for review. Only a few studies involved only ALBP patients. Many involved a mix of chronic and acute patients or did not report the duration of symptoms.

Most of the studies reviewed evaluated x-ray findings in patients with LBP compared with asymptomatic subjects. The main radiographic findings evaluated were degenerative changes, lumbar lordosis, spina bifida, transitional vertebrae, spondylolysis and spondylolisthesis. The conclusions were that in general x-ray findings correlate poorly with low back problems, with the only possible exception being spondylolisthesis.

Liang and Komaroff [1982] used a decision analysis model to assess the benefits, risks and costs of obtaining lumbar spine x-rays in the diagnostic examination of patients with ALBP of less than two weeks duration in a primary care setting. Only patients between the ages 18-60 years without signs or symptoms suggestive of serious disease were included in the analysis. The analysis compared two strategies at the index visit: routine x-ray use and no x-ray use. If symptoms persisted at four or eight weeks after the index visit, an x-ray would be taken regardless of the initial strategy used. The authors reported the probability of detecting a neoplasm or infection on an initial x-ray in this patient population was less than 1 in 1000. The probability of encountering disease requiring specific treatment on an x-ray in these patients
was less than 2 in 1000. The estimated sensitivity to detect specific diseases on the initial x-ray was as follows: 23% for spinal abscess, 25% for disc space infection, 66% for metastatic bone tumours, 70% for primary bone tumours, and 90% for both vertebral osteomyelitis and fractures. The authors concluded that the risks and costs of x-rays at the initial visit in this patient population are not worth the benefit of earlier diagnosis and treatment of a few cases of occult serious disease.

A recent systematic review [van Tulder et al., 1997] evaluated published observational studies that examined the causal relationship (association) between radiographic findings and non specific LBP. Two reviewers independently scored the methodologic quality of 31 relevant and available studies using a standardized set of criteria. The association between radiographic findings and non specific low back pain was expressed as an odds ratio with corresponding 95% confidence intervals. There were 18 studies that scored more than 50% of the maximum attainable validity score and were considered by the authors to be of acceptable or good methodologic quality. Only degeneration, defined by the presence of disc space narrowing, osteophytes and sclerosis had a positive association with non-specific low back pain with odds ratios ranging from 1.2 to 3.3. However, the authors indicated that the strength of this association was not convincing, and felt there were several potential sources of bias identified in the studies that may have led to an overestimation or underestimation of the true association. In addition, the authors had concerns that most studies did not address the temporality of the association. Therefore they concluded that there was no firm evidence that degeneration as associated with LBP. The same
conclusions were made for, spondylolysis and spondylolisthesis, spina bifida, transitional vertebrae, spondylosis, and Scheurmann's disease.

In a prospective study, [Deyo et al., 1986] 11 criteria for selective x-ray use were evaluated in 621 patients presenting to a hospital emergency room with LBP. The emergency room house staff physicians received a list containing the 11 criteria for x-ray use without intensive instructions and without constrained x-ray ordering. X-ray findings were considered therapeutically important if they detected a malignancy, fracture or osteomyelitis. All patients were followed for 6 months using hospital tumour registry and hospital discharge reports. Of the 311 patients who had x-rays, 227 (73%) met one or more of the criteria and 6.6% of these had therapeutically important findings (6.2% were fractures). None of the remaining 84 patients who had x-rays without meeting any of the criteria had therapeutically important findings. The main limitation of the study was the lack of an independent means to identify patients who did not meet the necessary x-ray criteria and did not receive an x-ray, but who may have had important x-ray findings. This would have required performing an x-ray on all patients who presented with LBP, which may not have been ethically or financially feasible, and would not have been useful in describing actual x-ray utilization patterns.

This was an important early study in evaluating x-ray ordering criteria for ALBP patients. The 11 criteria described in this paper were later refined and became the basis for the "red flags" in the AHCPR guidelines.

The use of x-ray to screen for conditions that may contraindicate the use of spinal manipulation
of the low back is considered unjustified. [Taylor et al., 1994; Philips, 1992] Gatterman [1991], in a review of contraindications and complications for spinal manipulation, suggests there are few conditions that either contraindicate or require modification of spinal manipulation, some of which include tumours, bone infection and fractures. In the vast majority of cases these conditions are evident from the history and physical examination. Lumbar spinal manipulation in the presence of degenerative disc disease, lumbar disc herniation and spondyololisthesis is considered safe. [Mierau et al., 1987; Cassidy et al., 1993; Quon et al., 1989]

The value of dynamic spine x-rays in assessing functional mechanics of the lumbar spine in LBP has not been proven. In a prospective study of 69 asymptomatic students, Cassidy [1976] found 70% exhibited movement that has been considered by some to be abnormal. [Grice, 1979; Vernon, 1982]

In another study, Phillips et al [1990] evaluated the lateral stress films of 72 patients with LBP. The authors found 36% of the patients studied had normal stress x-rays. When comparing normal and abnormal groups there were no significant differences found in demographic, historic and/or clinical data.

2.3 Clinical guidelines and x-ray utilization for ALBP

Ironically the explicit nature of the AHCPR x-ray guidelines, and that of its predecessor [Deyo et al., 1986], when strictly applied may actually increase utilization of x-ray for ALBP. Suarez-Almazor et al., [1997], performed a retrospective chart audit of patients with acute low back or sciatic pain (n=963) seen by 18 family physicians in Edmonton, Alberta over a one year
period. The authors found 13% of these patients received a lumbar spine x-ray at the initial visit. When the AHCPR guidelines were applied, the utilization of lumbar spine x-rays increased to 44%. The patients were followed up for a minimum of two years to assess the development of any serious disease as a cause of their LBP. The physician’s x-ray utilization pattern had a sensitivity 50.0 and a specificity of 87.1 compared to a sensitivity of 100.0 and a specificity of 56.2 when the AHCPR guidelines were applied. The authors concluded there was a need to further evaluate and modify the AHCPR x-ray guidelines by restricting or eliminating some red flags without significantly reducing its sensitivity.

The limitations of this study included the retrospective design which may have introduced bias during chart reviews and resulted in 13% of patients being seen only once which made assessment for later development of serious disease not possible. In addition, there was a high percentage of missing information on the presence or absence of red flags in the charts. When considering follow-up visits the x-ray utilization by physicians almost doubled to 23%. Activity limiting LBP for more than four weeks (an AHCPR red flag for x-ray use) was not considered. All patients prescribed antibiotics were considered to have a red flag for recent infection which may have been an over interpretation of the guidelines (especially if including antibiotics for upper respiratory infections).

Similar results were seen in two other studies using retrospective chart audits. Schroth et al. [1992] found an 11% physician x-ray use rate for the index ALBP visit (n=183) compared to 32% using criteria set out in the x-ray guidelines for ALBP developed by Deyo and Diehl, [1986]. Using the same guidelines, Frazier et al. [1989] found a physician x-ray utilization rate of 21% (n= 471) compared to a 46% rate when the guidelines were applied.
The guidelines used in the three studies described above have been criticized for the inclusion of age-related indications for x-ray use which substantially increases utilization. [Suarez-Almazor et al., 1997] A 51 year old man visiting his physician with activity limiting ALBP of one day’s duration (following several hours of bending over while gardening the previous day) without any other red flags would prompt an x-ray according to these guidelines. Deleting the age-related criterion for the index visit and delaying x-ray use for 2 or 3 weeks in patients over 50 years of age with persistent symptoms may reduce utilization while maintaining similar high sensitivity for detecting serious disease as a cause for ALBP. [Suarez-Almarzor et al., 1997; Russo et al., 1998] In a recent unpublished study, the AHCPR x-ray guidelines were modified by deleting age-related and history of previous cancer indicators for x-ray use, and were tested by a group of 20 Canadian physicians. [Russo et al., 1998] The authors found a 74% reduction of x-ray utilization compared to that resulting from an adherence to the AHCPR guidelines. A similar sensitivity for detecting serious abnormalities was observed in the two groups.

2.4 Results of intervention trials on strategies for practice guideline implementation

Davis et al., [1997] performed a recent systematic review (which is an update of previous reviews) of studies of clinical practice guideline implementation strategies and reviews of such studies, with emphasis on randomized controlled trials that objectively measured physicians’ performance or health care outcomes. The authors concluded that there are many variables that affect the adoption of practice guidelines including the quality of the guidelines, the characteristics of the health care professional, the practice setting, incentives, regulations
and patient factors. Trials of specific educational strategies were categorized into two groups: primary strategies involving mailing or publication of actual guidelines and secondary interventional strategies to reinforce the guidelines. Weak interventions were those using didactic and traditional continuing education methods and mailings. More effective strategies used practice- and community-based interventions. Moderately effective interventions used audit and feedback targeted to specific providers and delivered by peers and opinion leaders. Relatively strong interventions included those using reminder systems, academic detailing and multiple interventions. A needs assessment prior to the intervention was also considered to be important to the success of the intervention. This is the process of determining the gap between ideal and actual practice and focusing the educational intervention to the specific gap or need.

Lomas and Haynes [1988] performed a critical review of test strategies for the application of clinical practice recommendations and developed a taxonomy of these strategies. Articles were only reviewed if they reported planned investigations of attempts to improve performance of physicians or physicians in training in providing recommended care. More strength was given to randomized controlled trials. The conclusions made by the authors were similar to that of Davis et al.[1997] Strategies relying on mailings and didactic courses lack demonstrable impact by themselves in improving practitioner performance. Multifaceted educational strategies tailored to a specific group and delivered and facilitated by respected peers, who incorporate structured feedback, were shown to have higher success.
2.5 Intervention studies changing x-ray ordering behaviour for LBP

There were no published studies found attempting to change the x-ray ordering behaviour for LBP among chiropractors. The following published studies were identified involving physicians.

In a randomized controlled trial, Oakeshott et al. [1994] evaluated the ability of mailed guidelines to reduce referrals for x-ray examination. A total of 62 practices (170 general practitioners) referring patients to a London hospital in Britain for x-rays, were randomly allocated into two groups: one received the Royal College of Radiologists' guidelines for chest, limbs and joints, and spine x-rays on a laminated sheet (n=30), and the other received no intervention (n=32). The mean number of x-ray examinations were compared in both groups over a period of four weeks, before and after the introduction of the guidelines. There was a significant decrease in the mean number of spine examinations requested in the intervention group compared to the control (p<0.05). However, no significant difference was found between the groups in the change in number of requests for examination of chest, limbs and joints, or in the total number of examinations requested. The authors felt that the decrease in spine x-rays may have been due to the specific nature of the spine x-ray guidelines compared to those of chest, limbs and joints. In addition, there may have been more opportunity for improvement for spine x-ray requests in comparison to the other x-ray examinations.

A weakness in the study was the short follow-up period. It would be important to see if the reduction in spine x-ray requests persists over a longer period. There was a similar
reduction in overall x-ray requests from practices in both groups, which may suggest other factors, including seasonal variation. The effectiveness of the intervention may have been improved with the use of feedback to reinforce the guidelines.

In a non-randomized before and after study, Baker et al., [1987] evaluated the effect of a special requisition form on the utilization of lumbar spine x-rays for patients presenting with ALBP to the emergency room of a US hospital. The special requisition form listed only three indications for ordering x-rays: 1. trauma 2. focal neurological findings and 3. other. If “other” was selected, a one to two sentence summary of clinical findings was required along with the approval and signature of the supervising attending physician. After one year of using the requisition form, there was a 47% decrease in the number of lumbar spine x-ray examinations compared to the previous year. The main strengths of this study include, the use of an economical and easy to use decision aid tool which may have contributed to its high compliance rate (79%); and the requirement of a signature by a senior attending physician in cases where x-ray ordering may be less obvious. Limitations of this study include, non randomization and the lack of a concurrent control group. There was no mention of previous validation of the new requisition form or any potential adverse affects of using this form, such as missing a serious cause for ALBP. In addition, whether the results of this study can be generalized to family physician or chiropractic offices are questionable, since the study took place in a hospital emergency room setting, which is unlike a family practice setting both in structure and patient characteristics.
A recent controlled non-randomized study [Freeborn et al., 1997] tested the ability of an educational intervention to reduce the rate and variability of imaging tests for LBP among 67 internists and 28 family practitioners in a large group-model health maintenance organization (HMO) in Washington State. The study physicians were divided (by administratively distinct areas) into an intervention group (n= 42) which received guideline introduction or guideline introduction plus feedback, or a control group (n=53). The group receiving feedback received individual reports (at 2 month intervals for 6 months), ranking each physician with respect to use rates for imaging procedures.

For x-ray use there was no significant change in variability or rates in either intervention group when compared to the control. Notwithstanding the limitations due to the study design such as, non randomization, contamination and cointervention, there were a number of other problems with this study. In the initial protocol, the guideline presentation was to be conducted by well respected specialists in the community (EI) but, due to technical difficulties, this did not take place. This likely weakened the effectiveness of the educational intervention.[Lomas et al., 1988] The introduction of the guidelines was a brief, one-time presentation without reinforcement. As well, the initial protocol stated a one page laminated algorithm that summarized the recommendations for ordering imaging tests was to be included, but was actually omitted during the presentation of the guidelines. As a result, no simple decision aids were provided.

A strong point of the study was the use of ranking reports as feedback to the intervention physician, although the interval used was short relative to the number of tests ordered. This could produce a dramatic change in ranking, with a small absolute change in the number of
tests ordered by individual physicians. The fact that the study took place in a pre-paid HMO may have also influenced the results. HMOs may be more likely to already have a conservative approach to ordering tests with less room for further reduction. This is plausible when considering the average pre-intervention x-ray rate for this study was 16%, which is less than half the x-ray ordering rate for ALBP among Ontario physicians [Bombardier et al., 1996] who are reimbursed on a fee for service basis.

In another study, Cherkin et al. [1991] compared the change in management of LBP among 29 primary care physicians, (15 employed in a large HMO and 14 family physicians in six independent group practices) before and after the implementation of a 10 week educational intervention. The intervention included, two didactic sessions reviewing the evidence conducted by the authors, a videotape session comparing adequate and inadequate management of LBP, a clinical assessment form for LBP patients and an anatomical wall chart for patient education. Outcomes of interest were evaluated using pre and post intervention questionnaires with 3 clinical vignettes, and included questions related to knowledge and confidence in managing LBP patients, and x-ray use. The results demonstrated a significant increase in knowledge (62%) and confidence (50%) among the physicians; however, there was no significant change in x-ray rate. Of interest, the authors found no significant difference between the HMO and the independent fee-for-service physicians in all outcomes.

Part II of this study, Cherkin et al. [1991] examined whether the above intervention (on the
HMO physicians only) had any effect on patient outcomes. Outcomes of interest included symptom improvement, amount of disability and satisfaction with care. The outcomes were evaluated for 148 patients before the intervention and 158 after using telephone interviews. Previously validated instruments were used to measure disability and patient satisfaction. Despite the apparent benefit to physicians noted in the first part of the study, the intervention did not result in significant change in any patient outcomes.

The main limitations of this study include, non random selection of physicians or patients, the absence of a control group, the small number of providers, and the absence of an actual measure of physician behaviour in part I of the study (what they say they do and what they do may be different). The use of local EI or OL (instead of the investigators), providing individual feedback and the use of one on one reinforcement may have strengthened the educational intervention. A major strength in part I of the study was using both fee for service and pre-paid HMO physicians, although this was not carried out in part II.

This was an important study in the area of behavioural change and management of LBP since it demonstrated a feasible method to measure success of an educational intervention for LBP in terms of improving provider perceived knowledge, confidence, attitudes and behaviour as well as patient outcomes. This study laid the ground work for future studies in this area including a current study proposal by the IWH [Bombardier et al., 1994] This proposal is a randomized controlled trial using a multifaceted educational intervention aimed at changing the management of acute LBP towards evidence-based practice among 300 physicians practising in 20
communities in Ontario. The unit of randomization will be the community hospital located in each community with 15 physicians recruited from each community. Ten patients will then be recruited from each physician for a total of 3000 patients at baseline, and an additional 3000 patients post intervention. The educational intervention will be tailored to each intervention community and include: the identification and enrollment of EI and OL, community workshops on the AHCPR guidelines, feedback on present management of LBP, the use of decision aid tools, patient education material, academic detailing, and media news releases. The primary outcomes will be similar to the Cherkin study and include changes in attitude and behaviour in the management of ALBP using pre and post mailed questionnaires and patient outcomes (using telephone interviews) such as pain, disability and satisfaction with care. Secondary outcomes will include health care utilization including x-ray use. This protocol is an improvement to the Cherkin study both in its methodology and the comprehensiveness of the educational intervention. Currently, a pilot study is under way in two communities in Ontario, testing the feasibility of several components of this protocol.

Many of the components of the IWH study were incorporated in this pilot study, in particular the comprehensive intervention strategy and the use of pre and post intervention surveys. What is unique to this pilot study that has not been used in any studies described above, is an educational intervention aimed at chiropractors and the use of a focus group to assess attitudes and beliefs of chiropractors toward x-ray use.
2.6 Focus group interviews for examining practitioner’s views on x-ray use for LBP

The focus group interview is a qualitative research method that is often used to assess both patients’ and practitioners’ views on the use of health care services. [Quandt & Arcury, 1997; Kitzinger, 1995] It can be used independently to generate constructs and hypotheses or in conjunction with quantitative research to provide a greater understanding of the phenomenon of interest. [Kitzinger, 1995] Focus group interviews make use of communication and interaction to generate data from several individuals at one time. It explores people’s knowledge, attitudes and experiences and examines not only what people think, but how they think, and why they think that way. [Kitzinger, 1995] The focus group is usually made up of 4-12 participants who are homogeneous with respect to the purpose of the study. [Kitzinger, 1995; McDaniel & Bach, 1994] It typically takes place in an informal setting where a limited number of open-ended questions about a particular subject are discussed for approximately 1-3 hours. [Kingry et al., 1990] The researcher’s (facilitator) role is to encourage discussion and participant interaction and to ensure the topics of interest are covered. The session is usually recorded on audiotape which is later transcribed and analysed. The analysis process uses some form of data reduction to identify, categorize and summarize the themes and concepts emerging from the transcribed data. [Kingry et al., 1990; Kitzinger, 1995; Willms & Johnson, 1996]

There were no published studies found using focus groups to assess chiropractors’ views on the use of x-ray for LBP. One study was found where focus groups were used to examine the high variability in imaging use for LBP among internal medicine and family practice
physicians in a large US health maintenance organization. [Shye et al., 1998] In this study the authors retrospectively analysed data collected from 22 of 42 practitioners who agreed to participate in one of four, one hour focus group meetings. The number of participants at each meeting varied from 4-8. The focus groups were conducted prior to a separate study where an intervention, directed at these same 42 practitioners was tested in its ability to reduce imaging for LBP. [Freeborn et al., 1997] Two of the authors facilitated the discussion at each focus group meeting. A 5- minute introduction was given describing the research project and some data about variability in imaging -test ordering rates for LBP patients in the HMO. This was followed by a one page handout of 'proposed topics for discussion', asking physicians to think about the factors that influence their decision to use imaging for LBP patients. During the focus group session, the facilitator’s role was limited to clarifying points raised during the discussion. Each focus group session was recorded and later transcribed by one of the authors. The transcribed data was then analysed by the two authors using the method of immersion/crystallization (no reference given), where topics discussed were identified, categorized and summarized.

The authors concluded that the main source of variability in primary care physicians’ lumbar spine imaging test orders in LBP patients in this HMO setting, appeared to be due to non-clinical factors such as: the physicians’ perceived role and obligations toward their patients and toward the HMO management; time constraints (ordering an imaging test rather than spending the time reassuring the patient); access problems (getting the patient in the queue for tests such as CT scan and MRI); ambiguity of internal referral processes; and patient expectations. Only two patient characteristics were considered relevant to imaging use.
behaviour and that was age (the elderly are more likely to have a serious disorder), and work roles (those who were off work may be more likely to have an early imaging test). The authors felt these results could be generalizable to other similar HMO.

The interpretation and conclusions made from focus group data and qualitative research in general, have been criticized for lacking scientific rigour.[May et al., 1995] More specifically, this type of research is perceived to be highly subject to researcher bias and lacks both reproducibility and generalizability.[May et al., 1995; Quandt et al., 1997] However it is argued that like quantitative research, there are various strategies available to protect against bias and enhance the reliability of findings in qualitative research.[May et al., 1995; Corbin et al., 1990] In the focus group study described above, researcher bias could have been minimized by: the use of an independent facilitator, extending the focus group time to two hours so potentially more topics could be discussed, verifying the conclusions made using feedback from participating physicians and by independent analysis of the transcripts.
CHAPTER 3

Methods

3.1 Research design, setting and participants

The study design was quasi-experimental, comparing outcomes before and after an educational intervention with that of a concurrent control group. The study involved two communities, Peterborough, the intervention community and Guelph the control. The communities were pre-selected by researchers at the IWH for the physician ALBP pilot study [Bombardier et al., 1996] and was based on population size, demographics, number of hospitals, family physicians and specialists, industrial base and proximity to Toronto. There were 25 eligible chiropractors in Peterborough, and 21 in Guelph. The chiropractors were identified using the directory of the College of Chiropractors of Ontario, [CCO, 1996] the licensing body for Ontario chiropractors which assigns all practising chiropractors in Ontario to a particular community based on postal codes.

3.2 Pre-intervention phase

3.21 Description of chiropractic surveys: Prior to the intervention, surveys were mailed to all chiropractors in each community. Accompanying each survey was a stamped, self-addressed envelope and an introduction letter, briefly describing the purpose of the survey and assuring confidentiality.(see appendix A) Assurance of confidentiality was also printed on the cover page of the survey.

The survey instrument has been used in a previous study and had been pre-tested for
reliability (kappa 0.81) and content validity. [Aker et al., 1996] It was unchanged except for the addition of one question. (see Figure 5)

The survey was in a booklet format and contained questions regarding personal and practice characteristics, as well as knowledge, attitudes and beliefs regarding the management of LBP including x-ray use. (see appendix B) The surveys contained three clinical vignettes each describing a patient scenario. For each clinical vignette there was a list of response options on how the chiropractor would manage the patient scenario. The response options had three major sections: special investigations, in-office management, and referral outside the office for further management. For this study, the clinical vignette of interest described a 28 year old female with an insidious bout of uncomplicated ALBP (no red flags suggestive of more serious disease) of one week duration, and the response options section of interest was the special investigations section which included the response options, lumbar x-ray series and/or sacroiliac x-rays. In addition to the clinical vignettes, there were three other questions of interest pertaining to x-ray use for ALBP within the survey. (See Figure 5)

A modified Dillman mailing strategy used which included two mailings, one post card reminder and two telephone calls. [Dillman et al., 1994] Returned surveys from inactive chiropractors were excluded.
Figure 5 Questions Pertaining to X-ray Use in Survey:

Clinical Vignette 1
A 28 year old woman has suffered from acute low back pain for a week. She has been unable to do her job managing a hospital cafeteria for this time. While anxious to return to work, she feels immobilized by the pain. There is no history of trauma. The pain is limited to the low back area, without radiation. On physical examination, there is marked limitation of anterior flexion and tenderness in the left paraspinal region. The neurological examination is normal with straight leg raising to 90 degrees.

What investigations and treatment would you routinely order for this patient at this visit?

Investigations:
- Lumbar x-ray series
- Sacroiliac x-ray series

Please indicate the extent to which you agree or disagree with the following statements.
( strongly agree, agree, not sure, disagree, strongly disagree)

X-rays of the lumbar spine are useful in the diagnostic work up of patients with acute (< 1 month) LBP.

I am likely to arrange x-rays for my patients with low back pain because patients often expect me to do so.

Please answer ... by filling in the blank, circling the most appropriate answer...

Low back x-rays when needed are taken in own office or by other chiropractor *
1 Yes
2 No If no, where are they taken? ________________________________

* New question added to the original survey.

3.22 Identification and training of OL and EI: The pre-intervention survey was also used to assist in the identification of local OL and EI. A specific question in the survey asked participants to name an individual or individuals whom they seek locally for help and advice regarding difficult LBP cases. (See Figure 6) Once these individuals had been identified in the intervention community, they were to be approached and asked to participate in the study. Previous research in this area suggests that these respected individuals in the community will likely be willing to participate. [Lomas et al., 1988; Stross et al., 1996] Following their recruitment, they were to receive training in both guideline implementation and the AHCPR
x-ray guidelines by the principal investigator. The role of these individuals was to tailor the intervention to the community and to be important participants in its implementation.

Figure 6  Survey Question used to Identify Community OL and EI

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a local chiropractor, MD, specialist or other provider who you go to for information and/or advice on the management of low back pain?</td>
<td></td>
</tr>
<tr>
<td>1 Yes  If yes, please indicate the type of health care provider__________  and name________________________</td>
<td></td>
</tr>
<tr>
<td>2 No</td>
<td></td>
</tr>
</tbody>
</table>

3.23 Focus group session: The purpose of the focus group was to gather information regarding views and beliefs on x-ray use and clinical guidelines. This information would then be used to tailor the workshop and other components of the intervention. This qualitative method was used prior to a recent intervention study and found to be helpful in both the design of the intervention and in providing additional insight to the quantitative results of the study. [Shye et al., 1998] Following several interviews with chiropractors in the study community, eight local chiropractors (excluding OL and EI) were asked to participate in a focus group session. The chiropractors were approached following the receipt of completed pre-intervention surveys. The final selection was an attempt to have chiropractors with varied practice characteristics participate.

Prior to the start of the focus group session, a brief questionnaire (See appendix C) requesting information on personal and practice characteristics was completed by the focus group participants. The purpose of the session was outlined to the participants by the facilitator (principal investigator) who informed them the session would be recorded and later
transcribed. Assurance was given that information collected from the group would remain anonymous and they were encouraged to speak freely and openly. At the beginning of the session the participants were given an opportunity to introduce themselves and briefly describe their practices. Ten pre-prepared, open-ended questions (including a clinical vignette) were used as a guide by the facilitator to stimulate discussion. (See appendix C) The discussion topics were divided into four general sections: a) characteristics of participants' practice b) clinical practice guidelines c) x-ray use for ALBP and d) a clinical vignette describing a patient scenario and the decision whether or not to request an x-ray. (See appendix C)

Following the focus group session a brief evaluation form was completed by the participants. (See appendix C)

3.3 Intervention phase

The intervention had three main components: a workshop, academic detailing and a media campaign.

3.3.1 Workshop: The workshop was to be conducted by the EI and OL. All chiropractors in the intervention community were invited to attend. The workshop had four main components: a) Feedback: The results of the pre-intervention surveys were presented to the intervention chiropractors with specific emphasis on their current x-ray use rate as a community for uncomplicated ALBP. This rate was compared to that found in other studies and that suggested by the AHCPR x-ray guidelines.

b) Introduction of a decision aid tool: A one page, easy to use decision aid tool for x-ray
use in ALBP has been developed [Ammendolia, 1997] and was introduced at the workshop. (See Figure 7) It takes less than one minute to complete. This decision aid was modelled after the Ottawa Ankle Rules [Steil et al., 1992] with the goal of reducing unnecessary x-rays for ALBP. It is based on the presence or absence of “red flags” as outlined in AHCPR guidelines. Included was a modification of the age-related indication for x-ray use. There are 10 items in the index, each item representing a red flag. Each red flag is given a weighted score of “1” or “2” based on the likelihood of being associated with a serious cause for ALBP. If there are no red flags present, a “0” would be placed beside each red flag listed. The individual scores are then added to obtain a total score. A total score of 0 would indicate an x-ray is not necessary. A score of “2” or more recommends an x-ray be taken whereas a score of 1 suggests the patient be monitored over a 2 week period.
Figure 7  Decision Aid Tool for X-ray Use in ALBP

<table>
<thead>
<tr>
<th>Red Flags</th>
<th>Yes</th>
<th>No</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AGE &gt; 50</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2. ACTIVITY LIMITING &gt; 4 WEEKS</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3. ACTIVITY LIMITING &gt; 7 WEEKS</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4. SIGNIFICANT TRAUMA</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5. MINOR TRAUMA WITH POSSIBLE OSTEOPOROSIS</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6. HISTORY OF CANCER (EXCEPT SKIN)</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>7. RISK OF INFECTION</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>- HIV positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- corticosteroid use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IV drug use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Immuno suppressant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- skin lesions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- G-U infections</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. PAIN WORSE SUPINE/ NIGHT TIME</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>9. SYSTEMICALLY UNWELL</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>- weight loss/ fever/ chills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. NEUROMOTOR DEFICITS</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**SCORE**

An x-ray should be considered with a score ≥ 2.
Patients with a score of 1 should be monitored for 2 weeks and if not improved an x-ray should be taken.
X-ray is not recommended with a score of 0.

---

c) **Reviewing the evidence:** The evidence against the use of x-ray for uncomplicated ALBP was presented. Evidence which strongly refuted many of the reasons given for x-ray use during the focus group session was outlined. Potential risks associated with lumbar spine x-rays was also reviewed.

d) **Take home educational package:** Participants of the workshop received a take home
package containing a summary of the pre-intervention survey results, copies of the AHCPR guidelines, important and pertinent papers relating to x-ray use, copies of the decision aid tool and letters from prominent chiropractors endorsing the x-ray guidelines. (See appendix E)

3.32 Academic detailing: Following the workshop an attempt was made (by the principal investigator) to meet individually with each chiropractor in the intervention community. A special effort was made to contact those chiropractors who did not attend the workshop. During the meetings the information presented at the workshop was reviewed and questions or concerns addressed. Those chiropractors who could not, or were unwilling to attend the workshop or meet with the principal investigator, were sent a copy of the take home educational package.

3.33 Media campaign: The final component of the intervention involved sending news releases to the two local newspapers in the intervention community. The news releases highlighted issues surrounding the over-utilization of x-rays with special emphasis on the potential risks associated with unnecessary back x-rays. (See Figure 8) The goal of the media campaign was to educate the public which in turn may alter the behaviour of the local chiropractors toward x-ray use.
Figure 8  News Release Sent to Local Newspapers

"Many Back X-rays Useless and Pose Health Risks,"
Researcher says.

Decision aid tool may help physicians and chiropractors reduce unnecessary x-rays.

It is estimated that 80% of the population will experience a bout of low back pain at some point in their lives. In over 90% of these cases the source of back pain is inflamed muscles and joints which resolves on its own within four to six weeks. X-rays in these patients are not useful and not recommended.

However results of recent surveys of Ontario physicians and chiropractors suggests that many patients continue to have unnecessary x-rays for their low back pain.

"There is a risk associated with back x-rays" says Dr. Carlo Ammendolia, a chiropractor and research fellow at the Canadian Memorial Chiropractic College and the Institute for Work & Health in Toronto. "Because of the proximity to the reproductive organs, back x-rays increase the risk in inducing cell mutation and possibly cancer in this highly susceptible tissue".

An x-ray is useful in identifying the cause of acute (recent onset) low back pain in adult patients in less than 2% of cases. These patients tend to have an increased chance of having a more serious problem causing back pain. Patients who are at high risk for having more serious disease can usually be identified by the presence of "warning signs" which are found during history taking and when performing the physical examination. Some examples of "warning signs" include significant trauma, recent unexplained weight loss, night pain and a history of cancer and certain infections.

Dr. Ammendolia has developed a decision aid tool which scores patients based on the presence or absence of these "warning signs". Patients who obtain high scores are recommended to have an x-ray where as patients who obtain low scores are not. Medium risk patients should be monitored. If there is no improvement in their condition then an x-ray is recommended.

Dr. Ammendolia modelled this decision aid tool after the "Ottawa Ankle Rules" which is a similar tool to help doctors determine the likelihood of fracture, in patients who come to hospital emergency wards with twisted and swollen ankles. This decision aid tool has been shown to reduce unnecessary ankle x-rays by 33%.

The researcher is hopeful that his decision aid tool will have a similar impact on decreasing unnecessary back x-rays, thereby reducing not only potentially dangerous radiation exposure, but also saving the Ontario Health Care system millions of dollars each year. At present the Ontario Health Insurance Plan (OHIP) spends over $15 million a year on low back x-rays.

Dr. Ammendolia has recently begun to meet with local Peterborough chiropractors, outlining his research and introducing his x-ray decision aid tool. The presentations have been well received so far.

Dr. Ammendolia and other researchers from the Institute for Work & Health have been also working with a group of local Peterborough physicians who have developed the "Peterborough Back Rules". These rules also outline the importance of a focused history and physical examination so the doctor can rule out serious disease, thus eliminating the need for x-rays or laboratory tests. The importance of balancing pain relief, using certain medication and/or manipulation, with staying active and returning to regular activities - including work - as soon as possible is emphasized. "This group has come up with some innovative tools and excellent educational material for both physicians and patients." says Dr. Ammendolia.
3.4 Post intervention phase

3.41 Post intervention surveys: Following completion of the intervention, post intervention surveys were mailed to both communities. The surveys were identical to the pre-intervention surveys, except for the addition of one question asking the approximate proportion of patients seen with ALBP per week. (See Figure 9) The mailing strategy of the surveys was similar to that used for the pre-intervention surveys.

![Figure 9 Additional Question Added to the Post- Intervention Surveys](image)

Approximately what percentage of total patient visits per week are primarily for acute LBP (new episode of LBP, less than 3 months durations)? _____%

3.42 Questionnaire evaluating the intervention: An arms-length evaluation was conducted following the intervention. Upon receipt of the final post intervention surveys, a researcher at the Canadian Memorial Chiropractic College mailed questionnaires to all practicing chiropractors in the intervention community. (See appendix G) The purpose of the questionnaire was to get feedback on the different components of the intervention from the participating chiropractors in the intervention community.

3.5 Outcome measures

3.51 Primary measure: The primary outcome measure was the proportion of chiropractors who would request an x-ray for uncomplicated ALBP in clinical vignette 1 of the survey.

3.52 Secondary measure: A secondary outcome measure was the proportion of survey
respondents who agreed that an x-ray is useful in the diagnostic work-up of patients with ALBP of 1 month duration.

3.6 Analysis:

3.61 Quantitative analysis comparing change in x-ray use:

a) Primary analysis: For the primary outcome measure, a change in the proportion of survey respondents who requested an x-ray for clinical vignette 1 before and after the intervention was compared to that of the control community, using McNemar’s Exact Test for correlated proportions. [Rosner, 1995] Only data from chiropractors who responded to both pre and post-intervention surveys was analysed.

b) Secondary analysis: The same test was used to compare a change in the proportion of survey respondents who agreed that an x-ray is useful in the diagnostic work-up of patients with ALBP of < 1 month duration.

3.62 Descriptive analysis of survey respondents: Descriptive analyses were performed on personal and practice characteristics of both communities using pre-intervention survey data. The two communities were compared with respect to characteristics thought to influence x-ray use. A bivariate comparison was performed using pooled pre-intervention data from both communities for x-ray use in uncomplicated ALBP (clinical vignette 1) and characteristics thought to influence x-ray use (years of graduation, gender, post-graduate training, training of chiropractic trainees, practice type and in-office x-ray) using Fisher’s Exact Test. [Rosner, 1995]
3.63 Qualitative analysis of focus group session: The transcribed recording of the focus group was analysed using a cross-case thematic analysis. [Willms et al., 1996] The transcribed raw data was re-organized by responses to questions asked during the focus group session. Range, variation and patterns in the group’s beliefs, attitudes and practices were noted and then summarized based on the general topics described above.

Personal and practice characteristics of the participants of the focus group session were described. A comparison was made with those who responded to the surveys (excluding focus group participants who responded to the survey). The written evaluation of the focus group by the participants was summarized by each question asked.

3.64 Qualitative analysis of the intervention: Responses to mailed questionnaires evaluating the components of the intervention were summarized.
CHAPTER 4

Results

The entire study was completed over an approximate 15 month period. Figure 10 outlines the study timeline, highlighting chronologically important events of the study. Table 7 summarizes the number of respondents to the pre and post intervention surveys and the number of chiropractors who participated in the various activities in the intervention community.

4.1 Baseline characteristics

There was a 76% response rate for the pre-intervention surveys in the intervention community and 62% in the control. A comparison of personal and practice characteristics, and answers to questions on x-ray use by the respondents are summarized in Table 3. There were over twice as many solo practitioners in the intervention community (68%) compared to the control community (31%). The mean age of chiropractors in the control community was 37.3 years compared to 41.3 in the intervention community. Related to age, is mean practice years where the average chiropractor in the control community has been in practice just over 10 years compared to 14 years in the intervention community. Half the chiropractors in the intervention community and close to 40% in the control community had post-graduate training. In both communities, less than 16% of chiropractors taught chiropractic trainees. The vast majority of chiropractors in each community (95% in the intervention and 77% in the control) graduated from the Canadian Memorial Chiropractic College (CMCC). In-office x-ray facilities were used by close to 75% of intervention chiropractors and half of chiropractors
in the control community. With respect to x-ray use, 63% of intervention chiropractors and 54% in the control community requested an x-ray for the patient in clinical vignette 1 (uncomplicated ALBP of one week duration). X-ray was considered useful in ALBP of < 1 month duration (strongly agree or agree) by 68% of intervention chiropractors and 64% of chiropractors in the control community.

Less than 10% of chiropractors in the control community, and none in the intervention community stated they were likely to x-ray patients with LBP because patients expect them to do so.

In the bivariate analysis, none of the personal and practice characteristics tested, were found to be associated with x-ray use for uncomplicated ALBP (clinical vignette 1) when using pooled data from both communities.

When comparing pre-intervention survey responders (n=19) to non responders (n=6) in the intervention community, there appeared to be no large differences except for the proportion of solo practitioners. There were over twice as many solo practitioners among responders (68%) compared to non responders (33%). In the control community, survey non responders appeared to be older (by almost 10 years), have 20% more solo practitioners and have 13% more in office x-ray use compared to responders. (See Table 4)
Table 3 Comparison of Personal and Practice Characteristics, Including X-ray use of Respondents to Pre-intervention Surveys in both Communities.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention (n=19)</th>
<th>Control (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean years</td>
<td>41.3 *</td>
<td>37.3</td>
</tr>
<tr>
<td>Duration in practice, mean years</td>
<td>14.4 *</td>
<td>11.2</td>
</tr>
<tr>
<td>Year of graduation, % ≥ 1983</td>
<td>42</td>
<td>69</td>
</tr>
<tr>
<td>Male, %</td>
<td>79</td>
<td>77</td>
</tr>
<tr>
<td>Solo practice, %</td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>Post-grad training, %</td>
<td>50 *</td>
<td>38</td>
</tr>
<tr>
<td>Teach chiropractic trainees, %</td>
<td>11 *</td>
<td>15</td>
</tr>
<tr>
<td>Canadian Memorial Chiropractic College grad, %</td>
<td>95</td>
<td>77</td>
</tr>
<tr>
<td>In office x-ray use, %</td>
<td>74</td>
<td>50 **</td>
</tr>
<tr>
<td>X-ray use in vignette 1</td>
<td>63</td>
<td>54</td>
</tr>
<tr>
<td>X-ray useful in ALBP &lt; 1 month, % agree</td>
<td>68</td>
<td>64</td>
</tr>
<tr>
<td>X-ray due to patient expectation, % agree</td>
<td>0</td>
<td>09</td>
</tr>
</tbody>
</table>

* n = 18 and ** n = 12 due to missing data.

Table 4 Comparison of Personal and Practice Characteristics of Responders and Non responders to Pre-intervention Surveys in both Communities.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention Responders (n=19)</th>
<th>Non responders (n=6)</th>
<th>Control Responders (n=13)</th>
<th>Non responders (n=8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean years</td>
<td>41.3 *</td>
<td>43.7</td>
<td>37.3</td>
<td>46.1 ***</td>
</tr>
<tr>
<td>Duration in practice, mean years</td>
<td>14.4 *</td>
<td>16.5</td>
<td>11.2</td>
<td>17.3 ***</td>
</tr>
<tr>
<td>Year of graduation, % ≥ 1983</td>
<td>42</td>
<td>50</td>
<td>69</td>
<td>43 ***</td>
</tr>
<tr>
<td>Male, %</td>
<td>79</td>
<td>67</td>
<td>77</td>
<td>88</td>
</tr>
<tr>
<td>Solo practice, %</td>
<td>68</td>
<td>33 †</td>
<td>31</td>
<td>50</td>
</tr>
<tr>
<td>Post-grad training, %</td>
<td>50 *</td>
<td>50</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>Teach chiropractic trainees, %</td>
<td>11 *</td>
<td>0</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Canadian Chiropractic College grad, %</td>
<td>95</td>
<td>100</td>
<td>77</td>
<td>100 ***</td>
</tr>
<tr>
<td>In office x-ray use, %</td>
<td>74</td>
<td>67</td>
<td>50 **</td>
<td>63</td>
</tr>
</tbody>
</table>

* n=18, ** n=12 and *** n=7 due to missing data.
Figure 10  Study Time Line

PRE-INTERVENTION PHASE

JULY 2, 1997
MAIL SURVEYS

NOV 13, 1997
FOCUS GROUP SESSION

INTERVENTION PHASE

FEB. 12, 1998
WORKSHOP

JUNE 25, 1998
NEWS RELEASE

FEB. 25-MAR. 11, 1998
ACADEMIC DETAILING

POST INTERVENTION PHASE

JUNE 1, 1998
MAIL POST INTERVENTION SURVEYS

OCT 19, 1998
MAIL INTERVENTION EVALUATION QUESTIONNAIRE
4.2 Identification and training of OL and EI in the intervention community

Of the 19 respondents to pre-intervention surveys in the intervention community, 7 (36.8%) indicated they use a local chiropractor, medical doctor, specialist, or other provider for information and/or advice on the management of LBP. When asked to indicate the type of health care provider they use, 5 indicated another chiropractor, one a rheumatologist and one an orthopaedic specialist. Only 3 respondents provided the names of the health care providers, one of the names was not legible. Of the remaining two names, both were chiropractors.

The two chiropractors named were identified and found to practice in the same office. Following interviews with other chiropractors in the community, it appeared the named chiropractors were not considered by others to be either OL or EI. Moreover, there was not a consensus among the those interviewed, who in the community were considered to be OL and/or EI. Consequently, no OL or EI were identified or trained in the intervention community.

4.3 Focus group session

4.31 Personal and practice characteristics: The focus group session lasted for about two hours and was attended by seven of the eight chiropractors invited to participate. All participants completed the questionnaire briefly outlining their personal and practice characteristics, prior to the start of the session. The results are summarized and compared to pre-intervention survey respondents (excluding those respondents who participated in the focus group session) in Table 5. All seven chiropractors were graduates of CMCC. The mean
age was 36.7 and mean number of years in practice was 9.3. Over 70% of the participants were males. The majority, over 70% said they had post-graduate training and 14% were solo practitioners. The remaining participants stated they either practice in a multidisciplinary setting (43%) or with other chiropractors (43%). Almost 60% of the participants indicated they had in-office x-ray facilities.

When comparing the two groups, the survey respondent had 53% more solo practitioners, had seven years more experience and had 20% more in office x-ray use than the focus group participants.

Table 5  Comparison of Personal and Practice Characteristics of Focus Group Participants and Survey Respondents in the Intervention Community

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Focus group Participants (n=7)</th>
<th>Surveys Respondents (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean years</td>
<td>36.7</td>
<td>40.2</td>
</tr>
<tr>
<td>Duration in practice, mean years</td>
<td>9.3</td>
<td>16.7</td>
</tr>
<tr>
<td>Male, %</td>
<td>71</td>
<td>83</td>
</tr>
<tr>
<td>Solo practice, %</td>
<td>14</td>
<td>67</td>
</tr>
<tr>
<td>Post-grad training, %</td>
<td>71</td>
<td>50</td>
</tr>
<tr>
<td>Canadian Memorial Chiropractic College grad, %</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td>In office x-ray use, %</td>
<td>57</td>
<td>77</td>
</tr>
</tbody>
</table>

† excludes focus group participants who responded to surveys

4.32 Results of the qualitative analysis of the focus group session:

a) Participants characterize their practice

When asked to describe their practice, 5 out of the 7 participants described their practice as "wellness- based... incorporating an holistic approach to patient care". The remaining two chiropractors described their practice as "mainly acute care" with some elements of
preventative and maintenance care. Two of the participants who described their practice as "wellness-based" also considered themselves strong "subluxation-based... non-pain oriented" chiropractors whose goal is "the detection and adjustment of subluxation to maximize neural function thereby optimizing patient health." The others use some form of "mechanical model... to assess and treat spinal dysfunction..." and whose main goals are "...pain reduction, improved range of motion and an improvement in overall health."

b) Clinical practice guidelines

The majority of the group rarely used or refer to clinical practice guidelines such as the Mercy [Haldeman et al., 1992], Glenerin [Henderson et al., 1994] and/or AHCPR guidelines. [ Bigos et al., 1994] Most were critical of practice guidelines and there were no strong supporters for their use among the participants. The most sympathetic statements for their use included; "...they are just guidelines and I think it's important that we have them... so that practitioners get an idea of what is accepted, generally, for a particular problem..., ” and, published guidelines "... are just the first step in an evolution (of patient care)....”. There were three main themes surrounding the criticism of practice guidelines. Firstly, some felt they refer to patient symptoms only and there is no guidance on preventative or maintenance care; "... the guidelines seem to apply to the initial intensive acute care... once the main complaint is looked after... they seem to fall apart.” Those chiropractors who are more subluxation-based, stated they used other parameters to guide their care other than patient symptoms or orthopaedic tests; "... instruments such as radiography...EMG, infra-red thermography, thermo-scanning and postural assessments... help guide me to make proper decisions... when I realize a patient has reached his optimal level of health, then I simply suggest maintaining that
optimum level.”

Secondly, many felt that clinical guidelines refer to the uncomplicated patient “... which rarely exists ...” according to one participant. Another stated, “... there are lots of exceptions to the guidelines because of patient variability.” The vast majority agreed that most patients who seek care are not uncomplicated but rather complicated with their own unique set of circumstances; “... that’s why in my practice the guidelines don’t apply....”

Finally, practice guidelines were criticised because they are often quoted by third party payers who attempt to dictate care based on these guidelines without the necessary qualifications or full insight of the patient’s problem.

c) X-ray use for ALBP

This section produced more varied opinions and resulted in more debate among the participants. Two out of the 7 participants said they rarely use x-ray for ALBP patients unless there was the suggestion of underlying serious pathology (red flags) during the evaluation. Routine use of x-ray was used by two other chiropractors who stated that they perform full spine x-ray evaluation on all patients regardless of complaint. The only exception would be children 10 years old or younger and those patients who have had recent x-rays (provided they have the appropriate views taken). One chiropractor indicated he uses x-ray a lot less now than when he graduated; however if the patient does not show improvement within one to two weeks then he would request an x-ray. Another participant stated he x-rays approximately 80-90% of his adult patients and uses, in addition to static upright films, functional studies; “… I am also looking to see how the back is functioning... not just looking for pathologies or degenerative changes... its part of my dynamic analysis.” The final
chiropractor indicated he x-rays about 50-60% of his patients which is less than in his earlier years in practice, citing his experience and his concern for cancer producing radiation as reasons for reducing x-ray use.

The majority of the debate centred around the use of x-ray for detecting and analysing spinal misalignments and subluxations. Three out of the seven participants used some form of x-ray markings to assist them in their treatment; "... radiographs do show evidence of misalignment in the spine... and if you get into certain (adjusting) techniques, you need to see the x-ray in order to get a listing...". Another chiropractor, although he did not use x-ray marking, felt it was important as a chiropractor to be able to visualize what he is adjusting; "... x-rays help me visualize what I am going to do... it is one more piece of information."

One participant also cited using x-ray films and x-ray markings as an effective educational tool for patients. Other common reasons given for x-ray use in ALBP patients included, ruling out contra-indications for manipulation, to detect anomalies, to confirm a diagnosis, to assess the extent of degenerative changes for prognosis, to help predict recurrences and, for medico-legal purposes. A summary of the reasons given by participants for x-ray use in ALBP patients is given in Figure 11.
**Figure 11**  Focus Group Session: Reasons Given for Taking X-rays for ALBP

| Reason                                                                 | *
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent trauma</td>
</tr>
<tr>
<td>Old trauma, like childhood falls</td>
</tr>
<tr>
<td>Presence of red flags for possible serious disease</td>
</tr>
<tr>
<td>Detection of subluxation, misalignment</td>
</tr>
<tr>
<td>Rule out pathology such as arthritides, tumour, infection etc</td>
</tr>
<tr>
<td>For &quot;listings&quot; for specific adjusting techniques</td>
</tr>
<tr>
<td>To detect possible intervertebral foramina (IVF) encroachment</td>
</tr>
<tr>
<td>For detecting and monitoring degenerative changes</td>
</tr>
<tr>
<td>For presence of spinal anomalies (and possible need to alter adjusting technique)</td>
</tr>
<tr>
<td>To rule out contraindications to adjustments</td>
</tr>
<tr>
<td>To make or confirm a diagnosis</td>
</tr>
<tr>
<td>To assist in prognosis, such as likelihood of further degenerative changes and episodes</td>
</tr>
<tr>
<td>To assess spinal mechanics using dynamic films</td>
</tr>
<tr>
<td>To better visualize the adjustments made to the patient</td>
</tr>
<tr>
<td>For educating patients</td>
</tr>
<tr>
<td>For medico-legal reasons</td>
</tr>
<tr>
<td>After patient fails to respond following: 12 visits, 1-2 weeks, * 2-3 weeks or 4 weeks</td>
</tr>
</tbody>
</table>

*not supported by existing evidence.

d) x-ray use for clinical vignette (see Figure 12)

Two participants stated they would definitely not recommend an x-ray in this patient. However, each stated they would request an x-ray if the patient was not responding to treatment. One of these participants suggested he would wait 2-3 weeks while the other would wait 4 weeks. Two chiropractors indicated they would definitely take an x-ray, not only of the low back but of the entire spine. One participant stated he would likely take an x-ray because he felt the irritable bowel syndrome was a red flag and therefore made this case more complicated. The remaining two chiropractors agreed that the irritable bowel syndrome was an important feature and an x-ray may be helpful. They said they would certainly consider it,
if not initially then definitely after 12 visits, if the irritable bowel got worse or the back pain did not improve. When asked by another participant what they expected to see on an x-ray in a patient with an irritable bowel syndrome, one participant replied “... probably a scoliosis in the thoraco-lumbar junction.” Another chiropractor suggested “… some degenerative changes in the low back.” A participant added a further comment; “…it depends on your perspective and what your goal is... is it to get rid of the (back) pain or do you want to see if there is a spinal component to that irritable bowel syndrome …which is not going to disappear in 6 visits like a sacro-iliac joint problem.” Another chiropractor concluded “… this is a not an acute uncomplicated patient anymore, it is a bigger more complicated case now.”

When asked the type of views they would order if an x-ray was deemed necessary in this case, three participants stated they would use full spine with a cervical and lumbar lateral views (one chiropractor would also include lateral lumbar bending films). The remaining four chiropractors would use segmental x-rays of the lumbar spine without oblique views.

**Figure 12  Clinical Vignette used During Focus Group Session.**

A 27 year old female presents with a 10 day history of acute low back pain following a long bus ride from New York City. She is limited in her ability to work as a letter carrier. The pain is localized to the left lumbosacral region. She is otherwise healthy except for “a recurrent irritable bowel syndrome” which she has had on and off for two years. (now asymptomatic). On examination she has limited ROM during forward flexion (50%) and extension (25%). She is very tender over the left L5-S1 segments which on palpation reproduces her low back pain. Neurologically she is intact.

Would you take an x-ray of this patient? If so why? Which views would you take and why?

If not, why not? When would you consider taking films?

4.33 Results of the focus group evaluation: (See summary in Table 6) There were no
negative impressions or comments of the focus group session expressed by the participants. Some of the impressions and comments included: "enjoyed the dialogue", "informative and enjoyable", "interesting", "very good", "had good open discussion", "excellent rapport" and "quite worthwhile". Five of the seven participants commented on the "wide range of opinions", "different points of view" and "how varied the group was". All participants felt their opinions were sufficiently expressed and they all felt the groups' opinions on x-ray use reflect the opinions of most chiropractors in the study community. None of the participants felt that the facilitator tried to influence their opinions and all felt he maintained neutrality during the session.
<table>
<thead>
<tr>
<th>Participants</th>
<th>Questions</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>General impressions of Focus group session?</td>
<td>enjoyed the dialogue</td>
<td>interesting to see wide range of opinions on topic</td>
<td>informative and helpful-interesting to see differences in perspective and how others practice</td>
<td>good open discussion and conversation</td>
<td>excellent rapport- varied group with lots of common concerns</td>
<td>interesting to see different points of view- depending on background and scope of practice</td>
<td>very good. As many differing opinions as there are chiropractors</td>
<td></td>
</tr>
<tr>
<td>Your opinions sufficiently expressed?</td>
<td>yes</td>
<td>OK</td>
<td>yes</td>
<td>yes, I felt my opinions were expressed</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Groups opinions re: x-rays reflective of chiropractors in community?</td>
<td>a good cross-section</td>
<td>yes</td>
<td>yes</td>
<td>yes, they are varied as are chiropractors</td>
<td>yes</td>
<td>yes</td>
<td>based on each person’s practice method-yes</td>
<td></td>
</tr>
<tr>
<td>Facilitator influenced your opinions? Was he neutral?</td>
<td>Neutral</td>
<td>I believe he maintained neutrality</td>
<td>no</td>
<td>I would say he was generally neutral</td>
<td>no</td>
<td>no</td>
<td>no influence</td>
<td></td>
</tr>
<tr>
<td>Other comments regarding focus group session?</td>
<td>Quite worthwhile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>great</td>
<td></td>
</tr>
</tbody>
</table>
4.4 Intervention

4.41 Workshop: The principal investigator (PI) assumed the role of the OL and EI. The workshop was attended by 9 (36%) chiropractors and was conducted by the PI. In order to reinforce the main message of the workshop, two letters were included in the take home educational package and were presented at the workshop. (See appendix E) These letters were from internationally respected chiropractors who were members of the AHCPR panel, and involved in the development of the ALBP guidelines. Prior to the workshop, the PI had written to these chiropractors requesting a written personal endorsement of the AHCPR x-ray guidelines.

4.42 Academic detailing: The PI visited a total of 17 (68%) chiropractors in their offices (included chiropractors who attended the workshop), and reviewed the information conducted at the workshop. One additional session was conducted by telephone. There were a total of seven chiropractors (28%) who did not either attend the workshop, the focus group session or receive academic detailing. All chiropractors in the intervention community received the take home educational package.

4.43 Media campaign: The news release was published by the larger of the two community newspapers. There was some re-wording of the original news release; however the main content remained unchanged. (See appendix F)
4.5 Change in post intervention outcomes (See Table 8)

4.51 Primary outcome: There was a 64% response rate for the post-intervention surveys in the intervention community and 62% in the control. The number of respondents who completed and returned both pre and post intervention surveys was 14 (56%) for the intervention community and 13 (62%) for the control. In the intervention community there was a 42.9% decrease in the proportion of respondents who requested x-rays in clinical vignette 1 in the post-intervention surveys compared to that in the pre-intervention. This difference was statistically significant (p < 0.025). There was a 7.7% decrease in the control community which was not a statistically significant change (p > 0.05).

4.52 Secondary outcome: There was a 50% decrease in the proportion of respondents in the intervention community who agreed that x-rays were useful in ALBP < 1 month duration when compared to the pre-intervention surveys. This was a statistically significant decrease (p < 0.025). In the control community there was a 15.3% increase which was not statistically significant (p > 0.05).

When comparing personal and practice characteristics of respondents who completed and returned both pre and post intervention surveys and in each community, there were important differences noted, similar to that seen in the pre-intervention surveys. Respondents in the intervention community were on average older (by 7 years), have been in practice longer (by 6 years), have 25% more solo practitioners and have 21% more in office x-ray use. (See Table
Comparing the characteristics of respondents who reported high x-ray use for clinical vignette 1 at baseline with those who had a positive response to the intervention for clinical vignette 1, revealed no large differences except for a 25% higher proportion of respondents who graduated on or after 1983 among those who had a positive response to the intervention. (See Table 9)

When comparing personal and practice characteristics of post-intervention survey respondents to non respondents there were no large differences found in the intervention community (14 respondents vs 11 non respondents) except for a 21% higher proportion of chiropractors with post graduate training among non responders compared to responders. In the control community (13 respondents vs 8 non respondents) non responders had higher mean age (9 year older) were in practice longer (by 6 years) and had 19% more chiropractors with post graduate training. (See Table 10)

There were five respondents in the intervention community who completed the pre-intervention but not the post-intervention surveys. Of these five, four indicated they would both request an x-ray for clinical vignette 1 and agreed that an x-ray was useful in the diagnostic work-up of patients with ALBP of < 1 month duration. The remaining respondent responded no to both questions. In the control community there were no pre-intervention respondents lost to follow up.
### Table 7 Summary of Survey Respondents and Participants in Intervention Community

<table>
<thead>
<tr>
<th></th>
<th>total no. of chiropractors</th>
<th>survey respondents</th>
<th>no. of chiropractors in focus group</th>
<th>no. of chiropractors at workshop</th>
<th>no. of one to one chiropractor visits</th>
<th>responded to intervention evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>25</td>
<td>19</td>
<td>14</td>
<td>14</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 8 Change in the Proportion of Respondents to Questions on X-ray Use in ALBP in Pre-intervention surveys compared to Post-intervention in both Communities.

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterborough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total respondents*</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>X-ray in clinical vignette 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>9 (64.3)</td>
<td>3 (21.4)</td>
<td>&lt; 0.025</td>
</tr>
<tr>
<td>X-ray useful in ALBP &lt; 1 month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>10 (71.4)</td>
<td>3 (21.4)</td>
<td>&lt; 0.025</td>
</tr>
<tr>
<td>Guelph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total respondents*</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>X-ray in clinical vignette 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6 (46.2)</td>
<td>5 (38.5)</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>X-ray useful in ALBP &lt; 1 month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>6 (46.2)</td>
<td>8 (61.5)</td>
<td>&gt; 0.05</td>
</tr>
</tbody>
</table>

* includes respondents who completed both pre and post intervention surveys
Table 9 Comparison of Personal and Practice Characteristics of Respondents Reporting High X-ray use for clinical vignette 1 at Baseline with Those who had a Positive Response to the Intervention.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>High x-ray use clinical vignette 1 (n=12)</th>
<th>Positive response to intervention (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean years</td>
<td>41.7 *</td>
<td>43</td>
</tr>
<tr>
<td>Duration in practice, mean years</td>
<td>15.9 *</td>
<td>16.7</td>
</tr>
<tr>
<td>Year of graduation, % ≥ 1983</td>
<td>42</td>
<td>67</td>
</tr>
<tr>
<td>Male, %</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>Solo practice, %</td>
<td>75</td>
<td>67</td>
</tr>
<tr>
<td>Post-grad training, %</td>
<td>58 *</td>
<td>50</td>
</tr>
<tr>
<td>Teach chiropractic trainees, %</td>
<td>11 *</td>
<td>15</td>
</tr>
<tr>
<td>Canadian Memorial Chiropractic College grad, %</td>
<td>92</td>
<td>83</td>
</tr>
<tr>
<td>In office x-ray use, %</td>
<td>75</td>
<td>67</td>
</tr>
</tbody>
</table>

* n=11 due to missing data

Table 10 Comparison of Personal and Practice Characteristics of Responders and Non respondents to Post-intervention Surveys in both Communities.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention Responders (n=14)</th>
<th>Non responders (n=11)</th>
<th>Control Responders (n=13)</th>
<th>Non responders (n=8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean years</td>
<td>44.9</td>
<td>41.8</td>
<td>37.3</td>
<td>46.1 ***</td>
</tr>
<tr>
<td>Duration in practice, mean years</td>
<td>17.3</td>
<td>15.7</td>
<td>11.2</td>
<td>17.3 ***</td>
</tr>
<tr>
<td>Year of graduation, % ≥ 1983</td>
<td>43</td>
<td>45</td>
<td>69</td>
<td>43 ***</td>
</tr>
<tr>
<td>Male, %</td>
<td>86</td>
<td>73</td>
<td>77</td>
<td>88</td>
</tr>
<tr>
<td>Solo practice, %</td>
<td>57</td>
<td>55</td>
<td>31</td>
<td>50</td>
</tr>
<tr>
<td>Post-grad training, %</td>
<td>43</td>
<td>64 *</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>Teach chiropractic trainees, %</td>
<td>0</td>
<td>18 *</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Canadian Memorial Chiropractic College grad, %</td>
<td>100</td>
<td>91</td>
<td>77</td>
<td>100 ***</td>
</tr>
<tr>
<td>In office x-ray use, %</td>
<td>71</td>
<td>73</td>
<td>50 **</td>
<td>63</td>
</tr>
</tbody>
</table>

* n=10; ** n=12; *** n=7 due to missing data.
4.6 Evaluation of the intervention

A total of 12 completed questionnaires were returned for a response rate of 48%.

Only one respondent indicated their practice did not include patients with back pain. This respondent completed only the first section of the questionnaire.

Ten of the 12 respondents (83%) were aware of the research initiative in their community aimed at implementing evidence-based guidelines for the use of x-ray for ALBP. Only two respondents stated they were not aware of the "Red Flags" for x-ray use for ALBP. Seven of the 10 respondents who were aware of the "Red Flags" said they found out about them through the research project in their community. Half of the respondents said they had modified their approach to x-ray use for ALBP patients over the past year.

When asked what in their opinion, was the most important message of the research initiative, eight out of 10 who responded to this question selected the option: if there are no red flags, x-rays are of little value in patients with ALBP, and two selected: most patients with ALBP need x-rays. Table 8 summarizes the responses to the usefulness of each component of the intervention. There was 11 respondents who completed this section. Of 11 respondents, 9 indicated they took part in the workshop. Out of the 9 participants 7 (78%) indicated it was either useful or very useful and the remaining said they could not tell.

The decision aid tool was found very useful or useful by 8 (73%) of the respondents, 1 found it not very useful and 2 could not tell. The vast majority of respondents (82%) stated they felt the one on one meeting with the researcher (academic detailing) was either useful or very
useful and the remaining indicated they could not tell. Only one out of 10 who responded stated the news release was very useful, 2 said it was not very useful and the remaining indicated they could not tell or did not take part. (see summary Table 11)

<table>
<thead>
<tr>
<th>Component</th>
<th>Did not take part</th>
<th>Very useful</th>
<th>Useful</th>
<th>Not very useful</th>
<th>Useless</th>
<th>Can't tell</th>
<th>Total respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus group session</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Workshop meeting</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Handout material (key research papers)</td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Decision aid tool (check list for x-ray use)</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>one on one meeting with researcher</td>
<td>2</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>News release (educating public)</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>
Chapter 5
Protocol for the Use of Administrative Databases

5.1 Overview

There are weaknesses in this pilot study that substantially threaten the validity of the observed results. One main limitation is the use of survey data to assess outcomes pertaining to x-ray use in ALBP patients. Information obtained from surveys may not truly reflect what is actually done in practice. The use of administrative databases may help to assess more accurately, actual practice patterns. A protocol for the use of OHIP and WCB databases to assess x-ray utilization in ALBP patients in this study will be described. Due to confidentiality of chiropractors' and patients' records, only aggregate data in each community will be used. The Ministry of Health of Ontario and WCB will be given the names of eligible chiropractors practicing in the intervention and control communities. Eligible chiropractors will be those who were in active practice, in their respective communities, during the period 12 months before and after the intervention. This information will be obtained from the Directory of the College of Chiropractors of Ontario. [1996] Once identified, aggregate patient data from eligible chiropractors in each community will be collected. An attempt will be made to identify only ALBP patients and compare the proportion ALBP patients who receive an x-ray per chiropractor (on the index visit) before and after the intervention in each community.

5.2 Description of Databases
5.21 OHIP database: The OHIP database is a claims database for eligible health care providers, including chiropractors. Virtually all practising chiropractors bill to OHIP. [Grod, 1997] OHIP pays a maximum of $220.00 per patient per year for chiropractic services which includes a maximum of $40.00 for x-ray services. [Ontario Health Insurance Plan Bulletin on Chiropractic Services, 1989] For each service billed to OHIP, there is specific information required to initiate a valid claim including; date of service, patient and practitioner identifiers, procedural codes and diagnostic codes. Patient identifiers such as name, date of birth, gender and health card number as well as practitioner identification numbers have been shown to be coded with high accuracy by practitioners (> 97%). [ICES Practice Atlas, 1996] Procedural billing codes have also been shown to be coded with high accuracy (~ 98%). [ICES Practice Atlas, 1996] However coding for medical diagnoses which accompanies submitted claims is not very accurate. [ICES Practice Atlas, 1996]

The key variables of the chiropractic OHIP claims database for this study include chiropractor identification number, service date and codes for low back x-rays, initial assessment and diagnoses. All possible x-ray codes used by chiropractors to bill for low back x-rays as well as all likely diagnostic codes used for ALBP are outlined in Figure 13. Initial assessment and subsequent treatment codes are also listed. The initial assessment code is associated with a higher billing fee and refers to either a new patient or a previous patient who has not been seen for three months or more.

5.22 WCB database: This is a work injury claims database. Chiropractors are registered
practitioners with the Ontario WCB and must submit a written initial assessment report, and bill directly to the WCB for all services related to assessment and treatment of eligible injured workers. Submitted claims data includes, date of service, patient, practitioner and employer identifiers, nature of injury, body part injured and procedural codes (such as for x-rays, assessment and treatment). Like other administrative databases, patient and practitioner identifiers and procedural coding are coded with high accuracy. [Beaton, 1995] With respect to accuracy of coding for the nature of injury and body part injured, Beaton [1995] compared Ontario WCB claims data with telephone interviews of a cohort of 2051 injured workers. They found a 97% accuracy for coding of soft tissue injury (with 2% coded inaccurately and 1% missing data), and for body part injured there was moderate agreement (unweighted kappa of .71) between the database and telephone interviews.

Unlikely the OHIP database, specific x-ray billing codes are not available in the WCB database. This database aggregates all x-ray services billed into one x-ray service code, however a record of the amount billed for the x-ray service is available. [Hogg-Johnson, 1998] Given the body part injured, it may be possible to determine the specific type of x-ray billed using the x-ray service fee since the x-ray billing codes most likely to be used for a low back injury have different associated fees. The key variables of the WCB database for this study are: type of practice, service date, practitioner and patient identification numbers, initial assessment code, body part injured and the x-ray service code and associated fee. Figure 13 lists available codes in the WCB database as well as the x-ray billing codes and associated fee.
Figure 13  Important X-ray, Service, and Diagnostic Codes for OHIP and WCB Databases

<table>
<thead>
<tr>
<th>OHIP</th>
<th>X-ray Codes</th>
<th>Service Codes</th>
<th>Diagnostic Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>V108 Lumbar Spine A/P and Lat</td>
<td>V103 Initial/ Re-assessment</td>
<td>Subluxations</td>
<td></td>
</tr>
<tr>
<td>V109 Pelvis and Sacrum A/P and Lat</td>
<td>V101 Subsequent Visit</td>
<td>Lumbar, Lumbosacral, Sacroiliac, Coccyx</td>
<td></td>
</tr>
<tr>
<td>V110 Full Spine A/P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V111 Full Spine A/P plus Additional View</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V112 Full Spine A/P plus Two Additional Views</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WCB</th>
<th>X-ray Fees *</th>
<th>Service Codes</th>
<th>Body Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar or Lumbosacral</td>
<td>$ 32.90 (X028 two or three views)</td>
<td>06 General Assessment</td>
<td>Low back</td>
</tr>
<tr>
<td></td>
<td>$ 42.80 (X205 four or five views)</td>
<td>01 Minor Assessment/ Office Visit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$ 52.20 (X206 six or more views)</td>
<td>40 X-ray (all types)</td>
<td></td>
</tr>
<tr>
<td>Entire Spine</td>
<td>$ 71.65 (X032 minimum of four views)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$ 41.10 (X031 two or more views)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacroiliac Joints</td>
<td>$ 30.50 (X035 two or three views)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$ 40.20 (X208 four or more views)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* billing x-ray codes not identifiable in database only fee submitted.

5.3 Algorithm for identifying acute LBP patients from databases
The population of interest in this study were patients who present to chiropractic offices with ALBP, defined as LBP of less than 3 months duration without a previous episode for up to 6 months. Although there are diagnostic codes available for ALBP, the accuracy of diagnostic coding by chiropractors is unknown and assumed to be no better than physicians which has been shown to be poor. [ICES Practice Atlas, 1996; Check, 1997] Moreover there are no diagnostic codes available which strictly identifies the ALBP patient as defined above. Therefore an algorithm was developed to identify these patients from the databases.

For the OHIP database, all eligible chiropractors will first be identified. Using their practitioner number, data on all patients seen during the pre-intervention period (February 1st 1997 to January 31st, 1998) and post intervention period (July 1st, 1989 to June 30th, 1999) will be isolated for each community. The next step will be to accept only patients coded with a procedural code V103 (initial assessment code). This identifies all new patients presenting with symptoms or previous patients who have not been seen for three months or more. To identify patients with pain of recent onset only (acute), patients who presented to a chiropractor between 3 to 9 months prior to the initial assessment will be excluded (eliminating patients with chronic symptoms). Also excluded will be patients who visited a physician during the same time period and given a diagnosis of a musculoskeletal condition (using physician diagnostic codes). From this remaining group, patients will be accepted only if they have been coded with any of the possible pre-defined diagnostic codes for ALBP. Although there is uncertainty in the accuracy of the diagnostic coding, it is expected that the majority of patients with ALBP will be identified since over 75% of patients seen by Ontario
chiropractors present with LBP, and in over half the cases the duration of symptoms is less than 3 months. [Hurwitz et al., 1998]

Identifying LBP patients from the WCB database should be less problematic since coding for body part injured (low back) is considered moderately accurate [Beaton, 1995]. First, all WCB claims from eligible chiropractors during the study periods will be identified using practitioner identification numbers. Injury claims other than for the low back will be excluded. Injured workers with chronic or recurrent LBP will be eliminated if they have had previous WCB LBP claims (physician and/or chiropractor initiated) during a 6 month period prior to the initial visit. Patients will also be excluded if they had seen a chiropractor or a physician (with a musculoskeletal diagnosis) during this same time period. This information will be obtained by linking OHIP and WCB databases using patient identifiers, which have been shown to be accurate [ICES Practice Atlas, 1996] and service dates.

Once the ALBP patients have been identified, those who had an x-ray on the index visit can be determined using the x-ray service code outlined in Figure 13.

5.4 Assessing the validity of the algorithm

In order to assess the validity of the algorithm in identifying ALBP patients from the databases a random sample of 40 patients who are confirmed by chart review to have suffered ALBP, and a random sample of 40 patients who did not will be compared to the designation given using the databases. The patients will be selected from five randomly selected
chiropractors (using computer generated numbers) from each community. The records will be selected at each chiropractor's office by measuring the total length of records in centimetres for the 12 month period prior to the intervention (as if the records were books on a shelf). A random-number table will be used to select a random number of centimetres from the beginning of the chiropractor's charts. Records will be pulled until four patients with the chief complaint of ALBP (as previously defined above) and four without have been identified (one of each will be WCB claims). Patient identifiers and index service date will then be used to locate the patients within each database and compare their designation using the algorithm. The patient charts will be considered the "gold standard", and sensitivity, specificity and predictive value of the algorithm to identify ALBP patients will be calculated.

5.5 Outcome measures

5.51 Primary outcomes: The main outcome will be the proportion of ALBP patients who receive a back x-ray during the index visit (total number of back x-rays for ALBP/total number of ALBP patients) as derived from OHIP and WCB databases.

5.52 Secondary outcomes: This will include total billings for low back x-rays and for all services provided in the index visit per ALBP patient.

5.6 Analysis

The SAS statistical package version 6.12 will be used for the analysis. Raw data collected from OHIP and WCB before and after the intervention will be pooled together and entered
into the program. It will be assumed that all data entered will be exclusively from only ALBP patients seen in each community during the study period.

5.61 Sample size: The current x-ray rate for ALBP for Ontario chiropractors is estimated to be approximately 60%[Aker et al., 1996]. Using a sample size formula for comparing two binomial proportions, [Rosner, 1995] to detect a 30% reduction in the x-ray rate using an alpha = 0.05 and a power of 80%, 42 pairs of data points (total of 84) are required. Since the pre and post intervention periods are each 12 months in duration, the proportion of ALBP patients who receive a back x-ray per community would be measured each week. This would provide a sufficient number of data points (total of 96).

5.62 Primary analysis: For the primary analysis, the change in the mean x-ray rate (number of x-rays taken per ALBP patient per chiropractor) before and after intervention will be compared for both the intervention and control communities using a paired t-test for independent samples.[Rosner, 1995] This test assumes weekly measures (mean x-ray rates) are independent and are normally distributed with homogeneous variance. It is acknowledged that the weekly measures are not independent but rather auto-correlated and therefore this may limit the validity of the results. The use of additional data points as a buffer may help to compensate for this. Moreover, Donner [1994] suggests the t-test is remarkably robust to violations of the underlying assumptions. In order to control for the migration of chiropractors in and out of the study communities, all analyses will include aggregate data from only those chiropractors who have practised in their respective communities throughout the study period.
5.63 **Secondary analysis:** The change in the mean cost for back x-rays (total x-ray billings for ALBP during the index visit/total number of ALBP patients/total number of chiropractors in the community) and the change in mean cost for all services per ALBP patient per chiropractor before and after the intervention will be compared in each community using a paired t-test for independent samples.[Rosner, 1995] To assess trends in practice patterns over time among all chiropractors in each community, the frequency of back x-ray, assessment and office visit codes used (see Figure 13) per chiropractor for a period of three years prior to the pre-intervention phase will be evaluated for each database and compared to the study period. The chiropractors would be identified using the Directory of the College of Chiropractors in Ontario for the years 1993 to 1996. A comparison of the number of ALBP patients seen per chiropractor in each community before and after the intervention will also be performed. ALBP patients will be identified using the same methodology outlined in section 5.3.

5.7 **Strengths and limitations of databases**

Administrative databases such as OHIP and WCB are being increasingly used to measure the utilization of health care services. Advantages of these databases include the ability to provide information on large numbers of patients as well as allow long-term follow-up of a defined sample of patients, both at a relatively low cost compared with primary data collection. [Roos et al., 1987] Since the vast majority of physicians and chiropractors submit eligible claims to OHIP and WCB for payment, accurate information regarding the number and types of services provided can be collected. However, payment for chiropractic services by OHIP are limited by
a yearly cap per patient ($220 per year including a maximum of $40 per year for x-ray services) which represents about 22 visits. Once the cap has been reached, services provided, including x-ray, will not be captured by the OHIP database. Although in Ontario, the mean number of visits to a chiropractor per episode of LBP is 10.5 and for all conditions 9.6, [Hurwitz et al., 1998] it is possible that patients reached their cap (either the x-ray cap and /or total services) prior to their index ALBP episode and therefore would not be captured by the database.

In addition, some chiropractors send their patients to private facilities or hospitals for x-ray services. These services would usually be billed by the hospital or the private facility directly to OHIP and therefore the chiropractic x-ray codes would not apply. In the intervention community, according to the survey results in this study, only 2 out of the 19 (10.5%) respondents use a private facility for x-ray services. The remaining chiropractors either use in-office x-ray facilities or the facilities of another chiropractor and bill directly to OHIP. In the control community however, 7 out of the 12 (58%) survey respondents use local hospitals for x-ray services. The two hospitals in this community do not keep records of patients referred by chiropractors, and there are no means of identifying the referring chiropractor from the hospital OHIP billings for x-rays. This substantially limits the accuracy of x-ray utilization using the OHIP database in this community.

Another major limitation to administrative databases is the lack of accuracy of diagnostic coding. [ICES Practice Atlas] It is estimated that the diagnostic coding in the OHIP database by physicians and chiropractors is less than 50% accurate. [Check, 1997] The use of an algorithm was suggested in this protocol to attempt to overcome this problem. However, its
ability to identify the ALBP patient is unknown. The database and the protocol is also limited by the use of aggregate data. If any significant change in x-ray use is found, it would not be possible to determine if this was due to a change in the x-ray ordering behaviour of one or all eligible chiropractors. This limitation could be alleviated by identifying and tagging all eligible chiropractors thereby having specific data on each chiropractor. This however, would require written authorization from each eligible chiropractor (due to the confidentiality of the information) which may not be feasible.

There are additional limitations to the WCB database. Patients who sustain multiple injuries (including their low back) may not be identified in the database if the most serious body part injured is not the low back. The most serious body part injured is usually recorded in the database. Lack of specific coding of chiropractic x-rays in the database is also a problem although if patients have a single injury to the low back, the amount billed by the chiropractor can be used to identify the type of x-ray billed. However, patients who suffer injuries to both the neck and low back and receive an x-ray to only one area may not be differentiated since some cervical and lumbar spine x-ray fees are the same.

The duration of any positive result would also be limited by the protocol. With the use of administrative databases a longer follow-up period can be performed at a future date to assess the duration of any positive change in x-ray utilization.
CHAPTER 6
Discussion, evaluation of study design, limitations and conclusions

6.1 Discussion

The primary objective in this pilot study was to assess the ability of a multifaceted educational intervention to decrease the x-ray use rate for uncomplicated ALBP. Prior to answering this question, a needs assessment was conducted to determine if indeed a discrepancy existed between current practice and recommended care. A high rate of x-ray use was confirmed in both the intervention and control communities and was consistent with rates seen in other studies.

The positive results, a 43% (p<0.025) and 50% (p<0.025) reduction in both primary and secondary outcomes respectively, suggests the educational intervention in this study was successful in changing the self-reported need for x-ray use in ALBP. There was no change in the control community for either outcome measures. The power to detect a significant change in the control community was examined by comparing the proportion of chiropractors who had a favourable change their opinion following the intervention in each community. For the primary outcome, seven of nine (p1 = 0.78) in the intervention community compared to one of six (p2 =0.17) in the control changed their opinion. Testing the null hypothesis, p1 = p2 using Fisher’s Exact test gives a two-sided p-value of 0.07 and therefore, for those who originally favoured x-rays in the pre-intervention surveys, the rates of change between the two communities are marginally significantly different with more change in the intervention
community. For the secondary outcome, seven of the intervention chiropractors changed opinions between the pre- and post intervention periods, all in the favourable direction and this result was significant. In the control community, however, six chiropractors changed opinions, two in a favourable direction and four in the opposite direction (originally indicated they did not favour x-rays but later said they did). This result was not significant (p=0.69) suggesting that the changes in opinion were not systematically in one direction or the other. Therefore, it is unlikely that the results seen the the control community occurred by chance and a true change was missed.

The positive results in this study were seen despite alterations in the initial protocol. The inability to identify community OL and/or EI required the PI to take on the role of delivering, tailoring and facilitating the intervention strategies. According to Davies, [1997] it is unlikely that local OL and EI did not exist in this chiropractic community, but rather the method used was unsuccessful in identifying them. The survey question and interviews with local chiropractors were not successful in identifying OL and/or EI in this community. Similar questions have been successfully used in identifying OL and/or EI in the medical community. [ Bombardier et al., 1996] It is possible that OL and/or EI are generally more easily identifiable among physicians than chiropractors or the method used was more specific to physicians. It is likely that OL and/or physicians are more easily identified by their peers, possibly due to the greater interaction among physicians. This is especially true in the hospital environment, where there is already in place a hierarchy of experience and expertise as well as a place physicians regularly meet and attend educational lectures and workshops. Moreover, the existence of specialists among physicians makes it easier to identify those who are more
knowledgable and whose opinions would likely be respected. On the other hand, chiropractors generally practice in isolation, whether solo or in small group practices (usually with one other chiropractor) where there is less intra professional referrals and interaction, in comparison to physicians.[Aker et al., 1996] In an attempt to provide additional credibility to the message provided by the PI, letters were requested from two prominent international chiropractors endorsing the AHCPR x-ray guidelines. However, it is unlikely the letters were contributory in altering behaviour towards x-ray use. Neither letter was a strong reinforcement of the AHCPR guidelines.(See appendix E)

There are several possible reasons for the positive results seen in this study. The intervention as a whole, or any one of its components may have had a true effect in changing the attitudes towards x-ray use of the intervention chiropractors. It is also possible that the intervention chiropractors gave the desirable responses to follow-up surveys, just to please the PI, or because of the non-specific effects of being involved in the study (Hawthorne effect); therefore, the responses may not have been a reflection of their actual practice patterns. This would give rise to a false positive effect of the intervention in changing practice behaviour. To test this alternative explanation, random chart audits of respondents’ practices or the use of administrative databases where practitioners can be identified, would be required. Another explanation for the positive results, would be the presence of other unknown factors that had led to the change in practice behaviour independent of the intervention. This is a less likely possibility with the use of a control community, although potential unknown factors may be present that are specific to the intervention community.
In the bivariate analysis, there did not appear to be any personal or practice characteristics that were associated with x-ray use for uncomplicated ALBP. The small number of respondents in this study may be the reason for this finding. Previous studies have suggested solo practitioners, x-ray ownership and younger providers to be associated with higher x-ray use. [Carey et al., 1996; Childs et al., 1972] Due to the small number of participating chiropractors, there was low power to detect meaningful differences in personal and practice characteristics between the two communities. However, there appeared to be a qualitative trend whereby the chiropractors in the intervention community at baseline were older, more experienced, had higher number of solo practitioners, more owned their own x-ray machine and took more x-rays compared to the control community. Only the solo practice results achieved statistical significance, although some of the other trends were substantial. Similar differences were noted among chiropractors who responded to both pre and post intervention surveys. The trend suggested a bias in favour of higher x-rays use in the intervention community.

When comparing respondents with non respondents to both pre and post intervention surveys in the intervention community, there was only one large difference noted. This was with respect to post graduate training where the smaller proportion among respondents would again suggest a bias towards higher x-ray use in this group. In the control community the bias was in both directions. A higher proportion of younger, inexperienced respondents with less post graduate training suggests a higher x-rays use whereas a smaller proportion of solo practitioners in this group suggests a bias towards lower x-ray use compared to non
responders.

Another possible reason for a positive result in the intervention community was that the personal and practice characteristics of those chiropractors who had a favourable change following the intervention were different than those who had reported high x-ray use at baseline (bias favouring lower x-ray use). However, when examining these two groups there were no large differences between the two groups, except for a 25% higher proportion of respondents who graduated on or after 1983 (younger chiropractors) among chiropractors who had a positive response to the intervention. This would favour a bias towards higher x-ray use in this group.

When assessing for potential bias due to differential loss to follow-up, only in the intervention community was there a loss of respondents (a total of five). For the primary outcome, four out of five indicated in the pre-intervention surveys they would request an x-ray and one would not. For the secondary outcome, four agreed ( x-ray is useful in ALBP of less than one month duration) and one did not. When considering a worse case scenario where all high x-ray use respondents remain unchanged and are included in the analysis using McNemar’s Exact Test, this does not change the results of either outcome since there is no change in the number of discordant pairs. However if the respondent who originally said no (or disagreed) in the pre-intervention survey was included in the analysis as a yes (or agreed) following the intervention, then this would result in a p value > 0.05 and therefore would indicate there was no significant change in x-ray use before and after the intervention for both outcome measures. Using best case analysis would strengthen the positive results in both outcome measures.
The focus group session provided insight to the reasons for the high x-ray use rate found in the quantitative analysis. Qualitative methods, such as the use of focus groups, are well suited to understanding beliefs and behaviours and how and why decisions are made. [Kingry et al., 1990; Quandt et al., 1997] These methods are often used to complement quantitative research in order to have a better understanding of the phenomena of interest. [Pope et al., 1995]

The focus group participants and survey respondents were similar except for less practice years and fewer solo practitioners among focus group participants. This difference however, was not associated with a lower x-ray use rate among focus group participants when compared to the survey respondents.

The majority of reasons given by the focus group participants for x-ray use in ALBP patients were not consistent with existing evidence. This may explain the large gap between current practice and available evidence. Although all participants agreed that x-ray use is important in ALBP to rule out pathology, the majority felt there were other reasons to take x-rays, many being unique to chiropractors who use spinal manipulation. Most of these reasons can be grouped into 3 categories: performing a biomechanical evaluation, detecting spinal anomalies and contraindication to manipulation. The use of x-ray for biomechanical analysis of the spine has been used by chiropractors for many years and is controversial. [Phillips, 1992; Phillips, Frymoyer et al., 1986; Taylor et al., 1994; Mootz et al., 1997] This analysis refers to the detection of spinal misalignments (subluxation), postural distortions, and altered dynamics of spinal movement (using functional radiography). Spinal measurements are often taken to assess the structural alignment. Listings are given to describe the altered position and/or motion, and these listings are often used to determine the parameters for manipulation.
(adjustment). Previous studies, [Phillip et al., 1986; Haas et al., 1990; Phillips, Howe et al., 1986; Frymoyer et al., 1986] assessing the validity and reliability of radiographic biomechanical analysis suggest there is a lack of good evidence to substantiate its use. A recent review of the literature also concludes there is insufficient evidence for using radiographic biomechanical analysis. [Mootz et al., 1997] The only exception is for scoliosis evaluation. [Taylor et al., 1994] Many of these studies suggest high inter-observer and intra-observer error, and minimal predictive value for present or prior history of low back and leg complaints.

Most studies evaluating spinal anomalies in the lumbosacral spine such as spina bifida, transitional segment, facet tropism and Schmorl's nodes show no higher incidence in patients with low back and leg symptoms than those without. [Magora et al., 1980; Magora et al., 1978; Frymoyer et al., 1986] The only possible exception is spondylololithesis. [Magora et al., 1980; Bigos et al., 1994] However, none of these anomalies have been shown to be a contraindication to spinal manipulation. [Mierau et al., 1987; Gatterman, 1991] Most contraindications to manipulation of the low back are evident during the history and physical examination, and routine screening is not recommended. [Taylor et al., 1994; Gatterman, 1991]

The use of x-ray in patients with uncomplicated low back pain for detecting and monitoring intervertebral foramina (IVF) encroachment and degenerative changes is not supported by current evidence. [van Tulder et al., 1997; Mootz et al., 1997, Bigos et al., 1994] Many patients without low back pain have been shown to have degenerative changes and IVF encroachment. In those patients with LBP, the severity and location of the
degenerative changes correlate poorly with symptoms. [Witt et al. 1984; ] This variation would make the presence and/or severity of degenerative changes unreliable for assessing prognosis or predicting further episodes of LBP. In addition, the presence and monitoring of degenerative changes will unlikely alter treatment except in severe unstable degenerative spondylolithesis or severe degenerative spinal stenosis in which case more advanced imaging would likely be more useful. [Taylor et al., 1994] Other reasons given for taking x-rays such as patient education, medico-legal protection and routine office procedure are clinically and ethically unjustified. [Phillips, 1992; Taylor et al., 1994]

There are several limitations to the results of the focus group session. The sampling strategy used was subjective and may have resulted in the selection of a homogenous group whose views and attitudes were not representative of the study community. This did not appear to be the case. The opinions expressed by the participants were varied, and according to the focus group evaluation, participants felt their views reflected the diverse opinions of chiropractors in the community. Other limitations include, the lack of assurance that the participants were honest with their responses; the analysis and interpretation of the data could be seen as subjective, and the session was conducted, analysed and interpreted by the PI which may have introduced bias. Although these limitations may be possible, the varied beliefs and attitudes towards x-ray use expressed by this group appeared to be similar to those found in other types of studies both in the US and Canada.[Mootz et al., Aker et al., 1996; Cherkin et al., 1988; Phillips, 1992] There are no other known studies using focus group methods for assessing the attitudes and beliefs towards x-ray use for ALBP among chiropractors.
Strategies to improve the validity of the focus group findings would include using an independent facilitator, having another independent researcher summarize and interpret the transcribed recording, and providing the participants with a summary of the findings for validation.

Evaluation of the intervention provided some insight into which components of the intervention were perceived to be useful by chiropractors in the intervention community. Twelve chiropractors (48%) returned a completed questionnaire. None of the components of the intervention were perceived to be useless. The workshop, handout material, decision aid tool, and one on one meeting with the researcher all were considered useful or very useful by the majority of respondents. The component of the intervention that appeared to have the least perceived usefulness was the news release. This is not surprising since the message may have been perceived as “bad press” by chiropractors in the community.

It is was not possible from this study or this evaluation to determine which components of the intervention had the most influence on the results seen. This is another limitation to the study. However, the success of the intervention may likely be a result of implementing all the above components together as a complete strategy as apposed to incorporating them as individual components.

6.2 Evaluation of study design
The design of this study was quasi-experimental. This involved comparing outcomes before and after an intervention with that of a concurrent control group. The design is referred to as
“quasi”-experimental because the communities were pre-selected, not randomly selected as required in true experiments. [Rossi et al., 1993]

The lack of randomization and insufficient number of study communities are the main design limitations in this study. The two communities in this pilot study were pre-selected and matched, and may have been associated with selection bias. An attempt was made to compare the two communities for characteristics that might independently influence the outcome measures using actual numbers rather than statistical significance. Due to the lack of statistical power, calculating the probability of detecting a significant difference among the two communities would not be meaningful. There were important differences among the two communities although the bias was in favour of higher x-ray use in the intervention community. The lack of non randomization and the small sample size could also contribute to the unequal distribution among the two communities of other important unknown factors that could have influenced the results.

Using a sample size calculation for matched pairs, [Green et al., 1995] the number of paired communities (control and intervention) required for an 80% power to detect a change in x-ray use from .70 to .40 with a 5% risk of a type 1 error would be 48 (for a total of 96 communities).

Although this would provide for sufficient statistical power and a means for appropriate randomization, a project this size may not be feasible. Using intra-community correlation [Donner & Klar, 1994] may help to reduce the number of communities needed.

6.3 Other limitations
The positive results of the study were based on data collected by self-administered surveys. Data from the surveys were not verified by objective means and may not have reflected actual practice patterns. Recall bias, misinterpretation of questions, lack of honesty, and wanting to please the PI may have resulted in inaccurate responses to the survey questions. The x-ray use rates in each community were estimated from the pre-intervention surveys. However, the rates were consistent with those of other studies which added confidence to the validity of these rates. This survey has been used previously and has been shown to have high reliability (kappa 0.81) and content validity. [Aker et al., 1996]

The results of the primary and secondary outcomes in this study were based on data from survey respondents. It is not certain if there was a change in x-ray use among non respondents following the intervention. Non respondents to both pre and post intervention surveys represented 44% of the chiropractors in the intervention community and 38% in the control. There were important differences among respondents and non respondents in both communities and this further limits the ability to generalize the results to the study population. The news release was published over three weeks after the mailing out of the post-intervention surveys. This component of the intervention may not have had any impact on those chiropractors who completed and returned the post intervention surveys early. However, it is not likely that this delay in the publication of the news release influenced the results seen in this study based on the negative responses it received in the evaluation of the intervention questionnaires.

The use of the same survey questions before and after the intervention had potential advantages and disadvantages. The advantage was that the text remained stable throughout the
study and therefore minimizes the risk that a change in the wording would be a factor influencing the response. The main disadvantage is the learning effect where respondents may be less able to generalize to other similar clinical scenarios.

A main limitation to the study was bias introduced by the PI who became central to all components of the intervention as well as the focus group session. The intent of the study was likely evident to most chiropractors in the intervention community. The positive results in the study may have been influenced by the perceived enthusiasm and intense involvement of the PI for the project and the desire of the participants to see it succeed. Blinding was not possible for the intervention but could have been used for some of the analysis.

The exact intervention used in this study would not likely be reproduced in future studies, although this should not be the intent. The intervention was tailored to the community. Its success likely relies heavily on the effectiveness of individual OL and/or EI to facilitate change among practitioners.

Six of the respondents of the pre-intervention surveys from the control group requested and received copies of the AHCPR guidelines during the intervention phase of the study. This was not considered contamination of the control community since receiving mailed guidelines alone was not expected to change behaviour. This did appear to be the case since there was no change in x-ray use detected in the control community following the intervention.

A potential weakness of the study was the introduction of a decision aid tool which had not yet been validated. The sensitivity, specificity and predictive values for this decision tool are not unknown. However, this decision aid tool incorporates all the red flags of the AHCPR guidelines with some modifications to the age-related indications and delaying an x-
ray on the index visit with some red flags. The modifications are unlikely to miss a serious disease, since all patients who present with a red flag and do not show improvement within 2 weeks of the index visit would receive an x-ray.

6.4 Conclusions

The results of this pilot study suggests the multifaceted intervention strategy used was successful in reducing the self-reported need for x-ray use in ALBP by chiropractors in a select community in Ontario. There were many flaws in methodology and design in this study which significantly compromises the validity of the results. Some of the limitations include non-randomization, small sample size, selection bias, the use of unverified survey data, non-blinding assessment and non validated outcome measures.

Notwithstanding the limitations in this study, the positive results suggest the need for further study. A large-scale randomized controlled trial, although desirable would require an enormous effort and would likely not be feasible. Well-conducted, small trials using more validated methods may be the more realistic alternative.
REFERENCES


Ammendolia C. Evaluation of Existing Practice Guidelines for Plain Film Radiography for Low Back Pain and Spinal Disorders. 1996; Unpublished work.


Beaton DE. Examining the Clinical Course of Work-Related Musculoskeletal Disorders Using the Ontario Workers' Compensation Board Administrative Database. Master's Thesis in Clinical Epidemiology, University of Toronto, 1995


Cardin A. Head of Radiology, Canadian Memorial Chiropractic College. Personal communication 1997.


College of Chiropractors of Ontario, Directory 1996.


Grod J. Assistant Registrar, College of Chiropractors of Ontario. Personal communication 1997


Canada, 1994


Hogg- Johnson S. Institute for Work and Health. Personal communication 1998


Lomas, J. Teaching Old (And Not So Old) Docs New Tricks: Effective Ways to Implement


Oakeshott P, Kerry SM, Williams JE. Randomized Controlled Trial of the Effect of the Royal College of Radiologists’ Guidelines on General Practitioners’ Referrals for Radiographic


Workers’ Compensation Board of Ontario, Annual Review, 1993
APPENDIX A

Introduction letters and assurance of confidentiality
Dear Colleague,

I am a Research Fellow at CMCC and I am also enrolled in the Masters Program in Clinical Epidemiology at the University of Toronto. As part of my thesis I am collecting data on the chiropractic management of patients with acute low back pain.

As you are aware there has been an explosion of research in the area of low back pain over the past several years. The vast majority of this research has come from the medical community.

Chiropractors are important players in the management of spinal disorders and I believe it is equally important that we contribute significantly to leading edge research in this area.

Enclosed you will find a survey developed by Peter Aker, DC of CMCC and researchers at the Institute for Work and Health. The goal of this survey is to gain a better understanding of how Ontario chiropractors manage low back pain.

Please be kind enough to complete the survey and mail it in the enclosed stamped, self-addressed envelope. As indicated in the survey all replies will be kept confidential. The identification number on the cover of the survey will be used to monitor returns, save remailing of the survey to those who have already responded and to sent a summary of results to those who request it. Once the survey is returned the cover of the survey will be removed.

Thank you in advance for your co-operation. If you have any questions regarding this research project please contact me by mail, fax or phone.

Sincerely,

Carlo Ammendolia, Bsc, DC
Dear Colleague,

I am a Research Fellow at CMCC and I am also enrolled in the Masters Program in Clinical Epidemiology at the University of Toronto. As part of my thesis I am collecting data on the chiropractic management of patients with acute low back pain.

As you are aware there has been an explosion of research in the area of low back pain over the past several years. The vast majority of this research has come from the medical community.

Chiropractors are important players in the management of spinal disorders and I believe it is equally important that we contribute significantly to leading edge research in this area.

I will be collecting data from chiropractors in your community and I hope I can count on your participation. I will be contacting you by telephone over the next few days to elaborate further the details of my project.

Sincerely yours,

Carlo Ammendolia, DC.
APPENDIX B

Chiropractor's Survey
MANAGEMENT OF PATIENTS
WITH LOW BACK PAIN

Chiropractor's Survey

I.D. NO. __________

Sponsored by:

Canadian Memorial Chiropractic College
Institute for Work & Health
MANAGEMENT OF PATIENTS WITH BACK PAIN

Assurance of confidentiality

All information which would permit identification of an individual will be held confidential. It will be used only by persons engaged in and for the purpose of this study. It will not be disclosed or released to other persons or used for any other purpose. Please do not remove the identification number on the survey. The cover will be removed after the survey is returned. It will be used (1) to monitor returns and save remailing of the survey to those who have already responded and (2) to send a summary of results to those who request it.

We invite your written comments and would be happy to answer any questions that you might have about the survey. We can be contacted c/o Dr. Aker at the address below:

Dr. Peter Aker  
Canadian Memorial Chiropractic College  
1900 Bayview Avenue  
Toronto, Ontario  
M4G 3E6

Fax: (416) 482-9745
Personal and Practice Characteristics

In this section, there are questions about your background and the general characteristics of your practice. The information will be used for data analysis only. Please check the appropriate box, fill in the blank, or circle the appropriate number, as required.

1. What year did you graduate from chiropractic college?

   Which college? ___________________________ Age at graduation? ________

2. Gender: 1 Female 2 Male

3. What is your status with the College of Chiropractors of Ontario? (Please circle only one).

   1 Active
   2 Inactive
   3 Retired
   4 Other (Please specify) ___________________________

4. Have you completed postgraduate training? If yes, please specify

   1 No
   2 Yes
     (i) Clinical Sciences
     (ii) Radiology
     (iii) Sport Services
     (iv) Other ___________________________

5. List any other degrees/diplomas you have from any other health discipline, e.g. MD, ND, PT, OT, DS, Acupuncture, Homeopathy) ___________________________

6. Do you teach chiropractic trainees?

   1 Yes, full-time
   2 Yes, part-time
   3 No

7. Your practice is best described as:

   1 Solo practice
   2 Group practice (number of chiropractors ________, do not include yourself).
   3 Multidisciplinary setting (with MD, DDS, optometrist, etc.)
   4 Other (please specify) ___________________________

8. Are you currently clinically managing low back pain patients?

   1 Yes (Go to Question 9)
   2 No If no, please describe your practice ___________________________ and skip to question 27 on page 14.

On the next pages are three vignettes of patients with low back pain with the sort of symptoms and signs that you might see in your practice. Following each of the vignettes are some general questions regarding the management of low back pain.
9. **Clinical Vignette #1**

A 28-year old woman has suffered from acute low back pain for a week. She has been unable to do her job managing a hospital cafeteria for this time. While anxious to return to work, she feels immobilized by the pain. There is no history of trauma. The pain is limited to the low back area, without radiation. On physical examination, there is marked limitation of anterior flexion and tenderness in the left paraspinal region. The neurological examination is normal, with normal straight leg raising to 90 degrees.

Which investigations and treatments would you routinely order for this patient at this visit? Please mark all appropriate boxes. If you mark a box in error, please indicate with a note in the margin.

### Investigations:
- [ ] Lumbar X-ray series
- [ ] Sacroiliac X-rays
- [ ] Surface Electromyography
  (specify):

### Refer for:
- [ ] Advanced Imaging (eg. CT, MRI, Myelogram, Bone scan)
- [ ] Electromyography/nerve conduction
- [ ] Lab tests (eg. urinalysis, ESR)
- [ ] Other (specify):

### In-office management/advice:
- [ ] No intervention - expectant observation only
- [ ] Bedrest (______days)
- [ ] General advice on back care
- [ ] Manual therapy (manipulation, mobilization)
- [ ] Advice on exercise (home programme)
- [ ] Work modification
- [ ] Psychosocial evaluation
- [ ] Lumbar support or corset
- [ ] Spinal traction

### Refer for management outside your office:
- [ ] Pain Clinic
- [ ] Other Chiropractor
- [ ] Physiotherapy
- [ ] Acupuncture
- [ ] Rehabilitation Clinic
- [ ] Family MD/General Practitioner
- [ ] Refer for prescription medication (if chosen, see opposite page)
- [ ] Refer to clinic specializing in formal programs of active supervised exercise & education for back
- [ ] Other (specify):
- [ ] Medical Specialist (if chosen see opposite page)
- [ ] Would not refer

---
Hospitalization

Would you refer the patient for admission to hospital? (*Please circle the appropriate number*)


Prognosis (*Please circle the appropriate number*)

What is the probability that this patient will:

<table>
<thead>
<tr>
<th>Event</th>
<th>Very likely</th>
<th>Likely</th>
<th>Not sure</th>
<th>Unlikely</th>
<th>Very Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recover within 2 weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Recover within 6 weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Have a recurrence within 2 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Have permanent difficulties with activities of daily life</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Require surgery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

If you selected "prescription medication", please indicate medication that may be appropriate:

- Prescription analgesics (eg. Tylenol 3)
- Benzodiazepines (eg. diazepam, lorazepam)
- Prescription NSAIDs (eg. Naprosen)
- Low-dose antidepressants (eg. amitriptyline)
- Muscle relaxants (eg. Flexeril)
- Other (specify): __________________________

If you selected "medical specialist", what was your reason for referral?

- Injections (eg. trigger point, facet, epidural) (specify): __________________________
- Surgery
- Second Opinion
- Other (specify): __________________________
Clinical Vignette #2

The woman in Vignette #1 has now had her symptoms for five weeks. You have managed her during this time and there has been little change in pain and no change in physical findings. Today she continues to have pain with movement, and she has not had the confidence to return to work. On examination today, she still has some limitation in the anterior flexion of the spine with a normal neurological examination.

Which investigations and treatments would you order for this patient at this visit, (including any you had ordered previously but would continue to use at this time)? Please mark all appropriate boxes. If you mark a box in error, please indicate with a note in the margin.

Investigations:
☐ Lumbar X-ray series
☐ Sacroiliac X-rays
☐ Surface Electromyography
(specify):________________________________________

Refer for:
☐ Advanced Imaging (eg. CT, MRI, Myelogram, Bone scan)
☐ Electromyography/nerve conduction
☐ Lab tests (eg. urinalysis, ESR)
☐ Other (specify):______________________________
☐ Would not order tests

In-office management/advice:
☐ No intervention - expectant observation only
☐ Bedrest (_____ days)
☐ General advice on back care
☐ Manual therapy
(specify, manipulation, mobilization)
☐ Advice on exercise (home programme)
☐ Work modification
☐ Psychosocial evaluation
☐ Lumbar support or corset
☐ Spinal traction
☐ Exercise (stretch or strengthen)
☐ Education (back school)
☐ Suggest over the counter medication
(specify): ☐ Analgesic
☐ Anti-inflammatory
☐ Muscle Relaxant
☐ Other ____________________________
☐ Electrotherapy (eg. TENS, interferential, etc.)
☐ Non-exercise modalities (eg. heat, ice, etc.)
☐ Follow-up appointment in _____ days
☐ Other (specify):______________________________

Referral for management outside your office:
☐ Pain Clinic
☐ Other Chiropractor
☐ Physiotherapy
☐ Acupuncture
☐ Rehabilitation Clinic
☐ Family MD/General Practitioner
☐ Refer for prescription medication (if chosen, see opposite page) ---->
☐ Refer to clinic specializing in formal programs of active supervised exercise & education for back
☐ Other (specify):_____________________________________
☐ Medical Specialist (if chosen see opposite page) ---->
(specify):______________________________
☐ Would not refer
Hospitalization

Would you refer the patient for admission to hospital? *Please circle the appropriate number*

1. Definitely
2. Probably
3. Probably not
4. Definitely not

Prognosis *Please circle the appropriate number*

What is the probability that this patient will:

- Recover within 2 weeks
- Recover within 6 weeks
- Have a recurrence within 2 years
- Have permanent difficulties with activities of daily life
- Require surgery

Clinical Vignette #2 (continued)

If this patient also reported weight loss and pain at rest, what (if any) additional investigations, treatments or referral would you order? *Please specify*

- ________________

If you selected "prescription medication", please indicate medication that may be appropriate:

- Prescription analgesics (e.g. Tylenol 3)
- Benzodiazepines (e.g. diazepam, lorazepam)
- Prescription NSAIDS (e.g. Naproxen)
- Low-dose antidepressants (e.g. amitriptyline)
- Muscle relaxants (e.g. Flexeril)
- Other (specify): __________________________

If you selected "medical specialist", what was your reason for referral?

- Injections (e.g. trigger point, facet, epidural) (specify): __________________________
- Surgery
- Second Opinion
- Other (specify): __________________________
A 35-year old auto mechanic presents with a 4 day history of severe acute low back pain with radiation to the posterior calf and lateral foot. The pain started when he was twisting at work but there was no history of trauma. He has some sensory deficits in this distribution and a new diminished ankle reflex but no motor weakness. Straight leg raising is limited to 45 degrees in the affected leg.

Which investigations and treatments would you routinely order for this patient at this visit? Please mark all appropriate boxes. If you mark a box in error, please indicate with a note in the margin.

**Order Investigations:**
- Lumbar X-ray series
- Sacroiliac X-rays
- Surface Electromyography

**Refer for:**
- Advanced Imaging (eg. CT, MRI, Myelogram, Bone scan)
- Electromyography/nerve conduction
- Lab tests (eg. urinalysis, ESR)
- Other (specify):
- Would not order tests

**In-office management/advice:**
- No intervention - expectant observation
- Bedrest (_____ days)
- General advice on back care
- Manual therapy (manipulation, mobilization)
- Advice on exercise (home programme)

**Other:**
- Exercise (stretch or strengthen)
- Education (back school)
- Suggest over the counter medication (specify):
  - Analgesic
  - Anti-inflammatory
  - Muscle Relaxant

**Referral for management outside your office:**
- Pain Clinic
- Other Chiropractor
- Physiotherapy
- Acupuncture
- Rehabilitation Clinic
- Family MD/General Practitioner

**Other:**
- Refer for prescription medication (if chosen, see opposite page)
- Refer to clinic specializing in formal programs of active supervised exercise & education for back
- Medical Specialist (if chosen see opposite page)
- Would not refer
Hospitalization

Would you refer the patient for admission to hospital? *(Please circle the appropriate number)*

1  Definitely  2  Probably  3  Probably not  4  Definitely not

**Prognosis** *(Please circle the appropriate number)*

What is the probability that this patient will:

<table>
<thead>
<tr>
<th>Event</th>
<th>Very likely</th>
<th>Likely</th>
<th>Not sure</th>
<th>Unlikely</th>
<th>Very Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recover within 2 weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Recover within 6 weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Have a recurrence within 2 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Have permanent difficulties with activities of daily life</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Require surgery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

If you selected "prescription medication", please indicate medication that may be appropriate:

- Prescription analgesics (eg. Tylenol 3)
- Benzodiazepines (eg. diazepam, lorazepam)
- Prescription NSAIDS (eg. Naprosen)
- Low-dose antidepressants (eg. amitriptyline)
- Muscle relaxants (eg. Flexeril)
- Other *(specify):* ____________________________

If you selected "medical specialist", what was your reason for referral?

- Injections (eg. trigger point, facet, epidural) *(specify):* ____________________________
- Surgery
- Second Opinion
- Other *(specify):* ____________________________
The patient's symptoms and physical examination have not improved after a four week trial of conservative care. Which of the following procedures would you refer for or recommend? *(Mark one or more boxes.)*

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>No additional tests</td>
<td>☐</td>
</tr>
<tr>
<td>Continue conservative therapy</td>
<td>☑</td>
</tr>
<tr>
<td>Electromyography/nerve conduction</td>
<td>☐</td>
</tr>
<tr>
<td>Computed tomography (CT) without contrast</td>
<td>☐</td>
</tr>
<tr>
<td>Contrast Myelogram or CT/Myelogram</td>
<td>☐</td>
</tr>
<tr>
<td>Magnetic resonance imaging</td>
<td>☐</td>
</tr>
<tr>
<td>Diskogram</td>
<td>☐</td>
</tr>
<tr>
<td>Refer for second opinion</td>
<td>☑</td>
</tr>
<tr>
<td>Other (specify):</td>
<td>☐</td>
</tr>
</tbody>
</table>

Clinical Vignette #3 (continued)
Please indicate the extent to which you agree or disagree with the following statements. Please circle one number for each statement.

<table>
<thead>
<tr>
<th>Treatment Modalities</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Not Sure</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>NSAIDS</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Traction</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>TENS</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Massage</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Patients with acute low back pain (LBP) should be prescribed complete bed rest until pain goes away.

1. 2 3 4 5

I am likely to arrange X-rays for patients with low back pain because patients so often expect me to do so.

1. 2 3 4 5

X-rays of the lumbar spine are useful in the diagnostic work up of patients with acute (<1 month) LBP.

1. 2 3 4 5

Interventions by chiropractors in the health care system have very little positive impact on the natural history of acute LBP.

1. 2 3 4 5

Interventions by physicians and other providers in the health care system have very little positive impact on the natural history of acute LBP.

1. 2 3 4 5

Practice guidelines are useful to help chiropractors in the management of patients.

1. 2 3 4 5

Practice guidelines are useful to help physicians in the management of patients.

1. 2 3 4 5

Encouragement of physical activity is important in the recovery from LBP.

1. 2 3 4 5

Patients with LBP should not return to work until they are almost pain free.

1. 2 3 4 5
Back education programs aimed at educating workers in safe lifting techniques are effective in reducing recurrences of LBP.

Many patients with chronic back pain are motivated primarily by secondary gain.

I am very comfortable managing patients with LBP.

I often have negative feelings about treating people who have LBP.

In patients with LBP and neurological findings, in the long term there is no difference between surgical and chiropractic management (excluding cauda equina).

Many of the investigations for my patients with low back pain are ordered to conform with the normal practice patterns of my peer group.

There is nothing physically wrong with many patients with chronic back pain.

Well motivated patients are unlikely to have long term problems with low back pain.

I have no difficulty in assessing the motivation of my low back pain patients.

I would find practice guidelines helpful in the management of low back pain.

In patients treated initially with spinal manipulations for acute low back pain, ongoing spinal manipulative therapy is recommended after six weeks:

- if patient's symptoms are resolved
- if patient's symptoms continue to persist

In a normal individual manipulation will prevent low back pain.
Four years ago, the Worker's Compensation Board Rehabilitation Strategy established both the Community Clinics and Regional Evaluation Centres for injured workers. The programs are paid for by the Worker's Compensation Board.

The Community Clinics provide structured exercise and education, along with traditional chiropractic or physiotherapy treatment.

The Regional Evaluation Centres provide more sophisticated assessment and evaluation programs. These programs may be used to clarify the diagnosis, identify further treatment options and evaluate the worker's capacity for specific jobs.

The Worker's Compensation Board also arranged for Clinical Nurse Specialists to monitor difficult cases and suggest referrals when necessary.

*Please circle the appropriate number for each question.*

13. Were you aware of the Community Clinic program? Yes 1 No 2
14. Were you aware of the Regional Evaluation Centres? 1 2
15. Were you aware of the Clinical Nurse Specialists? 1 2

If you answered no to questions 13, 14 and 15, please skip to question 19 on page 13.

16. How would you rate the effectiveness of the WCB Community Clinic, Regional Evaluation Centre, and Clinical Nurse Specialist, compared to regular management?

<table>
<thead>
<tr>
<th></th>
<th>No Contact/ Never Referred</th>
<th>Clearly Superior</th>
<th>Superior</th>
<th>Equivalent</th>
<th>Inferior</th>
<th>Clearly Inferior</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Community Clinic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>b) Regional Evaluation Centre</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>c) Clinical Nurse Specialist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
17. If you refer cases to the Community Clinic Program what characteristics of the worker lead you to refer to a Community Clinic Program rather than any other therapy program. *Please mark those characteristics likely to result in referral.*

- [ ] male
- [ ] over 45 years of age
- [ ] in more severe pain
- [ ] has had similar problem before
- [ ] should recover quickly
- [ ] not responding to routine/usual treatment
- [ ] can't do regular job and no light duties available
- [ ] high likelihood of on-the-job re-injury
- [ ] blue collar worker
- [ ] communicate with difficulty in English
- [ ] present psychological problems
- [ ] other (specify): __________________________

18. If you have not referred a patient to either a community clinic or regional evaluation centre, why not? *Please check all boxes which apply.*

- [ ] Prefer to manage patient myself
- [ ] not available in my community
- [ ] lack of effectiveness
- [ ] difficult to get to/poor location
- [ ] length of treatment is too long
- [ ] waiting time for treatment is too long
- [ ] I do not see the type of patients who would benefit from the clinic/centre.
- [ ] Poor communication with WCB staff
- [ ] Unable to get cooperation with WCB
- [ ] Other (specify): __________________________
Patient Profile and Continuing Education

Please answer all questions by filling in the blank, circling the most appropriate answer or checking all the answers that apply. Thank you.

19. On an average day in the office, how many patients do you see per hour?
   _______ patients per hour

20. Approximately, how many office hours per week do you spend in direct patient contact?
   _______ hours per week

21. In a typical one week period, how many patients are seen primarily for low back pain (ie. pain in the lower back or buttocks).
   _______ patients per week

22. Approximately what percentage of your low back pain patients (those indicated in question 21) are Workers’ Compensation Board cases?
   _______ percentage

23. Do you attend continuing education seminars?
   1  Yes  If yes, which ones? ___

   2  No

24. Do you attend any regular local chiropractic society meetings?
   1  Yes  If yes, please specify

   2  No

25. Is there a local chiropractor, MD, specialist or other provider who you go to for information and/or advice on the management of low back pain?
   1  Yes  If yes, please indicate the type of health care provider and name ______________________

   2  No

26. How credible would the following professionals be as sources of information on the management of low back pain?

<table>
<thead>
<tr>
<th>Professional</th>
<th>Very Credible</th>
<th>Credible</th>
<th>Not Sure</th>
<th>Not Very Credible</th>
<th>Not at all Credible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiropractor</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Family Physician/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Practitioner</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Neurologist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Psychiatrist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Rheumatologist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>WCB Clinical Nurse Specialist</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Orthopaedic Surgeon</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
27. Would you like a summary of the survey results?
   1. Yes
   2. No

28. Do you have a copy of the Clinical Guidelines for Chiropractic Practice in Canada?
   1. Yes
   2. No

29. If not, would you like a copy?
   1. Yes
   2. No

Please use the space below for any comments you would like to make. Thank you.

________________________________________
________________________________________
________________________________________
________________________________________
________________________________________

That's all!
Please return the completed questionnaire in the enclosed envelope.
Thank you very much for your time!
APPENDIX C

Focus group questionnaire

Focus group introduction letter and questions

Focus group evaluation form
FOCUS GROUP QUESTIONNAIRE

1. What year did you graduate from chiropractic college? ____________________

2. Which chiropractic college did you graduate from? ____________________

3. How old were you when you graduated? ____________________

4. Gender: Male _____ Female _____

5. Postgraduate training? (Circle)  
   A. rehab fellow  
   B. clinical sciences  
   C. radiology  
   D. other ____________________

6. Practice  
   A. Solo  
   B. Other chiropractors  
   C. Multi disciplinary setting

7. X-ray use:  
   A. In office  
   B. Hospital  
   C. Other chiropractor  
   D. Private lab
FOCUS GROUP RESEARCH
SELECTED PETERBOROUGH CHIROPRACTORS
NOVEMBER 13TH 1997

OBJECTIVES: To assess the attitudes and beliefs of a select group of Peterborough chiropractors towards the use of x-ray for assessing patients with acute low back pain.

GENERAL INSTRUCTIONS: (a) introduction of moderator (primary investigator). (b) Brief explanation of the purpose of the focus group. Alert them that the session will be audio tape recorded. Outline the role of the moderator. Request that the participants express themselves freely without fear of being openly criticized. Assure the group of anonymity when the information is analyzed. c) Ask each participant to introduce themselves and tell the group a little about themselves (school of graduation, years in practice etc.).

QUESTIONS FOR DISCUSSION:
1. There is a great deal of discussion these days on the use of clinical practice guidelines. What are your thoughts on practice guidelines?

2. Is anyone familiar with guidelines on chiropractic practice? What are your thoughts on these guidelines. Are they helpful? Do you use them? Why? Where does the art of chiropractic practice come in and what about clinical intuition?

3. Mercy and Glenerin guidelines on x-ray use are very general and basically leave it up to the clinical judgement of the chiropractor. Many argue this is a good thing. The AHCPR guidelines on the other hand are very explicit and use the presence of “red flags” as indicators for x-rays use. How do you feel about this?

4. How many of you have your own x-ray in your office?

5. A recent survey indicated that about 70% of Ontario chiropractors stated they would x-ray their patients who present with acute low back pain. What do you think about the results of this survey? According to how you practice, is this rate of x-ray use high, low or about right?

6. As chiropractors is it not important that we x-ray all our patients (regardless of the symptoms) before an adjustment can be performed properly and safely? Or does it depend on patient history and examination findings?
7. What are the reasons that we x-ray our patients. (Spinographic analysis, diagnosis, prognosis, screening, locating subluxation, treatment selection, line of drive, contraindication to manipulation, pathology, patient education, financial, malpractice, monitor degenerative processes etc.)? Which do you think are valid reasons? Is there good supportive evidence?. Does it matter?

8. Is there a role for x-ray use to monitor patients progress after the initial acute episode? (ie, re-x-ray to monitor for advancing degenerative changes, changes in vertebral alignment/ mal- position, changes in curvatures eg. lordosis, pelvic leveling etc.) What about functional x-rays ie, flexion-extension or lateral flexion views?

9. Do you think there is a need to reduce or increase x-ray use for patients with acute low back pain?

10. How would you go about it here in Peterborough. Do you think your colleagues would be receptive to change in their x-ray ordering behaviour? What would it take to get them to change their practice. (more convincing scientific research, explicit chiropractic evidence-based guidelines, College of Chiropractors of Ontario endorsed guidelines, government regulations, peer pressure, expert opinion, patient demand, one on one education, educational workshops, decision aid tools, etc.)

11. Case study
a) 27 year old female presents with a 10 day history of acute low back pain following a long bus ride from New York City. She is limited in her ability to work as a letter carrier. The pain is localized to the left lumbosacral region. She is otherwise healthy except for “a recurrent irritable bowel” which she has had on and off for two years (now asymptomatic). On examination he has limited ROM during forward flexion (50%) and extension (25%). He is very tender over the left L5-S1 segment which on deep palpation reproduces her low back pain. Neurologically she is intact.
Would you take an x-ray of this patient? If so why? Which views would you take and why? (Full spine, lumbar spine- AP, Lat, Obl, SI joints, Pelvis)
If not, why not? When would you consider taking films?
FOCUS
FOCUS GROUP EVALUATION

PLEASE ANSWER THE FOLLOWING QUESTIONS REGARDING THE FOCUS GROUP EXPERIENCE. (Use the back of the page if you need more space).

1. What were your general impressions of the focus group meeting?

2. Did you feel you had sufficiently expressed your opinions regarding the topic. If not please elaborate below.

3. Do you think the groups opinions regarding x-ray, reflects the opinions of most chiropractors in this community?

4. Did the moderator try to influence your opinions? Did he maintain neutrality?

5. Any other comments regarding tonight focus group meeting?

Thank you for your assistance in this research project.
APPENDIX D

Workshop Introduction

Workshop Agenda
Welcome to today’s information workshop and thank you for your participation.

The purpose of this workshop is to provide feedback on the chiropractic surveys and focus group session that have been conducted in Peterbourgh recently. The objective of this research is to gather information about how chiropractors manage patients with acute LBP (LBP of less than 3 months duration) as well as their beliefs and attitudes on the use of x-ray for this patient population.

The ultimate goal of this workshop and this research initiative as a whole, is to attempt to narrow the gap between present practice and existing evidence.

The cost of health care in Canada continues to grow. There are many treatments and procedures that continue to be performed by all health care disciplines that have not only been shown to be of limited value, (and therefore adds a further unnecessary burden to our care resources) but also to have potential adverse affects on the patient.

One such procedure is the use of x-ray for assessing patients with acute LBP. There is a call from experts from all disciplines in this field, including chiropractic to reduce the unnecessary use of this diagnostic tool for acute LBP patients.

This workshop will present some of the evidence in support of the need to reduce the use of x-ray amongst chiropractors for patients who present with acute LBP.

It is the ultimate responsibility of all health care providers to continue to evaluate their practices to ensure their patients receive the most appropriate care, or at the very least, care that does more good than harm.

Thank you again for your participation.

Carlo Ammendolia DC
X-RAY FOR ACUTE LBP
WORKSHOP AGENDA

Review chiropractic survey results

summary of focus group session

review the evidence

practice guidelines

“Red Flags overview”

introduction to a decision aid tool
for x-ray use

discussion period
APPENDIX E

Letters from prominent chiropractors
February 11, 1998

Claire Bombardier, M.D.
Institute for Work & Health
250 Bloor Street East, Suite 702
Toronto, Ontario M4W 1E6
Canada

Dear Claire,

I have just received your letter and the enclosure from Carlo Ammendolia. I will try to give my thoughts on the issue as they come to me today.

1. This is an extremely controversial issue which is the subject of a great deal of professional debate.

2. Many chiropractors insist they need x-rays to make a biomechanical analysis prior to giving an adjustment (manipulation).

3. Until this year, Medicare has insisted that any chiropractic care be justified by x-ray.

4. Attorneys tend to attack chiropractors in malpractice cases of any nature if x-rays are not taken.

5. In the absence of red flags, it is highly unlikely that unexpected pathology will be found on x-ray.

6. There is controversy over the effect of manipulation in patients who may have greater than expected degenerative changes which are common in routine x-rays.
7. Chiropractors in Europe and most countries outside of North America practice without routine x-rays, and there is no obvious increased complication rate.

My position remains ambiguous. Intellectually, there does not appear to be any overwhelming reason for x-rays in the first month in the absence of red flags. I understand, however, the emotional reluctance of chiropractors to give up x-rays if they were taught to use x-rays for the correct manipulative procedure, if they are concerned about the amount of degeneration, which may modify their treatment, or if they have malpractice concerns.

The only way we can resolve these areas is with further knowledge and confidence based on research.

Yours sincerely,

SCOTT HALDEMAN, M.D., Ph.D.

SH/rm

byebom211198

cc: Carlo Ammendolia, D.C.
February 11, 1998

Dr. Carlo Ammendolia
Maple Professional Center
101-2301 Major McKenzie Dr.
Maple, Ontario
Canada L6A-1R8

Dear Dr. Ammendolia:

The response to your letter of 1-23-98 is attached. I hope that this will be of use to you. Good luck on your study.

Sincerely,

John J. Triano, D.C., M.A.

cc: Claire Bombardier, M. D., F.R.C.T.C.
Institute for Work and Health
250 Bloor St. east, Suite 702
Toronto, Ontario, Canada M4W1E6
X-RAY USE IN CHIROPRACTIC MANAGEMENT OF THE ACUTE SPINE CASE OF LESS THAN ONE WEEK DURATION

The purpose for plain x-ray investigation of the acute spine for which there is evidence of clinical utility is to confirm a high index of suspicion for significant trauma or osseous disease. Such condition being a contraindication to one or more anticipated treatment options or a basis for referral to alternative approach specifically more effective for the suspect condition.

The level of suspicion is always raised by information gleaned from the history and physical examination or from an unexplained clinical response of a treatment trial routinely used for the complaint.

Specific elements suggesting use of x-ray in the acute spine complaint include:

1. First episode of spine pain in males over age 50.
2. Trauma consistent with forces/moments adequate to result in fracture or ligamentous separation.
3. New presentation of back pain in a patient over age 70.
4. History or physical signs consistent with infection or frank instability.
5. History of cancer.
6. Physical findings suggesting endocrine or metabolic diseases of bone including pathological fracture.
7. Suspicion of moderate to severe osteoporosis.
8. Suspicion of toxopathy from foraminal stenosis.

Under these circumstances, treatment considered potentially harmful should be withheld until the suspicion is cleared by negative results of imaging.
APPENDIX F

News release
Physicians, chiropractors may reduce unnecessary X-rays with new decision aid tool, says researcher

By Examiner Staff

It is estimated that 60 percent of the population will experience a bout of low back pain at some point in their lives, says Dr. Carlo Ammendolia, a chiropractor and research fellow at the Canadian Memorial Chiropractic College and the Institute for Work and Health in Toronto.

In over 90 percent of these cases, the source of back pain is inflamed muscles and joints which resolves on its own within four to six weeks. X-rays in these patients are not useful and not recommended, he adds.

Dr. Ammendolia has recently begun to meet with local Peterborough chiropractors, outlining his research and introducing his decision aid tool.

The presentations have been well received so far, he says.

He and other researchers from the Institute for Work and Health have been also working with a group of local Peterborough physicians, who have developed the "Peterborough Back Rules."

These rules are: rule out serious problem causing back pain, he says.

"Patients who are at high risk for having more serious disease can usually be identified by the presence of "warning signs" which are found, during history-taking and when performing the physical examination, he adds.

Some examples of warning signs include significant trauma, recent unexplained weight loss, night pain and a history of cancer and certain infections, he says.

Dr. Ammendolia says he has developed a decision aid tool which scores patients based on the presence of absence of these warning signs.

Patients who obtain high scores are recommended to have an X-ray whereas patients who obtain low scores are not, according to Dr. Ammendolia. Medium risk patients should be monitored and if there is no improvement in their condition then an X-ray is recommended, he says.

Dr. Ammendolia modelled this decision aid tool after what he calls the "Ottawa Ankle Rules" which is a similar tool to help doctors determine the likelihood of fracture, in patients who come to hospital emergency wards with twisted and swollen ankles.

This decision aid tool has been shown to reduce unnecessary ankle X-rays by 33 percent, according to Dr. Ammendolia.

It is hoped that the decision aid tool will have a similar impact on decreasing unnecessary back X-rays, thereby reducing not only potentially dangerous exposure, but also saving the Ontario health care system millions of dollars each year, according to Dr. Ammendolia. At present the Ontario Health Insurance Plan (OHIP) spends over $1.5 million a year on low back X-rays, says Dr. Ammendolia.

This is a risk associated with back X-rays, says Dr. Ammendolia.

Because of proximity to the reproductive organs, back X-rays increase the risk of inducing cell mutation and possibly cancer in this highly susceptible tissue.

He explains that an X-ray is useful in identifying the cause of acute low back pain in adult patients in less than two percent of cases.

These patients tend to have an increased chance of having a more serious problem causing back pain, he says.

"Thus, the rules also emphasize the importance of a focused history and physical examination so the doctor can rule out serious disease, thus eliminating the need for X-rays or laboratory tests."

The importance of balancing pain relief, using certain medication and/or manipulation, with staying active and returning to regular activities — including work — as soon as possible is emphasized, says Dr. Ammendolia.

"This group has come up with some innovative tools and excellent educational material for both physicians and patients," he says.

However, results of recent surveys of Ontario physicians and chiropractors suggest that many patients continue to have unnecessary X-rays for their low back pain, he says.

Dr. Ammendolia
APPENDIX G

Evaluation of the intervention questionnaire
CHIROPRACTIC X-RAY PROJECT
EVALUATION SURVEY

Please circle one answer for each question.

1. Does your present chiropractic practice include patients with back pain?
   1. NO (please describe reason)
   2. YES

2. Were you aware of a research initiative in your community over the past year, aimed at implementing evidence-based guidelines for the use of x-ray for acute low back pain patients?
   1. NO
   2. YES

3. Over the past year, have you modified in any way your approach to x-ray use for patients with acute low back pain?
   1. NO
   2. YES
   
   If YES, in what way?_____________________________________________________
   __________________________________________ Why?
   __________________________________________

4. Are you aware of the "RED FLAGS" for x-ray use for acute low back pain patients?
   1. NO
   2. YES

   If YES, how did you find out about them?_____________________________________
   ______________________________________


5. **In your opinion**, what is the most important message of the research initiative?

A. Most patients with acute low back pain need x-rays.
B. If there are no red flags, x-rays are never needed.
C. X-rays are needed only when there is a history of cancer or trauma.
D. If there are no red flags, x-rays are of little value in patients with acute low back pain.

6. There were a number of components to the research initiative presented in your community over the past year. Please check the option that best reflects your opinion about the usefulness of each component in improving your x-ray use in patients with acute low back pain.

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<th>Useful</th>
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<th>Useless</th>
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